

8557345



# THE UNITED STATES OF AMERICA

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UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

*January 02, 2025*

**THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE  
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OF:**

**APPLICATION NUMBER: 13/828,960**

**FILING DATE: *March 14, 2013***

**PATENT NUMBER: 9173100**

**ISSUE DATE: *October 27, 2015***



Certified by

*David A. Brent*

Acting Under Secretary of Commerce  
for Intellectual Property  
and Acting Director of the United States  
Patent and Trademark Office

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# DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of  
Invention

ON BOARD VEHICLE NETWORK SECURITY

As the below named inventor, I hereby declare that:

This declaration  
is directed to:



The attached application, or



United States application or PCT international application number \_\_\_\_\_

filed on \_\_\_\_\_.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

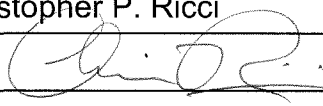
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

## WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Christopher P. Ricci Date (Optional) : \_\_\_\_\_

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

## Electronic Patent Application Fee Transmittal

**Application Number:**

**Filing Date:**

**Title of Invention:**

ON BOARD VEHICLE NETWORK SECURITY

**First Named Inventor/Applicant Name:**

Christopher P. Ricci

**Filer:**

Douglas W. Swartz/Christine Jacquet

**Attorney Docket Number:**

6583-247-CIP-5

Filed as Large Entity

### Utility under 35 USC 111(a) Filing Fees

| Description                | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|----------------------------|----------|----------|--------|----------------------|
| <b>Basic Filing:</b>       |          |          |        |                      |
| Utility application filing | 1011     | 1        | 390    | 390                  |
| Utility Search Fee         | 1111     | 1        | 620    | 620                  |
| Utility Examination Fee    | 1311     | 1        | 250    | 250                  |

**Pages:**

**Claims:**

|                        |      |   |    |     |
|------------------------|------|---|----|-----|
| Claims in Excess of 20 | 1202 | 4 | 62 | 248 |
|------------------------|------|---|----|-----|

**Miscellaneous-Filing:**

**Petition:**

| Description                       | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|-----------------------------------|----------|----------|--------|----------------------|
| Patent-Appeals-and-Interference:  |          |          |        |                      |
| Post-Allowance-and-Post-Issuance: |          |          |        |                      |
| Extension-of-Time:                |          |          |        |                      |
| Miscellaneous:                    |          |          |        |                      |
| Total in USD (\$)                 |          |          |        | 1508                 |



## Electronic Acknowledgement Receipt

|                                             |                                     |
|---------------------------------------------|-------------------------------------|
| <b>EFS ID:</b>                              | 15233702                            |
| <b>Application Number:</b>                  | 13828960                            |
| <b>International Application Number:</b>    |                                     |
| <b>Confirmation Number:</b>                 | 1085                                |
| <b>Title of Invention:</b>                  | ON BOARD VEHICLE NETWORK SECURITY   |
| <b>First Named Inventor/Applicant Name:</b> | Christopher P. Ricci                |
| <b>Customer Number:</b>                     | 111285                              |
| <b>Filer:</b>                               | Douglas W. Swartz/Christine Jacquet |
| <b>Filer Authorized By:</b>                 | Douglas W. Swartz                   |
| <b>Attorney Docket Number:</b>              | 6583-247-CIP-5                      |
| <b>Receipt Date:</b>                        | 14-MAR-2013                         |
| <b>Filing Date:</b>                         |                                     |
| <b>Time Stamp:</b>                          | 18:08:58                            |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)         |

### Payment information:

|                                          |                 |
|------------------------------------------|-----------------|
| Submitted with Payment                   | yes             |
| Payment Type                             | Deposit Account |
| Payment was successfully received in RAM | \$ 1508         |
| RAM confirmation Number                  | 12604           |
| Deposit Account                          | 191970          |
| Authorized User                          |                 |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

**Ford Ex. 1002 Page 5 of 1178**

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

## File Listing:

| Document Number                                 | Document Description                                | File Name                              | File Size(Bytes)/ Message Digest         | Multi Part /.zip | Pages (if appl.) |
|-------------------------------------------------|-----------------------------------------------------|----------------------------------------|------------------------------------------|------------------|------------------|
| 1                                               | Application Data Sheet                              | 6583-247-CIP-5-ADS-Final.pdf           | 53794                                    | no               | 7                |
|                                                 |                                                     |                                        | f4c1511c469d26ac3f5084db6a0b24391866ac57 |                  |                  |
| Warnings:                                       |                                                     |                                        |                                          |                  |                  |
| Information:                                    |                                                     |                                        |                                          |                  |                  |
| This is not an USPTO supplied ADS fillable form |                                                     |                                        |                                          |                  |                  |
| 2                                               |                                                     | 6583-247-CIP-5-PatentAppFinal.pdf      | 342805                                   | yes              | 93               |
|                                                 |                                                     |                                        | b751e9706a6c4fcefee51f1f5fd1272f75145b1  |                  |                  |
|                                                 | Multipart Description/PDF files in .zip description |                                        |                                          |                  |                  |
|                                                 | Document Description                                |                                        | Start                                    | End              |                  |
|                                                 | Specification                                       |                                        | 1                                        | 86               |                  |
|                                                 | Claims                                              |                                        | 87                                       | 92               |                  |
|                                                 | Abstract                                            |                                        | 93                                       | 93               |                  |
| Warnings:                                       |                                                     |                                        |                                          |                  |                  |
| Information:                                    |                                                     |                                        |                                          |                  |                  |
| 3                                               | Drawings-only black and white line drawings         | 6583-247-CIP-5-DrawingsFinal.pdf       | 137417                                   | no               | 31               |
|                                                 |                                                     |                                        | 2b52c4105c00120ff1ab6835525833fb13973d39 |                  |                  |
| Warnings:                                       |                                                     |                                        |                                          |                  |                  |
| Information:                                    |                                                     |                                        |                                          |                  |                  |
| 4                                               | Oath or Declaration filed                           | 6583-247-CIP-5-ExecutedDeclaration.pdf | 135920                                   | no               | 1                |
|                                                 |                                                     |                                        | 7025d7851a4ffeeff60e760da6e2ef9c905e56f3 |                  |                  |
| Warnings:                                       |                                                     |                                        |                                          |                  |                  |
| Information:                                    |                                                     |                                        |                                          |                  |                  |
| 5                                               | Fee Worksheet (SB06)                                | fee-info.pdf                           | 37025                                    | no               | 2                |
|                                                 |                                                     |                                        | 16ce5d61a54a59a42b40af88c6897573ac6aaba5 |                  |                  |
| Warnings:                                       |                                                     |                                        |                                          |                  |                  |
| Information:                                    |                                                     |                                        |                                          |                  |                  |
| Total Files Size (in bytes):                    |                                                     |                                        | 706961                                   |                  |                  |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                        |                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------|----------------|
| <b>Application Data Sheet 37 CFR 1.76</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   | Attorney Docket Number | 6583-247-CIP-5 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   | Application Number     |                |
| Title of Invention                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ON BOARD VEHICLE NETWORK SECURITY |                        |                |
| <p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p> |                                   |                        |                |

## Secrecy Order 37 CFR 5.2

|                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Inventor Information:

|                                                                                                                                                                                    |             |                          |             |                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------|-------------|-------------------------|
| Inventor 1 <span style="float: right;">Remove</span>                                                                                                                               |             |                          |             |                         |
| Legal Name                                                                                                                                                                         |             |                          |             |                         |
| Prefix                                                                                                                                                                             | Given Name  | Middle Name              | Family Name | Suffix                  |
|                                                                                                                                                                                    | Christopher | P.                       | Ricci       |                         |
| Residence Information (Select One) <input checked="" type="radio"/> US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service           |             |                          |             |                         |
| City                                                                                                                                                                               | Saratoga    | State/Province           | CA          | Country of Residence US |
| Mailing Address of Inventor:                                                                                                                                                       |             |                          |             |                         |
| Address 1                                                                                                                                                                          |             | 20650 4th Street, Unit 2 |             |                         |
| Address 2                                                                                                                                                                          |             |                          |             |                         |
| City                                                                                                                                                                               | Saratoga    | State/Province           | CA          |                         |
| Postal Code                                                                                                                                                                        | 95070       | Country                  | US          |                         |
| All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the <b>Add</b> button. <span style="float: right;">Add</span> |             |                          |             |                         |

## Correspondence Information:

|                                                                                                                                       |                              |           |              |
|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------|--------------|
| Enter either Customer Number or complete the Correspondence Information section below.<br>For further information see 37 CFR 1.33(a). |                              |           |              |
| <input type="checkbox"/> An Address is being provided for the correspondence information of this application.                         |                              |           |              |
| Customer Number                                                                                                                       | 111285                       |           |              |
| Email Address                                                                                                                         | flexpatents@sheridanross.com | Add Email | Remove Email |

## Application Information:

|                                         |                                   |                                                      |  |
|-----------------------------------------|-----------------------------------|------------------------------------------------------|--|
| Title of the Invention                  | ON BOARD VEHICLE NETWORK SECURITY |                                                      |  |
| Attorney Docket Number                  | 6583-247-CIP-5                    | Small Entity Status Claimed <input type="checkbox"/> |  |
| Application Type                        | Nonprovisional                    |                                                      |  |
| Subject Matter                          | Utility                           |                                                      |  |
| Total Number of Drawing Sheets (if any) | 31                                | Suggested Figure for Publication (if any)            |  |

|                                           |                                   |                        |                |
|-------------------------------------------|-----------------------------------|------------------------|----------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                   | Attorney Docket Number | 6583-247-CIP-5 |
|                                           |                                   | Application Number     |                |
| Title of Invention                        | ON BOARD VEHICLE NETWORK SECURITY |                        |                |

**Publication Information:**

|                          |                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | Request Early Publication (Fee required at time of Request 37 CFR 1.219)                                                                                                                                                                                                                                                                                                                      |
| <input type="checkbox"/> | <b>Request Not to Publish.</b> I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application <b>has not and will not</b> be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing. |

**Representative Information:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                  |                                              |                                                         |                    |                                                  |                                              |                                                         |                 |        |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------|---------------------------------------------------------|--------------------|--------------------------------------------------|----------------------------------------------|---------------------------------------------------------|-----------------|--------|--|--|
| <p>Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.</p> |                                                  |                                              |                                                         |                    |                                                  |                                              |                                                         |                 |        |  |  |
| <table border="1"> <tr> <td>Please Select One:</td> <td><input checked="" type="radio"/> Customer Number</td> <td><input type="radio"/> US Patent Practitioner</td> <td><input type="radio"/> Limited Recognition (37 CFR 11.9)</td> </tr> <tr> <td>Customer Number</td> <td colspan="3">111285</td> </tr> </table>                                                                                                                                                    |                                                  |                                              |                                                         | Please Select One: | <input checked="" type="radio"/> Customer Number | <input type="radio"/> US Patent Practitioner | <input type="radio"/> Limited Recognition (37 CFR 11.9) | Customer Number | 111285 |  |  |
| Please Select One:                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <input checked="" type="radio"/> Customer Number | <input type="radio"/> US Patent Practitioner | <input type="radio"/> Limited Recognition (37 CFR 11.9) |                    |                                                  |                                              |                                                         |                 |        |  |  |
| Customer Number                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 111285                                           |                                              |                                                         |                    |                                                  |                                              |                                                         |                 |        |  |  |

**Domestic Benefit/National Stage Information:**

|                                                                                                                                                                                                                                                                                                                      |                         |                          |                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------|--------------------------|
| This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78. |                         |                          |                          |
| Prior Application Status                                                                                                                                                                                                                                                                                             | Pending                 | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                                                                                                                                                                                                                   | Continuity Type         | Prior Application Number | Filing Date (YYYY-MM-DD) |
|                                                                                                                                                                                                                                                                                                                      | Continuation in part of | 13/679476                | 2012-11-16               |
| Prior Application Status                                                                                                                                                                                                                                                                                             | Expired                 | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                                                                                                                                                                                                                   | Continuity Type         | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13/679476                                                                                                                                                                                                                                                                                                            | non provisional of      | 61/560509                | 2011-11-16               |
| Prior Application Status                                                                                                                                                                                                                                                                                             | Pending                 | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                                                                                                                                                                                                                   | Continuity Type         | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13/679476                                                                                                                                                                                                                                                                                                            | non provisional of      | 61/637164                | 2012-04-23               |
| Prior Application Status                                                                                                                                                                                                                                                                                             | Pending                 | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                                                                                                                                                                                                                   | Continuity Type         | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13/679476                                                                                                                                                                                                                                                                                                            | non provisional of      | 61/663335                | 2012-06-22               |
| Prior Application Status                                                                                                                                                                                                                                                                                             | Pending                 | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                                                                                                                                                                                                                   | Continuity Type         | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13/679476                                                                                                                                                                                                                                                                                                            | non provisional of      | 61/646747                | 2012-05-14               |
| Prior Application Status                                                                                                                                                                                                                                                                                             | Pending                 | <a href="#">Remove</a>   |                          |

|                                           |                                   |                        |                |
|-------------------------------------------|-----------------------------------|------------------------|----------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                   | Attorney Docket Number | 6583-247-CIP-5 |
|                                           |                                   | Application Number     |                |
| Title of Invention                        | ON BOARD VEHICLE NETWORK SECURITY |                        |                |

|                                                                                                                       |                    |                          |                          |
|-----------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------|--------------------------|
| Application Number                                                                                                    | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13/679476                                                                                                             | non provisional of | 61/653275                | 2012-05-30               |
| Prior Application Status                                                                                              | Pending            | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                    | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13/679476                                                                                                             | non provisional of | 61/653264                | 2012-05-30               |
| Prior Application Status                                                                                              | Pending            | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                    | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13/679476                                                                                                             | non provisional of | 61/653563                | 2012-05-31               |
| Prior Application Status                                                                                              | Pending            | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                    | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13/679476                                                                                                             | non provisional of | 61/672483                | 2012-07-17               |
| Prior Application Status                                                                                              | Pending            | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                    | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13/679476                                                                                                             | non provisional of | 61/714016                | 2012-10-15               |
| Prior Application Status                                                                                              | Pending            | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                    | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) |
| 13/679476                                                                                                             | non provisional of | 61/715699                | 2012-10-18               |
| Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the <b>Add</b> button. |                    |                          |                          |

## Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)<sup>i</sup> the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

|                                                                                                        |                      |                          |                                          |
|--------------------------------------------------------------------------------------------------------|----------------------|--------------------------|------------------------------------------|
| <a href="#">Remove</a>                                                                                 |                      |                          |                                          |
| Application Number                                                                                     | Country <sup>i</sup> | Filing Date (YYYY-MM-DD) | Access Code <sup>i</sup> (if applicable) |
|                                                                                                        |                      |                          |                                          |
| Additional Foreign Priority Data may be generated within this form by selecting the <b>Add</b> button. |                      |                          |                                          |

|                                           |                                   |                        |                |
|-------------------------------------------|-----------------------------------|------------------------|----------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                   | Attorney Docket Number | 6583-247-CIP-5 |
|                                           |                                   | Application Number     |                |
| Title of Invention                        | ON BOARD VEHICLE NETWORK SECURITY |                        |                |

## Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

|                          |                                                                                                                                                                                                                                                    |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Authorization to Permit Access:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Authorization to Permit Access to the Instant Application by the Participating Offices |
| <p>If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.</p> <p>In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.</p> <p>In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.</p> |                                                                                        |

## Applicant Information:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                        |                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------|
| Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                        |                                      |
| <b>Applicant 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                        |                                      |
| <p>If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.</p> |                                                                        |                                      |
| <input type="button" value="Clear"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                        |                                      |
| <input checked="" type="radio"/> Assignee                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <input type="radio"/> Legal Representative under 35 U.S.C. 117         | <input type="radio"/> Joint Inventor |
| <input type="radio"/> Person to whom the inventor is obligated to assign.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <input type="radio"/> Person who shows sufficient proprietary interest |                                      |

|                                           |                                   |                        |                |
|-------------------------------------------|-----------------------------------|------------------------|----------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                   | Attorney Docket Number | 6583-247-CIP-5 |
|                                           |                                   | Application Number     |                |
| Title of Invention                        | ON BOARD VEHICLE NETWORK SECURITY |                        |                |

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

|  |  |
|--|--|
|  |  |
|--|--|

Name of the Deceased or Legally Incapacitated Inventor :

|  |
|--|
|  |
|--|

If the Applicant is an Organization check here. ☒

|                   |                     |
|-------------------|---------------------|
| Organization Name | Flextronics AP, LLC |
|-------------------|---------------------|

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Additional Applicant Data may be generated within this form by selecting the Add button.

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |             |             |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------|-------------|--------|
| <b>Assignee 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |            |             |             |        |
| Complete this section only if non-applicant assignee information is desired to be included on the patent application publication in accordance with 37 CFR 1.215(b). Do not include in this section an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest), as the patent application publication will include the name of the applicant(s). |            |             |             |        |
| If the Assignee is an Organization check here. <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                            |            |             |             |        |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |             |             |        |



|                                           |                                   |                        |                |
|-------------------------------------------|-----------------------------------|------------------------|----------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                   | Attorney Docket Number | 6583-247-CIP-5 |
|                                           |                                   | Application Number     |                |
| Title of Invention                        | ON BOARD VEHICLE NETWORK SECURITY |                        |                |

|                                                                                         |  |                |  |
|-----------------------------------------------------------------------------------------|--|----------------|--|
| <b>Mailing Address Information For Non-Applicant Assignee:</b>                          |  |                |  |
| Address 1                                                                               |  |                |  |
| Address 2                                                                               |  |                |  |
| City                                                                                    |  | State/Province |  |
| Country <sup>i</sup>                                                                    |  | Postal Code    |  |
| Phone Number                                                                            |  | Fax Number     |  |
| Email Address                                                                           |  |                |  |
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**Signature:**

|                                                                                                                              |                     |           |        |                     |            |
|------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------|--------|---------------------|------------|
| NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. |                     |           |        |                     |            |
| <b>Signature</b>                                                                                                             | /Douglas W. Swartz/ |           |        | Date (YYYY-MM-DD)   | 2013-03-14 |
| First Name                                                                                                                   | Douglas W.          | Last Name | Swartz | Registration Number | 37739      |
| Additional Signature may be generated within this form by selecting the Add button.                                          |                     |           |        |                     |            |

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
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## ON BOARD VEHICLE NETWORK SECURITY

### CROSS REFERENCE TO RELATED APPLICATION

The present application is a continuation-in-part of U.S. Patent Application Serial No. 13/679,476, filed November 16, 2012, entitled "Vehicle Middleware", which claims the benefits of U.S. Provisional Application Serial Nos. 61/560,509, filed November 16, 2011; 61/637,164, filed April 23, 2012; and 61/663,335, filed June 22, 2012, all entitled "Complete Vehicle Ecosystem"; 61/646,747, filed on May 14, 2012, entitled "Branding of Electrically Propelled Vehicles Via the Generation of Specific Operating Sounds"; 61/653,275, filed on May 30, 2012, entitled "Vehicle Application Store for Console"; 61/653,264, filed on May 30, 2012, entitled "Control of Device Features Based on Vehicle State"; 61/653,563, filed on May 31, 2012, entitled "Complete Vehicle Ecosystem"; 61/672,483, filed on July 17, 2012, entitled "Vehicle Climate Control"; 61/714,016, filed on October 15, 2012, entitled "Vehicle Middleware"; and 61/715,699, filed October 18, 2012, entitled "Vehicle Middleware"; each of which is incorporated herein by this reference in its entirety.

Cross reference is made to U.S. Patent Application Nos. 13/420,236, filed on March 14, 2012, entitled, "Configurable Vehicle Console"; 13/420,240, filed on March 14, 2012, entitled "Removable, Configurable Vehicle Console"; 13/462,593, filed on May 2, 2012, entitled "Configurable Dash Display"; 13/679,459, filed on November 16, 2012, entitled "Vehicle Comprising Multi-Operating System"; 13/679,234, filed on November 16, 2012, entitled "Gesture Recognition for On-Board Display"; 13/679,412, filed on November 16, 2012, entitled "Vehicle Application Store for Console"; 13/679,857, filed on November 16, 2012, entitled "Sharing Applications/Media Between Car and Phone (Hydroid)"; 13/679,878, filed on November 16, 2012, entitled "In-Cloud Connection for Car Multimedia"; 13/679,875, filed on November 16, 2012, entitled "Music Streaming"; 13/679,676, filed on November 16, 2012, entitled "Control of Device Features Based on Vehicle State"; 13/678,673, filed on November 16, 2012, entitled "Insurance Tracking"; 13/678,691, filed on November 16, 2012, entitled "Law Breaking/Behavior Sensor"; 13/678,699, filed on November 16, 2012, entitled "Etiquette Suggestion"; 13/678,710, filed on November 16, 2012, entitled "Parking Space Finder Based on Parking Meter Data"; 13/678,722, filed on November 16, 2012, entitled "Parking Meter Expired Alert"; 13/678,726, filed on November

16, 2012, entitled “Object Sensing (Pedestrian Avoidance/Accident Avoidance)”;  
13/678,735, filed on November 16, 2012, entitled “Proximity Warning Relative to Other  
Cars”; 13/678,745, filed on November 16, 2012, entitled “Street Side Sensors”; 13/678,753,  
filed on November 16, 2012, entitled “Car Location”; 13/679,441, filed on November 16,  
5 2012, entitled “Universal Bus in the Car”; 13/679,864, filed on November 16, 2012, entitled  
“Mobile Hot Spot/Router/Application Share Site or Network”; 13/679,815, filed on  
November 16, 2012, entitled “Universal Console Chassis for the Car”; 13/679,476, filed on  
November 16, 2012, entitled “Vehicle Middleware”; 13/679,306, filed on November 16,  
2012, entitled “Method and System for Vehicle Data Collection Regarding Traffic”;  
10 13/679,369, filed on November 16, 2012, entitled “Method and System for Vehicle Data  
Collection”; 13/679,680, filed on November 16, 2012, entitled “Communications Based on  
Vehicle Diagnostics and Indications”; 13/679,443, filed on November 16, 2012, entitled  
“Method and System for Maintaining and Reporting Vehicle Occupant Information”;  
13/678,762, filed on November 16, 2012, entitled “Behavioral Tracking and Vehicle  
15 Applications”; 13/679,292, filed November 16, 2012, entitled “Branding of Electrically  
Propelled Vehicles Via the Generation of Specific Operating Output”; 13/679,400, filed  
November 16, 2012, entitled “Vehicle Climate Control”; \_\_/ \_\_, \_\_, filed on \_\_\_\_,  
2013, entitled “Improvements to Controller Area Network Bus”; 13/678,773, filed on  
November 16, 2012, entitled “Location Information Exchange Between Vehicle and  
20 Device”; 13/679,887, filed on November 16, 2012, entitled “In Car Communication Between  
Devices”; 13/679,842, filed on November 16, 2012, entitled “Configurable Hardware Unit  
for Car Systems”; 13/679,204, filed on November 16, 2012, entitled “Feature Recognition for  
Configuring a Vehicle Console and Associated Devices”; 13/679,350, filed on November 16,  
2012, entitled “Configurable Vehicle Console”; 13/679,358, filed on November 16, 2012,  
25 entitled “Configurable Dash Display”; 13/679,363, filed on November 16, 2012, entitled  
“Configurable Heads-Up Dash Display”; and 13/679,368, filed on November 16, 2012,  
entitled “Removable, Configurable Vehicle Console”. The entire disclosures of the  
applications listed above are hereby incorporated by reference, in their entirety, for all that  
they teach and for all purposes.

## FIELD

The disclosure relates generally to vehicle middleware systems and particularly to vehicle middleware systems for drivers and third-parties.

## BACKGROUND

5 Modern vehicles use a number of communication systems and/or networks. Each of these communication systems and/or networks may have a bus structure that is open or proprietary. Each of these buses may also be specifically designed to work in a vehicle or may be available as a general communication protocol. These communication systems and/or networks connect the various individual components of the vehicles through their respective  
10 buses. Examples of proprietary vehicle bus architecture include Controller Area Network (CAN) Bus, Local Interconnect Network (LIN) Bus, and the various Original Equipment manufacturer (OEM) Bus among others. Examples of open and general bus architecture include wired or wireless Ethernet and Low-Voltage Differential Signaling (LVDS) among others.

15 Taking the CAN bus for example, the CAN bus is a serial network developed primarily for use with automotive applications. CAN bus allows devices and microcontrollers in a vehicle to communicate with each other without a host computer.

The CAN protocol allows various devices and microcontrollers to be connected to a single CAN bus. According to the protocol, communication along the CAN bus is message-  
20 based to allow messages and data to be sent from one connected device to another.

To facilitate communication on the CAN bus without the need of a host computer, CAN features an arbitration-free transmission mechanism. A CAN transmission includes an arbitration field (message ID) representing the priority of the message being transmitted. A dominant bit ('0') indicates a higher priority than a recessive bit ('1'). For example, in a  
25 hypothetical two-bit ID CAN network, a device sending a '10' ID will have priority over a device sending a '11' ID on the CAN bus. In this example, both devices have a recessive bit in the first bit; however, the first device has a dominant second bit which could be used to arbitrate against a recessive second bit in the second device. The second device will back-off from transmitting over the bus upon this determination in favor of the second device and will  
30 attempt to retransmit a few clock cycles after the first device has finished transmitting. It is recognized that each message ID transmitted must be unique over the CAN bus for this

arbitration-free transmission mechanism. According to the CAN specification, standard CAN (version 2.0A) uses 11-bit IDs, and extended CAN (version 2.0B) uses 29-bit IDs.

The CAN specification (ISO 11898) further described two types of CAN buses, the high-speed CAN bus (ISO 11898-2) (such as for engine, suspension, and transmission controllers and safety equipment) and the low-speed CAN bus (ISO 11898-3) (such as for less critical components including non-safety sensors). The high-speed CAN bus is designed to carry data at high speed (up to 1Mbit/s in some implementation). The low-speed CAN bus is designed to carry data at a lower speed (up to 125Kbit/s in some implementation) but is more fault tolerant than the high-speed CAN bus. Further, the low-speed CAN bus can serve as a back-up for the high-speed CAN bus in case there is a failure to the high-speed CAN bus.

As usage of the CAN standard evolves, many vehicles and systems implementing CAN are using both a high-speed and a low-speed CAN bus in parallel. The high-speed CAN bus carries information that is vital for vehicle operation or safety and is delivered to various part of the vehicle or system in substantially real time. For example, the high-speed CAN bus would be used in a situation where an airbag deploys. When sensors in the bumper or at the front of the vehicle indicate that the vehicle has been involved in a frontal collision, the sensors can send priority information via the high-speed CAN bus to the airbag deployment unit to deploy the airbag. The low-speed CAN bus would be used for other less critical applications.

A number of extensions have been proposed and used to extend the capabilities of the various bus architectures. For example, On-Board Diagnostics (OBD) adds support for requesting data from vehicle components for diagnostics purposes using Parameter Identifiers (PIDs). While OBD is designed to work with CAN bus, OBD can be implemented to work with other general and/or OEM specific buses. Further, specific vehicle components such as the Engine Control Unit (ECU), Transmission Control Unit (TCU), Anti-lock Braking System (ABS), and generally Body Control Modules (BCMs) can have specific protocol extensions to work with the various bus architectures. Further, extensions to the bus architectures are needed to support carrying information regarding various environmental type issues such as emissions information to comply with various government regulation mandates.

Vehicles, particularly passenger vehicles, are evolving rapidly with emerging safety, entertainment, and communication technologies. Existing vehicle bus protocols, which are largely designed for safety, are generally unsuitable for other non-safety communications, due to low bus bandwidth and transmission speed. There are therefore various needs in the art including improving information flow between vehicle components, leveraging the various communication systems and/or networks in the art to enhance vehicle safety, data security, and/or data processing, and providing remote authorized third party (i.e. peace officers, vehicle manufacturers, vehicle security services, and owners) access to a vehicle's functions and state information while maintaining security against unauthorized parties and components.

### SUMMARY

These and other needs are addressed by the various aspects, embodiments, and/or configurations of the present disclosure. The present disclosure is directed to a vehicle having a variety of networking and other capabilities.

The vehicle, in accordance with this disclosure, can include a microprocessor executable network controller operable to one or more of (a) isolate one or more other on board computational component(s) in a vehicular wireless network not affected by a security breach event from a computational component affected by the security breach event and (b) isolate an on board computational component in the vehicular wireless network and affected by the security breach event from the one or more other on board computational component(s) not affected by the security breach event.

A method, in accordance with this disclosure, can include the steps of:

(a) a microprocessor executable network controller identifying a possible security breach event; and

(b) in response, the microprocessor executable network controller at least one of (a) isolating one or more other on board computational component(s) in a vehicular wireless network not affected by the security breach event from a computational component affected by the security breach event and (b) isolating an on board computational component in the vehicular wireless network and affected by the security breach event from the one or more other on board computational component(s) not affected by the security breach event.

A non-transient, tangible computer readable medium, in accordance with this disclosure, can include a microprocessor executable network controller on board a selected vehicle that, when executed:

- (a) identifies a possible security breach event and
- 5 (b) in response, one or more of (i) isolates one or more other on board computational component(s) in a vehicular wireless network not affected by the security breach event from a computational component affected by the security breach event and (ii) isolates an on board computational component in the vehicular wireless network and affected by the security breach event from the one or more other on board computational component(s) not affected
- 10 by the security breach event.

The security breach event can be one or more of an instance of a virus, malware, unauthorized access, misuse, modification, denial-of-service attack, spoofing, man-in-the-middle attack, ARP poisoning, smurf attack, buffer overflow, heap overflow, format string attack, SQL injection, identity theft (or MAC spoofing), network injection, caffe latte attack,

15 or denial of a computer network and/or network-accessible resource.

The network controller can receive a warning signal associated with the security breach event from a gateway, a firewall, a honeypot, a network node impacted by the security breach event, and a network probe.

The one or more other board computational component(s) can be one or more of an on-board sensor, processing module, software application, expansion module, critical device,

20 non-critical device, and cellular upgrade module.

The one or more other board computational component can be one or more of an on board sensor, a media controller, a gateway, a firewall, a processing module, a network controller, an input/output system, a display controller, an audio controller, an arbitration

25 module, a health check module, a critical system controller, a non-critical system controller, an on board sensor monitor, a displayed object movement module, a diagnostic module, a media filter, a network selector, a remote control module, a computational module selector, an expansion module, an application, and a plug-in module.

The network controller can analyze the security breach event by one or more of

30 reviewing historical behavior and comparing the behavior to templates characteristic of differing types of attacks and/or applying rules to the historical behavior.



When the computational component affected by the security breach event is an external computational device, the one or more other on board computational component(s) not affected by the security breach event can be isolated from the external computational device by the vehicular wireless network denying wireless network access by the external computational component.

At least one of the following can be true about the isolation:

(a) communications between the one or more other on board computational component(s) in the vehicular wireless network not affected by the security breach event and the computational component affected by the security breach event, the communications not normally passing through a gateway and/or firewall, can be redirected through and filtered by the gateway and/or firewall and

(b) communications between the one or more other on board computational component(s) in a vehicular wireless network not affected by the security breach event and the computational component affected by the security breach event can be blocked in whole or part.

When the one or more other on board computational component(s) not affected by the security breach event is a critical component and the computational component affected by the security breach event is a node on the vehicular wireless network and physically and/or logically positioned outside of but interiorly and/or internally to the DMZ, isolation can be effected by enabling a critical communication security mechanism that is one or more of (a) encryption of access restrictions in the one or more other on board computational component(s), (b) disabling ESSID broadcasting, (c) hiding the SSID, (d) performing MAC ID filtering, (e) performing static IP addressing, (f) implementing IEEE 802.11, 802.11i, and/or 802.1x security, (g) using wired equivalent privacy encryption, (h) using one or more of TKIP, EAP, LEAP, PEAP, WPAv 1, and/or WPAv2 protocols, and (i) using end-to-end encryption.

The vehicle described in the present disclosure can provide a number of advantages. For example, the vehicle can provide for improved control of data stream management and integration to accommodate the ever-increasing sophistication of each data segment and enable data sharing amongst all segments. It can enable interoperability amongst diverse systems. It can provide an open architecture, thereby obviating existing constraints on design

changes due to locked-in technology. It can enable drivers freely and conveniently to integrate his or her digital lifestyle into a vehicle while enabling voice and fingertip activation. It can implement a dynamic software environment and on board vehicle network that does not need to change over technology generations. Car manufacturers can have the

5 freedom to specify any type of processor, memory or storage technology and to make appropriate changes at any time. The architecture can integrate presentation functions, sensor/control functions and infotainment functions in a highly modular extensible way ensuring that the system design can scale up or down easily and evolve over many model

10 years without battling technological obsolescence. For example, the architecture can allow the vehicle owner and/or manufacturer to upgrade and/or add application engines, upgrade the in-vehicle networking capabilities, upgrade Internet connectivity, upgrade display capabilities, and migrate to high availability capabilities, all without radical changes to the software environment and/or for inter- and intra-model line differentiation. The vehicle can support multiple processing and expansion modules that anchor specific functions to a

15 selected processor. It can support a variety of embedded Electronic Control Unit (“ECU”) data sources, such as those provided by LIN, CAN, and FlexRay, and IPv6 connectivity that enables seamless migration to Ethernet-based sensor technology and new bus architectures supported by the AutoStar initiative. It can employ a single data management hub, providing improved vehicle safety in the face of security threats posed by connectivity to the Ethernet.

20 It can enable vehicle manufacturers to manage multiple display subsystems that are unique to the subsystem location in the vehicle and deliver vehicle occupants a personalized experience. The subsystems can include, for example, a console display (providing information and input/output control), a configurable dashboard display, a configurable heads-up display, and passenger display units. Configurable displays allow drivers to

25 add/change gauges for non-vehicle operation information that is displayed on the dashboard and heads-up display to suit user preferences and needs. Direct video can be delivered through display controllers and/or an interactive touch screen, optionally equipped with proximity sensors, all implemented with Ethernet-based intelligent display subsystems. Handheld devices, such as personal digital assistants, cellular phones, and tablet and laptop

30 computers, can interface wirelessly, via one or more tethered networks, with the vehicle’s processing module(s) and be integrated into the processing resources available to perform

vehicle-related tasks, operations, and functions. Assignment of an IPv6 address or other electronic address on a network to the vehicle can provide an address to locate the vehicle on the Internet (or other network), simplify implementing cyber security, enable applications that support safety and data collection for predictive analytics, enable voice-over-IP calls  
5 from the vehicle, and furnish reliable presence information to a presence service or server.

These and other advantages will be apparent from the disclosure.

The phrases “at least one”, “one or more”, and “and/or” are open-ended expressions that are both conjunctive and disjunctive in operation. For example, each of the expressions “at least one of A, B and C”, “at least one of A, B, or C”, “one or more of A, B, and C”, “one  
10 or more of A, B, or C” and “A, B, and/or C” means A alone, B alone, C alone, A and B together, A and C together, B and C together, or A, B and C together.

The term “a” or “an” entity refers to one or more of that entity. As such, the terms “a” (or “an”), “one or more” and “at least one” can be used interchangeably herein. It is also to be noted that the terms “comprising”, “including”, and “having” can be used  
15 interchangeably.

The term “automatic” and variations thereof, as used herein, refers to any process or operation done without material human input when the process or operation is performed. However, a process or operation can be automatic, even though performance of the process or operation uses material or immaterial human input, if the input is received before  
20 performance of the process or operation. Human input is deemed to be material if such input influences how the process or operation will be performed. Human input that consents to the performance of the process or operation is not deemed to be “material”.

The term “automotive navigation system” is a satellite navigation system designed for use in automobiles. It typically uses a GPS navigation device to acquire position data to  
25 locate the user on a road in the unit's map database. Using the road database, the unit can give directions to other locations along roads also in its database. Dead reckoning using distance data from sensors attached to the drivetrain, a gyroscope and an accelerometer can be used for greater reliability, as GPS signal loss and/or multipath can occur due to urban canyons or tunnels.

30 The term “bus” and variations thereof, as used herein, refers to a subsystem that transfers information and/or data between various components. A bus generally refers to the

collection communication hardware interface, interconnects, bus architecture, and/or protocol defining the communication scheme for a communication system and/or communication network. A bus may also be specifically refer to a part of a communication hardware that interfaces the communication hardware with the interconnects that connect to other  
5 components of the corresponding communication network. The bus may be for a wired network, such as a physical bus, or wireless network, such as part of an antenna or hardware that couples the communication hardware with the antenna. A bus architecture supports a defined format in which information and/or data is arranged when sent and received through a communication network. A protocol may define the format and rules of communication of  
10 a bus architecture.

A “communication channel” refers to an analog and/or digital physical transmission medium such as cable (twisted-pair wire, cable, and fiber-optic cable) and/or other wireline transmission medium, and/or a logical and/or virtual connection over a multiplexed medium, such microwave, satellite, radio, infrared, or other wireless transmission medium. A channel  
15 is used to convey an information signal, for example a digital bit stream, from one or several senders (or transmitters) to one or several receivers. A channel has a certain capacity for transmitting information, often measured by its bandwidth in Hz or its data rate in bits per second. Channel performance measures that can be employed in determining a quality or grade of service of a selected channel include spectral bandwidth in Hertz, symbol rate in  
20 baud, pulses/s or symbols/s, digital bandwidth bit/s measures (e.g., gross bit rate (signaling rate), net bit rate (information rate), channel capacity, and maximum throughput), channel utilization, link spectral efficiency, signal-to-noise ratio measures (e.g., signal-to-interference ratio, Eb/No, and carrier-to-interference ratio in decibel), bit-error rate (BER), packet-error rate (PER), latency in seconds, propagation time, transmission time, and delay jitter.

25 The terms “communication device,” “smartphone,” and “mobile device,” and variations thereof, as used herein, are used interchangeably and include any type of device capable of communicating with one or more of another device and/or across a communications network, via a communications protocol, and the like. Exemplary communication devices may include but are not limited to smartphones, handheld computers,  
30 laptops, netbooks, notebook computers, subnotebooks, tablet computers, scanners, portable

gaming devices, phones, pagers, GPS modules, portable music players, and other Internet-enabled and/or network-connected devices.

A “communication modality” refers to a protocol- or standard defined or specific communication session or interaction, such as Voice-Over-Internet-Protocol (“VoIP”), cellular communications (e.g., IS-95, 1G, 2G, 3G, 3.5G, 4G, 4G/IMT-Advanced standards, 3GPP, WIMAX™, GSM, CDMA, CDMA2000, EDGE, 1xEVDO, iDEN, GPRS, HSPDA, TDMA, UMA, UMTS, ITU-R, and 5G), Bluetooth™, text or instant messaging (e.g., AIM, Blauk, eBuddy, Gadu-Gadu, IBM Lotus Sametime, ICQ, iMessage, IMVU, Lync, MXit, Paltalk, Skype, Tencent QQ, Windows Live Messenger™ or MSN Messenger™, Wireclub, Xfire, and Yahoo! Messenger™), email, Twitter (e.g., tweeting), Digital Service Protocol (DSP), and the like.

The term “communication system” or “communication network” and variations thereof, as used herein, refers to a collection of communication components capable of one or more of transmission, relay, interconnect, control, or otherwise manipulate information or data from at least one transmitter to at least one receiver. As such, the communication may include a range of systems supporting point-to-point to broadcasting of the information or data. A communication system may refer to the collection individual communication hardware as well as the interconnects associated with and connecting the individual communication hardware. Communication hardware may refer to dedicated communication hardware or may refer a processor coupled with a communication means (*i.e.*, an antenna) and running software capable of using the communication means to send a signal within the communication system. Interconnect refers some type of wired or wireless communication link that connects various components, such as communication hardware, within a communication system. A communication network may refer to a specific setup of a communication system with the collection of individual communication hardware and interconnects having some definable network topography. A communication network may include wired and/or wireless network having a pre-set to an ad hoc network structure.

The term “computer-readable medium” as used herein refers to any tangible storage and/or transmission medium that participate in providing instructions to a processor for execution. Such a medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. Non-volatile media includes, for example,

NVRAM, or magnetic or optical disks. Volatile media includes dynamic memory, such as main memory. Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, or any other magnetic medium, magneto-optical medium, a CD-ROM, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a RAM, a PROM, and EPROM, a FLASH-EPROM, a solid state medium like a memory card, any other memory chip or cartridge, a carrier wave as described hereinafter, or any other medium from which a computer can read. A digital file attachment to e-mail or other self-contained information archive or set of archives is considered a distribution medium equivalent to a tangible storage medium. When the computer-readable media is configured as a database, it is to be understood that the database may be any type of database, such as relational, hierarchical, object-oriented, and/or the like. Accordingly, the disclosure is considered to include a tangible storage medium or distribution medium and prior art-recognized equivalents and successor media, in which the software implementations of the present disclosure are stored.

The terms “dash” and “dashboard” and variations thereof, as used herein, are used interchangeably and include any panel and/or area of a vehicle disposed adjacent to an operator, user, and/or passenger. Typical dashboards may include but are not limited to one or more control panel, instrument housing, head unit, indicator, gauge, meter, light, audio equipment, computer, screen, display, HUD unit, and graphical user interface.

The terms “determine”, “calculate” and “compute,” and variations thereof, as used herein, are used interchangeably and include any type of methodology, process, mathematical operation or technique.

The term “display” refers to a portion of a screen used to display the output of a computer to a user.

The term “displayed image” or “displayed object” refers to an image produced on the display. A typical displayed image is a window or desktop or portion thereof, such as an icon. The displayed image may occupy all or a portion of the display.

The term “electronic address” refers to any contactable address, including a telephone number, instant message handle, e-mail address, Universal Resource Locator (“URL”), Universal Resource Identifier (“URI”), Address of Record (“AOR”), electronic alias in a database, like addresses, and combinations thereof.

The term “means” as used herein shall be given its broadest possible interpretation in accordance with 35 U.S.C., Section 112, Paragraph 6. Accordingly, a claim incorporating the term “means” shall cover all structures, materials, or acts set forth herein, and all of the equivalents thereof. Further, the structures, materials or acts and the equivalents thereof shall include all those described in the summary of the invention, brief description of the drawings, detailed description, abstract, and claims themselves.

The term “module” as used herein refers to any known or later developed hardware, software, firmware, artificial intelligence, fuzzy logic, or combination of hardware and software that is capable of performing the functionality associated with that element. Also, while the disclosure is presented in terms of exemplary embodiments, it should be appreciated that individual aspects of the disclosure can be separately claimed.

The terms “online community”, “e-community”, or “virtual community” mean a group of people that primarily interact via a computer network, rather than face to face, for social, professional, educational or other purposes. The interaction can use a variety of media formats, including wikis, blogs, chat rooms, Internet forums, instant messaging, email, and other forms of electronic media. Many media formats are used in social software separately or in combination, including text-based chat rooms and forums that use voice, video text or avatars.

The term “presence” is a status indicator that conveys ability and willingness of a potential communication partner—for example a user—to communicate. A user's client provides presence information (presence state) via a network connection to a presence service, which is stored in what constitutes his personal availability record (called a presentity) and can be made available for distribution to other users (called watchers) to convey his availability for communication. Presence information has wide application in many communication services and is one of the innovations driving the popularity of instant messaging or recent implementations of voice over IP clients. A user client may publish a presence state to indicate its current communication status. This published state informs others that wish to contact the user of his availability and willingness to communicate. The most common use of presence today is to display an indicator icon on instant messaging clients, typically from a choice of graphic symbols with easy-to-convey meanings, and a list of corresponding text descriptions of each of the states. Even when technically not the same,

the “on-hook” or “off-hook” state of called telephone is an analogy, as long as the caller receives a distinctive tone indicating unavailability or availability.

5 The term “satellite positioning system receiver” refers to a wireless receiver or transceiver to receive and/or send location signals from and/or to a satellite positioning system, such as the Global Positioning System (“GPS”) (US), GLONASS (Russia), Galileo positioning system (EU), Compass navigation system (China), and Regional Navigational Satellite System (India).

10 The term “social network service” is a service provider that builds online communities of people, who share interests and/or activities, or who are interested in exploring the interests and activities of others. Most social network services are web-based and provide a variety of ways for users to interact, such as e-mail and instant messaging services.

The term “social network” refers to a web-based social network.

15 The term “screen,” “touch screen,” or “touchscreen” refers to a physical structure that enables the user to interact with the computer by touching areas on the screen and provides information to a user through a display. The touch screen may sense user contact in a number of different ways, such as by a change in an electrical parameter (e.g., resistance or capacitance), acoustic wave variations, infrared radiation proximity detection, light variation detection, and the like. In a resistive touch screen, for example, normally separated  
20 conductive and resistive metallic layers in the screen pass an electrical current. When a user touches the screen, the two layers make contact in the contacted location, whereby a change in electrical field is noted and the coordinates of the contacted location calculated. In a capacitive touch screen, a capacitive layer stores electrical charge, which is discharged to the user upon contact with the touch screen, causing a decrease in the charge of the capacitive  
25 layer. The decrease is measured, and the contacted location coordinates determined. In a surface acoustic wave touch screen, an acoustic wave is transmitted through the screen, and the acoustic wave is disturbed by user contact. A receiving transducer detects the user contact instance and determines the contacted location coordinates. The touch screen may or may not include a proximity sensor to sense a nearness of object, such as a user digit, to the  
30 screen.



The term “vehicle” refers to a device or structure for transporting animate and/or inanimate or tangible objects (e.g., persons and/or things), such as a self-propelled conveyance. The term “vehicle” as used herein includes any conveyance, or model of a conveyance, where the conveyance was originally designed for the purpose of moving one or more tangible objects, such as people, animals, cargo, and the like. The term “vehicle” does not require that a conveyance moves or is capable of movement. Typical vehicles may include but are in no way limited to cars, trucks, motorcycles, busses, automobiles, trains, railed conveyances, boats, ships, marine conveyances, submarine conveyances, aircraft, space craft, flying machines, human-powered conveyances, and the like.

The preceding is a simplified summary of the disclosure to provide an understanding of some aspects of the disclosure. This summary is neither an extensive nor exhaustive overview of the disclosure and its various aspects, embodiments, and/or configurations. It is intended neither to identify key or critical elements of the disclosure nor to delineate the scope of the disclosure but to present selected concepts of the disclosure in a simplified form as an introduction to the more detailed description presented below. As will be appreciated, other aspects, embodiments, and/or configurations of the disclosure are possible utilizing, alone or in combination, one or more of the features set forth above or described in detail below.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 depicts a vehicle configured in accordance with an embodiment;  
Fig. 2 is a block diagram of a processing module according to an embodiment;  
Fig. 3 depicts a vehicle implementing processing modules configured in accordance with an embodiment;  
Fig. 4 depicts a flow diagram of a health-check method according to an embodiment;  
Fig. 5 depicts a flow diagram of a hand-off procedure method according to an embodiment;  
Fig. 6 depicts a flow diagram of a system stand-by method according to an embodiment;  
Fig. 7 depicts a flow diagram of a processor off-load method according to an embodiment;  
Fig. 8 depicts a flow diagram according to an embodiment;

Fig. 9 depicts a flow diagram according to an embodiment;  
Fig. 10 depicts a flow diagram according to an embodiment;  
Fig. 11 depicts a flow diagram according to an embodiment;  
Fig. 12 depicts a flow diagram according to an embodiment;  
5 Fig. 13 depicts a flow diagram according to an embodiment;  
Fig. 14 depicts a flow diagram according to an embodiment;  
Fig. 15 is a block diagram of a computational system according to an embodiment;  
Fig. 16 is a block diagram of an input/output system according to an embodiment;  
Fig. 17 depicts a flow diagram according to an embodiment;  
10 Fig. 18 depicts a flow diagram according to an embodiment;  
Fig. 19 depicts a flow diagram according to an embodiment;  
Fig. 20 is a block diagram of a vehicle computational system according to an  
embodiment;  
Fig. 21 depicts a flow diagram according to an embodiment;  
15 Figs. 22A-B depict configurations of input/output systems according to an  
embodiment;  
Fig. 23 depicts a flow diagram according to an embodiment;  
Fig. 24 depicts a flow diagram according to an embodiment;  
Fig. 25 depicts a flow diagram according to an embodiment;  
20 Fig. 26 depicts a flow diagram according to an embodiment;  
Fig. 27 depicts a communication system according to an embodiment;  
Fig. 28 depicts a flow diagram according to an embodiment;  
Fig. 29 depicts a flow diagram according to an embodiment;  
Fig. 30 depicts a flow diagram according to an embodiment; and  
25 Fig. 31 depicts a flow diagram according to an embodiment.

## DETAILED DESCRIPTION

### Overview

The present disclosure describes a vehicle implementing one or more processing modules. These modules are configured to connect and interface with the various buses in the  
30 vehicle, where the various buses are connected with the various components of the vehicle to facilitate information transfer among the vehicle components. Each processing module is

further modularized with the ability to add and replace other functional modules now or in the future. These functional modules can themselves act as distinct vehicle components. Each processing module may hand-off processing to other modules depending on its health, processing load, or by third-party control. Thus, the plurality of processing modules help to  
5 implement a middleware point of control to the vehicle with redundancy in processing and safety and security awareness in their applications.

Exemplary processing modules include one or more of:

(a) an active-active or active-standby duplicated processing module  
configurations in fully or partially wirelessly networked vehicles;

10 (b) an arbitration module to handle hand-off conflicts in duplicated processing  
module configurations;

(c) a health check module which checks critical and non-critical tasks, functions,  
and operations of each processing module to determine which to designate as the active or  
primary processing module;

15 (d) a displayed object movement module to move displayed objects from a source  
input/output system to a target or destination input/output system ;

(e) a media filter which filters and/or processes (e.g., formats, configures,  
changes a presentation mode of, and/or otherwise causes at least part of the signal to be  
altered from the signal as received) third party sourced signals, particularly multimedia  
20 signals, in a manner consistent with a vehicle universal or occupant-specific whitelist,  
blacklist, or other user preference, sensed occupant context, and/or a governing federal, state,  
provincial, and/or local law or regulation;

(f) in a vehicle equipped with an internal wireless network and optionally bus-  
type network, a network selector which selects a network for signal transmission based on  
25 network/node status, signal/noise ratio, type of signal, available and/or unavailable  
bandwidth, network performance parameter(s) (e.g., availability, packet drop or loss, jitter,  
latency, buffer capacity, throughput, and the like) quality of service, and/or other parameters  
and configures the signal for transmission over the selected network;

(g) a diagnostic module handles warning/error signals in a predetermined manner;

30 (h) a remote control module which receives a request from a remote source or  
third party to command a vehicle function (which function may be identified by a suitable

function-specific code), authenticates the requestor, and if successfully authenticated and if privileged to request the performance of the vehicle function, executes the request notwithstanding a contrary command from the vehicle operator;

(i) a media controller, which receives a media stream from a remote node,  
5 identifies which input/output systems are disabled (and/or restricted) due to operator command and/or as a result of governing law, and provides the media stream to an input/output system associated with the associated occupant;

(j) an installation supervisor which, for a newly installed software and/or hardware and/or other device (such as an on-board sensor, processing module or component  
10 thereof, software application, circuit board, expansion module or component thereof (which expansion module may be hardware, software, or a combination thereof), critical or non-critical device (such as those discussed above with respect to the critical or non-critical system controller(s)), cellular upgrade module (e.g., 2G, 3G, 4G, 5G, LTE, or other cellular standard upgrade or Subscriber Identity Module (“SIM”) card, board, or other upgrade  
15 module, and the like), determines whether the newly installed component satisfies defined functional and/or source or reuse requirements and/or restrictions for the component, license restrictions, and other criteria, and, if satisfied, creates data structures in the component (if it has a resident memory) and the vehicle memory to bind the component to the current vehicle;

(k) a computational module selector to perform processing load balancing over  
20 multiple processing modules;

(l) network security which isolates a component encountering a security breach event and/or isolates the primary processing module from other components in the local network if the former is not possible;

(m) a “cone of silence” capability by the media controller for external  
25 computational devices;

(n) an automated caching, potentially by individual input/output systems, by the media controller of media based on various factors;

(o) a presence reporting module considering local laws in determining whether an individual is present (e.g., for unified communications) and, if so, by what communication  
30 channel(s) and/or modalities; and

(p) a networking module to enable processing modules of different vehicles to wirelessly connect for to exchange vehicle information.

### The Vehicle

Figs. 1, 3, and 15 collectively illustrate a vehicle 100 incorporating various features.

5 Referring to Fig. 1, the vehicle 100 includes, among many components common to vehicles, wheels 104, a power source 108 (such as an engine, motor, or energy storage system (*e.g.*, battery or capacitive energy storage system)), a manual or automatic transmission 112, a manual or automatic transmission gear controller 116, a power controller 120 (such as a throttle), a braking system 136, a steering wheel 140, a display panel 144 (*e.g.*,  
10 a dashboard displaying information regarding components in vehicle 100), and an occupant seating system 148.

Other components in vehicle 100 include communication components such as a wireless signal receiver 152 to receive wireless signals from signal sources such as roadside beacons and other electronic roadside devices, and a satellite positioning system receiver 156  
15 (*e.g.*, a Global Positioning System (“GPS”) (US), GLONASS (Russia), Galileo positioning system (EU), Compass navigation system (China), and Regional Navigational Satellite System (India) receiver).

The vehicle 100 also includes a number of control units and sensors for the various components of vehicle 100. Exemplary control units and sensors therefore include wheel  
20 state sensor 160 to sense one or more of vehicle speed, acceleration, deceleration, wheel rotation, wheel speed (*e.g.*, wheel revolutions-per-minute), wheel slip, and the like. Power source controller and energy output sensor 164 controls the power source and to senses a power output of the power source 108. Example aspects of power source controller and energy output sensor 165 include balancing the mixture of fuel (*e.g.* gasoline, natural gas, or  
25 other sources of fuel) and other elements (*e.g.* air for combustion) and measuring one or more of current engine speed (*e.g.*, revolutions-per-minute), energy input and/or output (*e.g.*, voltage, current, fuel consumption, and torque), and the like. Switch state control unit 168 activates or deactivates the power source (*e.g.* the ignition). Transmission control unit (“TCU”) 170 sets the current state the transmission (*e.g.*, gear selection or setting) based on  
30 the state of gear controller 116. Power control unit 174 sets the throttle for power source 108 given the state of power controller 120. Brake control unit 176 operates the current state

(braking or non-braking) of braking system 136 based on the state of the brake controller (which could be linked to power controller 120).

Vehicle 100 also includes other control units and sensors for safety purposes. An airbag deployment system includes an airbag deployment control unit 133 and a collision sensor 132. When a collision is detected by collision sensor 132, data is sent to airbag release control unit 133 which determines whether to deploy the airbag based on the data received (e.g., the speed of the collision and the area of impact to determine whether an airbag deployment can promote safety). Other safety components include seat belt control unit and sensors for setting the seat belt (e.g. engaging or disengaging the seat belt during hard breaking), head light control unit and sensors for headlight 128 and other lights (e.g. emergency light, brake light, parking light, fog light, interior or passenger compartment light, and/or tail light state (on or off)), door settings (locking and unlocking), window settings (opening or closing), one or cameras or other imaging sensors (which commonly convert an optical image into an electronic signal but may include other devices for detection objects such as an electromagnetic radiation emitter/receiver that emits electromagnetic radiation and receives electromagnetic waves reflected by the object) to sense objects, such as other vehicles and pedestrians and optionally determine the distance, trajectory and speed of such objects, in the vicinity or path of the vehicle, and other components and sensors as known in the art.

Vehicle 100 further includes components for the convenience and enjoyment of the occupants or operators. Seating system controller and sensor 178 sets the position and other settings of a seat and measure various attributes of an occupant of the seat (e.g., the current weight of seated occupant) in a selected seat of the seating system 148. Entertainment system 190, preferably located in the head unit of the passenger compartment, provides entertainment options such as music or video for occupants of vehicle 100.

Examples of other vehicle components include one or more cameras or other imaging sensors (which commonly convert an optical image into an electronic signal but may include other devices for detection objects such as an electromagnetic radiation emitter/receiver that emits electromagnetic radiation and receives electromagnetic waves reflected by the object) to sense objects, such as other vehicles and pedestrians and optionally determine the distance, trajectory and speed of such objects, in the vicinity or path of the vehicle, odometer reading

sensor, trip mileage reading sensor, wind speed sensor, radar transmitter/receiver output, brake wear sensor, steering/torque sensor, oxygen sensor, ambient lighting sensor, vision system sensor, ranging sensor, parking sensor, heating, venting, and air conditioning (HVAC) sensor, water sensor, air-fuel ratio meter, blind spot monitor, hall effect sensor, microphone, radio frequency (RF) sensor, infrared (IR) sensor, vehicle control system sensors, wireless network sensor (e.g., Wi-Fi and/or Bluetooth sensor), cellular data sensor, and other sensors known to those of skill in the vehicle art.

Vehicle 100 includes one or more vehicle buses 180 for connecting the various components and systems of vehicle 100 as described above. In modern vehicles, subsystems such as an anti-lock braking system (ABS), which may be used by brake control unit 176 and braking system 136, engine control unit (ECU), which may be used by power source control 164, transmission control unit (TCU), which may be used by transmission control unit 170 and gear controller 116, and supplemental restraint system (SRS), such as airbag deployment control unit 133 and collision sensor 132 and seating system controller and sensor 178, are frequently interconnected using a standardized bus. Standardized buses for use in vehicles include Controller Area Network (CAN), and Local Interconnect Network (LIN) and others, as are known in the art. In particular, these components and subsystems may use the high-speed CAN bus for real-time information. Other components with lower priorities may use the low-speed CAN bus to transmit information. Vehicle bus 180 (which is optional) is illustrated as one bus in Fig. 1. However, vehicle 100 may include one or more of these standardized buses, such as a combination of the high-speed and low-speed CAN, LIN, and/or other buses. Also, vehicle bus 180 may further include and support extensions to standardized buses, such as the FlexCAN extension to the CAN bus. Further, vehicle bus 180 may include standardized communication networks that can be implemented vehicle 100. Well known networks include Ethernet, Wi-Fi, USB, I<sup>2</sup>C, RS232, RS485 and FireWire.

Vehicle 100 also includes processing module 124. Preferably, processing module 124 is placed in the trunk, hood (not shown), behind the head unit (not shown), and/or other accessible but unseen locations. Processing module 124 is coupled to vehicle bus 180 and provides processing for data related to vehicle bus 180 and other vehicle components.

Processing modules, for example, can perform, monitor, and/or control critical and non-critical tasks, functions, and operations, such as interaction with and/or monitoring

and/or control of critical and non-critical on board sensors and vehicle operations (e.g., engine, transmission, throttle, brake power assist/ brake lock-up, electronic suspension, traction and stability control, parallel parking assistance, occupant protection systems, power steering assistance, self-diagnostics, event data recorders, steer-by-wire and/or brake-by-wire operations, vehicle-to-vehicle interactions, vehicle-to-infrastructure interactions, partial and/or full automation, telematics, navigation/SPS, multimedia systems, audio systems, rear seat entertainment systems, game consoles, tuners (SDR), heads-up display, night vision, lane departure warning, adaptive cruise control, adaptive headlights, collision warning, blind spot sensors, park/reverse assistance, tire pressure monitoring, traffic signal recognition, vehicle tracking (e.g., LoJack™), dashboard/instrument cluster, lights, seats, climate control, voice recognition, remote keyless entry, security alarm systems, and wiper/window control). Processing modules can be enclosed in an advanced EMI-shielded enclosure containing multiple expansion modules. Processing modules can have a “black box” or flight data recorder technology, containing an event (or driving history) recorder (containing operational information collected from vehicle on board sensors and provided by nearby or roadside signal transmitters), a crash survivable memory unit, an integrated controller and circuitry board, and network interfaces. Processing module 124 is further disclosed with reference to Fig. 2.

As set forth below and as shown in Fig. 3, multiple processing modules 124a-c may be located at various locations in a common vehicle. The disparate, spaced apart locations of the processing modules 124a-c provide redundancy in the event of a collision or other catastrophic event. For example, a collision with the rear of the vehicle 100 may damage the processing module 124c but not the processing modules 124a,b.

As will be appreciated, the multiple processing modules 124a-c may be configured to operate in an active/active and/or active/standby mode. These operating modes describe the manner in which first and second (redundant) devices operate under normal conditions. In active/standby implementations, only the primary device in a pair processes information and issues commands. The standby device sits idle, ready to assume the active role should the primary device fail. The standby device may receive, from the primary device, processing, command, and primary device state information to facilitate stateful failover, but it does not itself commonly perform meaningful work until the primary device fails. In active/active



implementations, both devices are online and collaboratively process information and issue commands under normal conditions. When one device fails, all processing is handled by the remaining device.

5 A user can be an occupant of a vehicle 100 that implements the system of Fig. 1. A user can further be an assembler, technician, or mechanic working on the vehicle to configure the system of Fig. 1 for use by an end-user of the vehicle.

Fig. 2 illustrates an exemplary block diagram for a (primary and/or secondary) processing module 124a-c.

10 Processing module 124 may include processor 210, memory 220, storage 230, and interfaces for one or more buses 240-270. Among the interfaces 240-270 include high-speed CAN bus 240, low-speed CAN bus 250, LIN bus 260, network interface 270, and/or wireless interface 280. One skilled in the art will recognize that processing module 124 may take other configurations and with other buses as known in the art, and interfaces 240-290 may be implemented with more or fewer buses than those shown.

15 The operations of processing module 124 will now be described with respect to the high-speed CAN bus interface 240 and low-speed CAN bus interface 250 as an exemplary configuration in one embodiment of the invention. In one implementation, processing module 124 receives data transmitted over vehicle bus 180 through high-speed CAN bus interface 240 and/or low-speed CAN bus interface 250. Data transmitted over the high-speed  
20 CAN bus includes priority data from subsystems such as anti-lock braking system (ABS), which may be used by brake control unit 176 and braking system 136, engine control unit (ECU), which may be used by power source control 164, transmission control unit (TCU), which may be used by transmission control unit 170 and gear controller 116, and supplemental restraint system (SRS), such as airbag deployment control unit 133 and  
25 collision sensor 132 and seating system controller and sensor 178, as described above. Data transmitted over the low-speed CAN bus includes other noncritical data, such as engine temperature and oil pressure sensor readings.

Wireless interface 280, by contrast, can be a transceiver for one or more long, intermediate, or short range wireless networks, such as a radio (e.g., cellular such as CDMA,  
30 GSM, or IS-95 network), 802.X, a WiFi™ network, a Bluetooth™ network, and the like, sending and receiving a wide variety of information, including lower priority information,

such as data for the convenience and enjoyment of the occupants in entertainment system 190 or seating system 148. The wireless interface 280 can access information over one or more wireless networks using an appropriate protocol, such as the Wireless Application Protocol, Wireless Internet Protocol, Wireless Session Protocol, Bluetooth Wireless Protocol, Wireless Datagram Protocol, Wireless HART Protocol, Wired Equivalent Privacy (WEP), MiWi and MiWi P2P, RuBee (IEEE standard 1902.1), Wireless USB, Wireless Transport Layer Security (WTLS), and the like. In one vehicle configuration, the wireless interface 280 connects, via a short distance protocol such as Bluetooth™ or WiFi™, to an external computational device, such as a cell phone, personal digital assistant, laptop, personal computer, or tablet computer, for access to remote nodes over the Internet.

Local network interface 270 is a transceiver for signals exchanged with other on board components of the vehicle (including the components discussed above with respect to Fig. 1). The signals may be sent over a wired or wireless (or combination thereof) network. In one configuration, the local network interface is a wireless access point. Any suitable local area network protocol may be used, with the Ethernet protocol and the short-range protocols mentioned above being examples.

The processor 210 may comprise a general purpose programmable (micro) processor or controller for executing application programming or instructions. In accordance with at least some embodiments, the processor 210 may include multiple processor cores, and/or implement multiple virtual processors. In accordance with still other embodiments, the processor 210 may include multiple physical processors. As a particular example, the processor 304 may comprise a specially configured application specific integrated circuit (ASIC) or other integrated circuit, a digital signal processor, a controller, a hardwired electronic or logic circuit, a programmable logic device or gate array, a special purpose computer, or the like. The processor 210 generally functions to run programming code or instructions implementing various functions of the device 200.

Memory 220 for use in connection with the execution of application programming or instructions by the processor 210, and for the temporary or long term storage of program instructions and/or data. As examples, the memory 220 may comprise RAM, DRAM, SDRAM, or other solid state memory. Alternatively or in addition, data storage 230 may be provided. Like the memory 220, the data storage 230 may comprise a solid state memory

device or devices. Alternatively or in addition, the data storage 230 may comprise a hard disk drive or other random access memory.

Fig. 3 depicts a vehicle 300 with multiple processing modules according to an embodiment. Vehicle 300 includes bus 180, vehicle component 310, and processing modules 124A-C.

Vehicle component 310 is an exemplary vehicle component for illustration purposes that is connected to bus 380. Vehicle component 310 may represent any of the vehicle components discussed in connection with vehicle 100 (Fig. 1).

Each of the processing modules 124A-C is coupled to bus 180. Processing module 124A is located in the engine compartment of vehicle 300; processing module 124B is located in the passenger compartment of vehicle 300; and processing module 124C is located in the truck of vehicle 300.

In one configuration, some of the processing modules 124A-C may have limited processing functions as compared to the others. For example, processing module 124A may act as the default processing module for vehicle 300 normally because of its location being close to most critical vehicle components in the engine compartment (*i.e.*, ECU, TCU). If the other processing modules 124B-C are only needed for redundancy, they may be implemented to only have limited capabilities (*i.e.*, these processing modules would not be required to have processing all critical and non-critical functions). This implementation has the advantage of reduced costs and/or space as compared to fitting processing module with full capabilities. The processing modules 124A-C may also have cascading levels of capabilities. For example, processing module 124B is fitted in the passenger compartment and is deemed to most likely survive a collision; it may be required to have capabilities critical to vehicle operation but no other capabilities to save space in the passenger compartment. Processing module 124C may have additional capabilities such as a cellular module so that emergency calls may be automatically placed if the default processing module 124A fails.

In another configuration, each of the processing modules 124A-C may have different capabilities. For example, processing module 124A may have capabilities only for critical vehicle functions; processing module 124C may have capabilities only for non-critical vehicle functions; and processing module 124B may be reserved for back-up processing of both critical and non-critical vehicle functions. In one implementation, processing may be

off-loaded to another processing module if one module becomes overloaded. This configuration has the advantage of a further reduction in costs and space because processing power is not wasted due to redundancy. In the case where one processing module malfunctions, the other processing modules may pick up processing duties via a processor off-load procedure. If there is not enough processing power for all wanted functionalities, the processing modules may work together to prioritize critical vehicle functions ahead of non-critical functions.

Fig. 20 depicts computational modules and data structures in memory 220 according to an embodiment.

An arbitration module 2000 selects a processing module to currently possess or own token 2004 (which is used to designate the processing module 124, in an active-standby configuration, being the active or standby processing module or, in an active-active configuration, having the responsibility for certain tasks, functions, or operations, such as critical tasks, operations, or functions, while the other processing module has responsibility for other different tasks, operations, or functions, such as non-critical tasks, operations, or functions.

A health check module 2008 performs checks or tests, in response to internally generated interrupts or requests from the other processing module, its ability to perform both critical and non-critical tasks, functions, and operations. Individual scores and composite or cumulative scores for the tasks, functions, and operations can be determined and compared to thresholds to determine an absolute state of health and/or to the individual and/or cumulative scores of the other processing module to determine a relative state of health.

Critical system controller(s) control, monitor, and/or operate critical systems.

Critical systems can include one or more of (depending on the particular vehicle) monitoring, controlling, and/or operating the ECU, TCU, door settings, window settings, and/or blind spot monitor, monitoring, controlling, and/or operating the safety equipment (e.g., airbag deployment control unit 133, collision sensor 132, nearby object sensing system, seat belt control unit, sensors for setting the seat belt, *etc.*), monitoring and/or controlling certain critical sensors such as the power source controller and energy output sensor 164, engine temperature, oil pressure sensing, hydraulic pressure sensors, sensors for headlight 128 and other lights (e.g., emergency light, brake light, parking light, fog light, interior or

passenger compartment light, and/or tail light state (on or off)), vehicle control system sensors, wireless network sensor (e.g., Wi-Fi and/or Bluetooth sensor), cellular data sensor, and/or steering/torque sensor, controlling the operation of the engine (e.g., ignition), head light control unit, power steering, display panel, switch state control unit 168, power control  
5 unit 174, and/or brake control unit 176, and/or issuing alerts to a user and/or remote monitoring entity of potential problems with a vehicle operation.

Non-critical system controller(s) 2016 control, monitor, and/or operate non-critical systems. Non-critical systems can include one or more of (depending on the particular vehicle) monitoring, controlling, and/or operating a non-critical system, emissions control,  
10 seating system controller and sensor 178, entertainment system 190, monitoring certain non-critical sensors such as ambient (outdoor) weather readings (e.g., temperature, precipitation, wind speed, and the like), odometer reading sensor, trip mileage reading sensor, road condition sensors (e.g., wet, icy, etc.), radar transmitter/receiver output, brake wear sensor, oxygen sensor, ambient lighting sensor, vision system sensor, ranging sensor, parking sensor,  
15 heating, venting, and air conditioning (HVAC) system and sensor, water sensor, air-fuel ratio meter, hall effect sensor, microphone, radio frequency (RF) sensor, and/or infrared (IR) sensor.

On board sensor monitor(s) 2020 include interfaces to receive signals from and transmit signals to a corresponding on-board sensor, including the on-board sensors  
20 discussed above, and the logic to monitor sensor operation and readings.

The displayed object movement module 2024 monitors display input received from occupants for commands to move a displayed object from a first display to a different second display in the vehicle for viewing by, for instance, a different occupant. The display input may include, for example, a sensed gesture, an icon selection, or other input indicative to a  
25 desire or request to move a displayed object from the first display to the second display. The moved object may or may not be retained for view on the first display after movement.

The diagnostic module 2028 handles warning/error signals in a predetermined manner. The signals, for instance, can be presented to a third party and/or occupant and/or cause the performance of on board diagnostics.

30 The media filter 2032 filters third party sourced signals, particularly multimedia signals, in a manner consistent with a vehicle universal or occupant-specific whitelist,

blacklist, or other user preference, sensed occupant context, and/or a governing federal, state, provincial, or local law or regulation.

The network selector 2036 selects a network for signal transmission based on network/node status, signal/noise ratio, type of signal, available and/or unavailable  
5 bandwidth, network performance parameter(s) (e.g., availability, packet drop or loss, jitter, latency, buffer capacity, throughput, and the like) quality of service, and/or other parameters and configures the signal for transmission over the selected network.

The remote control module 2040 receives a request from a remote source or third party to command a vehicle function (which function may be identified by a suitable  
10 function-specific code), authenticates the requestor, and if successfully authenticated and if privileged to request the performance of the vehicle function, executes the request notwithstanding a contrary command from the vehicle operator. The requestor can, for example, be a vehicle owner, a law enforcement authority, a vehicle manufacturer, a lender having a loan collateralized by the vehicle, and the like.

15 The installation supervisor 2044, for a newly installed software and/or hardware and/or other device (such as an on-board sensor, processing module 124 or component thereof, software application, circuit board, expansion module 290 or component thereof (which expansion module 290 may be hardware, software, or a combination thereof), critical or non-critical device (such as those discussed above with respect to the critical or non-  
20 critical system controller(s) 2012 and 2016), cellular upgrade module (e.g., 2G, 3G, 4G, 5G, LTE, or other cellular standard upgrade or Subscriber Identity Module (“SIM”) card, board, or other upgrade module, and the like), determines whether the newly installed component satisfies defined functional and/or source or reuse requirements and/or restrictions for the component, license restrictions, and other criteria, and, if satisfied, creates data structures in  
25 the component (if it has a resident memory) and the vehicle memory 220 to bind the component to the current vehicle.

The media controller 1524 receives a media stream from a remote node, identifies which input/output systems are disabled due to operator command and/or as a result of governing law, and provides the media stream to an input/output system associated with the  
30 associated occupant.

The computational module selector 2052 identifies the computational modules, particularly software applications, currently available within the local area network of the vehicle, the identification including not only the type (*e.g.*, game, multimedia, music, utility, and the like), source or vendor (*e.g.*, Apple, Microsoft, and the like), capabilities and requirements (*e.g.*, operating system, processing, memory, display, and other requirements) but also the version of the computational module, and records this information in memory 220. The selector 2052 can select not only, for duplicated computational modules, a most current version of the duplicated module to execute and a computational platform (*e.g.*, first, second, . . . processing module or external computational device 1532) for the execution.

The presence reporting module 2056 considers local laws, individual (contactee) context, and other factors in determining whether an individual (contactee) is present (*e.g.*, for unified communications) and, if so, by what communication channel(s).

The social networking module 2070 creates, manages, and/or maintains a social networking session with one or more other vehicles. The social networking module 2070 can identify operational vehicles having an occupant in a social networking relationship with an occupant of the selected vehicle, notify one or both occupants of the capability of instantiating a social networking session, and effectuate and maintain such a session.

In one application, processing module 124 is configured to process information sent over the CAN buses. As priority data is received by processing module 124 from high-speed CAN bus interface 240 and/or low-speed CAN bus 250, processing module 124 may determine the nature of the received data and independently do further processing on the received data. In a preferred embodiment, processor 210 executes instructions stored in memory 220 to perform these functions. Further, memory 220 serves as stores and retrieves for data by processor 210.

In one configuration, processing module 124 only receives data over high-speed CAN bus 240 and may send the data back over low-speed CAN bus 250. As the CAN bus provides arbitration-free transmission, processing module 124 may passively listen to information traffic, which includes priority data from the various components as discussed, sent over high-speed CAN bus 240. Processing module 124 then determines if a piece of received information may need further processing and should be sent to devices via low-speed CAN bus 250.

For example, collision sensor 132 may have detected a frontal collision. In one data path, collision sensor 132 may send a signal with details to the collision (*i.e.*, areas of impact and/or force and/or velocity of impact) over high-speed CAN bus 240 with specific target to airbag release control unit 133 to potentially deploy the airbags once airbag release control unit 133 determines that it is suitable to do so upon the receipt of the sent data. Since the CAN bus is arbitration-free, processing module 124 also receives the collision information from collision sensor 132. Processing module 124 then processes the information received to determine to relay the information to an information display (*i.e.*, display console of entertainment system 190) via the low speed CAN bus 250.

It is noted that the data rate is limited in the current implementations of the CAN bus. However, future implementations may allow for higher speeds such that the CAN bus may support data rate suitable for multimedia application. In these implementations, processing module 200 may be configured to leverage the CAN bus for multimedia use. For example, real-time multimedia information (*i.e.*, analog/digital radio or television signal) may be received by an antenna and transmitted through a CAN bus via processing unit 200 to entertainment system 190. At some point in time, one component of vehicle 100 may have suffered a malfunction that requires information the driver. In the default implementation of the CAN bus, the higher priority signal from the malfunctioning component will have priority over the multimedia information. With the leveraged CAN bus by processing module 200, the high priority signal from the malfunctioning component can be further processed by processor 210. If processor 210 determines that the malfunction is minor, processor 210 may relay the malfunction information to the low speed CAN bus 250 but being mixed in with the multimedia information such that there is little disruption to playing backing the multimedia information. Further, processor 210 may also consider if the malfunction requires further processing such as notification to a repair facility or emergency services.

In another configuration, processing module 200 may leverage other buses such as the network interface 270 and/or wireless interface 280 that have more bandwidth for the data. For example, while the present implementation of the CAN bus would not support multimedia information with any substantial bit rate, the network interface 270 may be leveraged such that while CAN bus information is received via the high speed CAN bus 240,



multimedia information is relayed separately via the network interface 270. This enables the processing module 200 to implement the previous example discussed involving relaying information regarding malfunctioning component without waiting for a future implementation of the CAN bus.

5 In another application, a processing module 124 may add further expansion modules 290A-N for further capabilities. For example, expansion modules 290A-N may contain a cellular telephony module. The cellular telephony module can comprise a GSM, CDMA, FDMA, or other digital cellular telephony transceiver and/or analog cellular telephony transceiver capable of supporting voice, multimedia and/or data transfers over a cellular  
10 network. Additionally, expansion modules 290A-N can include other cellular telephony modules from different providers or modes for other wireless communications protocols. As examples, the modules for other wireless communications protocols can include a Wi-Fi, BLUETOOTH TM, WiMax, infrared, or other wireless communications link. The cellular telephony module and the other wireless communications module can each be associated  
15 with a shared or a dedicated antenna. Further, expansion modules 290A-N may also include other wired bus modules that may connect to additional essential and nonessential vehicle components that may be installed or upgraded in the future. Processing modules 290A-N may contain functions critical to the operation of the vehicle such as engine control (ECU), transmission control (TCU), airbag control, various sensors, or other operational or safety  
20 related components. Further, processing modules 290 may take on more processing duties from a vehicle component 310 connected to bus 380. Thus, processing modules 124A-C benefits from redundancy in the case that one of modules malfunctions. Further, in a vehicle collision, it is expected that at least some of the processing modules may totally malfunction. In these cases, the remaining processing modules may take over limited or full processing  
25 duties of the malfunctioning vehicle components 310 or processing modules 390A-C.

In one configuration, processor 210, memory 220, storage 230, and the bus interfaces 240-280 may also be expansion modules similar to 290A-N. For example, processor 210 may be initially implemented as an OMAP 4 processor. In the future, OMAP 5 processors may be developed and processor 210 may be upgraded as a modular component.

30 In another application, processing module 124 is able to support additional vehicle hardware and/or software components that are added to the vehicle and is connected to

processing module 124 via a bus. For example, vehicle 100 may have installed an additional entertainment system. In one configuration, processing module 124 can treat the additional component that is connected to processing module 200 via a bus as an expansion module 290A-N.

5 In another configuration, the additional hardware and/or software component may require further processing for it to work with processing module 124. For example, the bus protocol may need to be modified to support communicating with the additional component because the additional component has capabilities beyond the existing protocol (*i.e.*, an extension to an existing bus architecture). In one implementation, processing module 124  
10 must first check to ensure that the additional component complies with OEM defined standards such that rogue components not recognized for a particular vehicle would not be supported.

Fig. 15 depicts the vehicle 100 in communication, via first, second, . . . networks 1504 a, b, . . . , with a remote node 1500, such as a computational device, *e.g.*, a server,  
15 mobile phone, tablet computer, laptop computer, personal computer, and the like, of the vehicle owner, law enforcement authority, insurance company, vehicle or parts manufacturer/vendor (*e.g.*, to provide vehicle diagnostics, maintenance alerts, vehicle or part recall notifications, and/or predictive analytics), a service provider (*e.g.*, a convenience service provider such as a service to connect the vehicle operator with a dealer, a service to  
20 locate the vehicle, a service to provide vehicle information and/or feature assistance, an automotive navigation system service and a service to start a vehicle (OnStar™ being an example), a location-based service provider (*e.g.*, traffic and/or weather reporting and/or adviser on gas, accommodations, navigation, parking assistance, and/or food), Internet content provider, software vendor, concierge service provider, a processing module of  
25 another vehicle, a roadside monitor, sign, beacon, and the like, to name a few.

The first, second, . . . networks 1504a,b, . . . can be any wireless network, such as a radio or cellular network (*e.g.*, CDMA, CDMA2000, AMPS, D-AMPS, TACS, ETACS, CSK, CDMAOne, GSM, EDGE, GPRS, HSCSD, UMTS, WCDMA, HSPA, WIMAX, WIMAX ADVANCED, LTE ADVANCED, or FDMA in accordance with the 1G, 2G, 2G  
30 transitional, 3G, 3G transitional, 4G or 5G cellular network standards), a Wi Fi network, a Bluetooth network, and the like.

The vehicle 100 includes a transceiver 1508 to send and receive signals over a selected one of the first, second, . . . networks 1504 a, b, . . . , a gateway/firewall 1512 to provide secure connectivity between the various components of the vehicle 100 and the first, second, . . . networks 1504a, b, . . . , primary and secondary processing modules 124a and b, memory/storage 220 or 230, on board sensors 1516 (discussed above with reference to Fig. 1), input/output system(s) 1520 and associated media controller (discussed below) to manage and control the output presented by the input/output system(s) to the user, network controller 1528 to supervise local networks and nodes thereof and identify and, if possible, isolate malfunctioning networks and/or nodes to avoid detrimental impact on other networks and/or nodes of the vehicle 100, and external computational device(s) 1532 of occupants, such as wireless capable mobile phones, personal digital assistants, tablet computers, laptop computers, and the like. As will be appreciated, the logic for the gateway/firewall 1512, media controller 1524 and network controller 1528 can be contained within memory/storage 220, 330. The various components are connected by a bus, wireless network, or combination thereof (denoted by reference 1536).

The gateway/firewall can be any suitable module that can maintain secure connectivity. The need for the gateway/firewall is necessitated by the assignment of a wireless data network address, such as defined by IPv6 (Internet Protocol version 6), with the corresponding processing module 124. As will be appreciated, IPv6 addresses, as commonly displayed to users, consist of eight groups of four hexadecimal digits separated by colons, for example 2001:0db8:85a3:0042:0000:8a2e:0370:7334.

Each processing module 124 can have an independent network address or use a common network address. The gateway can be any module equipped for interfacing with another network that uses one or more different communication protocols. The firewall can use any technique to maintain security, including network address translation, network layer or packet filtration, application-layer firewall, and the like.

Fig. 16 depicts an exemplary input/output architecture for the vehicle 100. The architecture includes first, second, . . . nth input/output systems 1600a-n, the media controller 1524, display controller(s) 1604 to receive user input via the input/output system(s) and configure the output presented by the input/output system(s) to the user, audio controller(s) 1608 to control audio output to the user, and rule sets 1612 (stored in memory/storage 220,

230) to regulate corresponding features/functions of the vehicle 100, particularly the information and/or other output provided to each occupant by a respective input/output system. Generally, each of the multiple occupants has a separate and corresponding input/output system 1600. For example, each seat 148 can have a corresponding input/output system 1600.

As can be appreciated, the functionality disclosed herein may be affected by the geographical location and/or movement of a vehicle. A vehicle may cross a jurisdictional line where different laws exist that concern behavior in or about vehicles. These laws may be stored, as one or more rule set(s) 1612, in a database on-board and/or remotely accessible by the vehicle. A vehicle may use its location-based features to determine the appropriate applicable laws and enable or disable certain features to a user. For example, in the event that an individual crosses a state line where the local laws prohibit texting while driving, the vehicle may disable texting for the vehicle operator. This blocking would not prevent others in a vehicle from texting, and if allowed may provide for the operator to continue to send voice-activated texts, etc. Movement and location of the vehicle may be determined using location-based features as described herein. Moreover, to prevent false blocking of features, a specific user device position may be determined by sensors on the device, sensors in the vehicle, and/or combinations thereof. Although described with reference to blocking the texting ability of a specific user, it can be appreciated that the ability to surf the Internet, view photos, access streaming content, and other predetermined distractions may also be disabled.

For an additional external computational device 1532 that connects to processing module 124 via wireless interface 280, a secured connection protocol is needed. Unlike a wired bus connection, which is generally electronically confined to vehicle 100, a wireless connection via wireless interface 280 may be broadcast to other communication systems within the vicinity of vehicle 100. Thus, other wireless communication hardware, systems, and networks might be able to communicate with the communication system of the vehicle 100. This ability is potentially a security hazard.

To resolve this issue, wireless security rules should be used to ensure that only trusted devices, such as the external computational device 1532, communicate wirelessly, via the wireless interface 280, with the on board vehicle components through the wireless interface

280. Such security is provided by the gateway/firewall 1512 applying known security algorithms. In one implementation, wireless security may be implemented by the gateway/firewall 1512 using the current security setup in the 802.11 standard such as Wired Equivalent Privacy (WEP) or Wi-Fi Protected Access (WPA) or other security systems as known in the art. OEMs may also choose to implement security by using a propriety security system and/or wireless protocol to work with the in-vehicle wireless communication network.

Upgrading the vehicle 100 using different processing modules and/or other on board components, such as on board sensors 1516, can be done securely and seamlessly. A limit may be imposed on the place and manner in which an additional component communicating via the in-vehicle wireless network may be added to the vehicle 100. For example, installation of the additional component may only be available at an automobile shop or may even more limited to only in OEM approved shops or dealership to ensure that the newly installed component is fully tested to communicate only with vehicle 100 and not with other adjacent vehicles.

To facilitate this process, a handshake procedure may be used during the initial installation of the component. In one implementation, an OEM approved shop may have codes that will allow the new component to accept a link with vehicle 100. During this handshake procedure, vehicle 100 and its relevant components, such as processing module 200, may negotiate a protocol and/or security settings to communicate with the new component. For example, a symmetric or asymmetric code or key pair may be developed for encrypting communications. Alternatively, codes for WEP, WPA, or other security systems as known in the art may be developed for secured communication. After this initial handshake procedure, the new component and vehicle 100 will not have to do any further security setup in the future to prevent leaking the secured codes. In a further implementation, the new component is considered married or bound to vehicle 100 and may not communicate with any other vehicles unless unmarried or unbound when the component is removed at an approved shop. The dedication of the component to the vehicle may be done by using a unique code, such as a serial number of the component or vehicle, to enable a type of routine licensing compliance check when the car is activated. This can be done, for example, by comparing a unique code received by the installed component from another vehicle

component or by the other vehicle component from the installed component. The licensing check is successful when the received code matches a code stored in memory of the receiving device.

In another configuration, the additional, or installed, component may also communicate wirelessly with other vehicle components of vehicle 100 without needed processing module 200 to relay any communication. This may be done by sharing a vehicle encryption scheme and code for the wireless use. This may be useful for emergency purposes (*i.e.*, the police may have a need to control certain components in a vehicle).

#### Operation of Arbitration and Health Check Modules 2000 and 2008

The processing modules 124 can use any of a variety of techniques to determine relative status and/or processing role of each. For example, under one technique a token is passed to signify the active or passive processing module or the processing module performing a specified set of processing operations. The processing module in possession of the token at any one time has the status and/or is responsible for the set of processing operations associated with the token. Rules may be used to arbitrate between the processing modules when each asserts ownership and/or non-ownership of the token.

By way of illustration, the processing modules 124 can determine which module is active and which is standby by employing the following rules. Upon detection of a selected stimulus (e.g., at vehicle start-up, processing module power-up, and/or periodically during vehicle or processing module operation), the health check module 2008 in each processing module 124 runs self-tests or queries the health check module 2008 other processing module 124 to perform selected computational tasks and provide the result. The processing modules 124 thus exchange messages with each other. Based on the results of its self-test (or queried tests), each processing module 124 decides whether it can become active. If so, the processing module 124 asserts an available signal to an arbitration module 2000, which propagates the signal to the other processing module 124. The arbitration module 2000, applying rules, chooses the active processing module 124 and forwards the token to the selected processing module 124, along with an interrupt. Rules may include a default selection, an ordered, random or pseudorandom periodic change in which processing module 124 is active and which is standby, which processing module 124 is healthier (or has a higher state of health score, the relative capabilities of the processing modules 124 (with the more

capable processing module being active), and the like. The arbitration module 2000 propagates a token non-ownership signal to the other processing module 124, along with an interrupt. Each processing module 124, in response, sets its status in memory to “primary” or “standby”. If the active processing module 124 is removed, powered down, or voluntarily  
5 de-asserts ownership or possession of the token, the standby processing module immediately receives the available token 2004, along with an interrupt. It then assumes, and records in memory, the primary state.

In one variation, arbitration is performed by the arbitration module 2000 using a health check procedure 400 shown in Fig. 4.

10 Health check procedure 400 by the health check module 2008 is one way in which each processing modules 124A-C may self-check to determine a respective state of health (e.g., if the processing modules remains fully functional or is only partially functional). Health check procedure 400 may be activated by each processing module 124 or one of the other processing modules 124 at a certain time interval or may be manually activated by user  
15 (i.e., a user directly activating the module or whenever the ignition is started). Health check procedure 400 may also be continuously running while the vehicle 300 is running to ensure the fastest response time in case a collision occurs resulting in an immediate loss of processing functions.

In step 410, the health check module 2008 in each processing module 124 performs a  
20 health check on its critical tasks, functions or operations of which losing one would result in a potentially critical loss to vehicle operation. As discussed previously, the critical tasks, functions or operations may include, for example (depending on the particular vehicle), monitoring, controlling, and/or operating a critical system. Health check 410 may involve procedures such as testing or monitoring that each critical function or operation is operating  
25 within predetermined or selected operating parameters and/or causing each critical component (safety equipment, selected sensors, engine, power steering, and/or brakes) to operate within selected operating parameters. In some configurations, a critical system, such as the ECU, may include both critical (i.e., engine failure) and non-critical tasks or functions (i.e., minor oil leak). Health check 410 may be configured to check only the critical tasks or  
30 functions.

In pass test check 411, if any malfunction to a critical task, function or operation is detected, the procedure activates hand-off procedure in step 440, which will be discussed with reference to Fig. 5. In one variation, a cumulative score is computed for all critical tasks, functions, and operations. The individual scores of the tasks, functions, and operations and cumulative score for the processing module is provided to the arbitration module 2000, which compares both sets of scores for the two processing modules 124 and selects and designates the healthier of the two processing modules 124 as the primary or active processing module 124.

If the processing module 124 passes test check 411, health check on non-critical tasks, functions or operations 420 is performed. Non-critical tasks, functions or operations may include, for example (depending on the particular vehicle) monitoring, controlling, and/or operating a non-critical system. In step 420, health check is done on various functions of the non-critical system, with each function having a score for passing the health check. The score may be adjusted according to the level non-criticality of the system. For example, an emissions control unit, while it may be non-critical to vehicle operation, may nonetheless be fairly important so as to comply with environmental regulations; therefore an emissions control unit could be weighted a comparatively high score for passing. In contrast, an entertainment system's failure may not be deemed to be important (except for operator/occupant inconvenience) and may be weighted with a relatively low score for passing.

In step 421, the score is tabulated for all non-critical systems and compared to see if it is above a certain threshold. If the score is below the threshold, a hand-off procedure is activated in step 450. For example, if emissions control by the processing module 124 is detected to be failing, causing or potentially causing harmful gas emissions to rise significantly above the legal limit, health check 421 may give a very low score to this non-critical system. Therefore, even if the entertainment system is working perfectly, health check may still give a score that is below the threshold and hand-off procedure will be activated.

In one configuration, the score weight for each non-critical system may be defined dynamically according to the location of the vehicle or other factors. For example, vehicle-use laws may affect how a non-critical system should be weighted (i.e., the stringency of



emissions law, noise control law, or other laws in one area). Thus, vehicle -use laws may be provided by an organization, governmental entity, group, individual, and/or combinations thereof. The laws may be stored locally or retrieved from a remotely located storage. The vehicle-in-use laws may be statutes and/or regulations that are enforced by a government  
5 entity, such as a city, municipality, county, province, state, country, and the like. These laws may define vehicle, traffic, transportation, and/or safety rules associated with a given geographical region. An exemplary vehicle-in-use law governs texting, cellular phone use, and video availability to the operator when the car is in motion and the like). The laws may be updated from time to time to, among other things, account for changes in the laws. Thus,  
10 a first task, operation, or function may be critical in a first geographic location but noncritical in a different second geographic location. Likewise, a first task, operation, or function may be non-critical and have a first score (if operating properly) in a first geographic location but be non-critical and have a lower second score (if operating properly) in a second geographic location.

15 In step 430, if the score for non-critical systems is above the threshold, the active processing module 124 may be continued to be used as the active processor. In one variation, a cumulative score is computed for all non-critical tasks, functions, and operations. The individual scores of the tasks, functions, and operations and cumulative score for the processing module is provided to the arbitration module, which compares both sets of scores  
20 for the two processing modules and selects and designates the healthier of the two processing modules as the primary or active processing module.

The operation of a an arbitration module 2000 procedure 500 for a processing module will now be discussed with reference to Fig. 5.

25 The arbitration module 2000 can activate a token arbitration procedure 500 by steps 440 and 450 (Fig. 4) where either (a) the one or more critical tasks, functions, and operations has failed health check or (b) where one or more non-critical tasks, functions, and operations has not tabulated enough score to represent that the selected processing module is healthy enough for processing. Arbitration may be based on an absolute and/or relative state-of-health.

In step 510, a health check is performed, by a respective health check module 2008, on each processing module 124 and the pass/fail results and scoring information reported to the other processing modules 124 and/or the arbitration module 2000.

5 In step 514, the arbitration module 2000 selects a next processing module 124 (until all are considered) and proceeds to decision diamond 518.

In decision diamond 518, the arbitration module 2000 determines whether the selected processing module 124 passes the health test on set of critical tasks, functions, and operations. If so, the arbitration module 2000 proceeds to decision diamond 524.

10 In decision diamond 524, the arbitration module 2000 determines whether the selected processing module 124 passes the health test on set of non-critical tasks, functions, and operations. If so, the arbitration module 2000 proceeds to step 528.

In step 528, the arbitration module 2000 creates or updates data structures indicating that the selected processing module 124 is healthy and recording the selected processing module's respective scoring information. Optionally, the arbitration module 2000 can  
15 determine and record the relative state-of-health of the selected processing module 124 relative to other processing modules.

When the selected processing module 124 fails to pass one or more sets of critical tasks, functions, and operations (decision diamond 518) or non-critical tasks, functions, and operations (decision diamond 524), the arbitration module 2000 proceeds to step 532 and  
20 creates or updates data structures indicating that the selected processing module 124 is unhealthy and recording the selected processing module's respective scoring information. Optionally, the arbitration module 2000 can determine and record the relative state-of-health of the selected processing module 124 relative to other processing modules.

After performing steps 528 or 532, as appropriate, and when no processing module  
25 124 remains to be analyzed, the arbitration module 2000 proceeds to decision diamond 536. In decision diamond 536, the arbitration module 2000 determines whether a healthy processing module 124 is available and, when available, designates, in step 540, the healthiest (based on absolute or relative state-of-health or both) processing module 124 as the active processing module 124 (or, in an active-active configuration, as being primarily  
30 responsible for handling critical tasks, functions, and operations).

When no healthy processing module 124 is available, the arbitration module 2000 implements emergency measures, activates an alarm indicating that there is currently no available healthy processing module 124, and reports the alarm to the user and/or a remote node 1500, such as the vendor, manufacturer, servicing entity, roadside service, and the like.

5           The emergency measures implemented can vary by application. In one application, the emergency measure is to identify which processing module 124 is healthy to perform each set of critical and optionally non-critical tasks, functions and operations. If a healthy processing module exists for each set of critical and optionally non-critical tasks, functions and operations, the arbitration module 2000 assigns each set of critical and optionally non-critical tasks, functions, and operations to a processing module 124 having a sufficiently high health score (e.g., above a selected threshold) to perform the selected set of critical and optionally non-critical tasks, functions and operations. Where multiple processing modules are healthy enough to perform the selected set of critical and optionally non-critical tasks, functions and operations, the arbitration module 2000 can select the processing module  
10           having the highest health score for the selected set of critical and optionally non-critical tasks, functions and operations and/or having the highest available or unused processing units or resources to perform the selected set of critical and optionally non-critical tasks, functions and operations. Where no processing module 124 is healthy to perform a selected set of critical and optionally non-critical tasks, functions and operations, the selected set of critical and optionally non-critical tasks, functions, and operations can be performed by a remote node, via first, second, . . . network 1504a, b, . . . The remote node 1500 can be, for example, the vendor, manufacturer, servicing entity, roadside service, and the like. In one application, the critical and optionally non-critical tasks, functions, and operations are performed by a remote node 1500, via first, second, . . . network 1504a, b, . . . , rather than by  
15           a local or on board processing module 124.  
20           a local or on board processing module 124.  
25           a local or on board processing module 124.

An important aspect of an active-standby configuration can be how to maintain synchronicity between the active and standby processing modules to enable “hot” hand-offs, which can be particularly important for automotive applications, without loss of memory as to the current operational state of the vehicle and its component tasks, functions, and  
30           operations. One technique is to have the standby processing module 124 perform “shadow” processing in which it receives all input received by the active processing module 124 and

performs the same processing tasks, functions, and operations as the active processing module 124. The assumption is that the two processing modules 124 have identical processing rates and therefore, at any one time, precisely duplicate the other as to processing state of completion as to any task, function, and/or operation. Due to varying processing loads on the processing modules, delays in signal transmissions, and other factors, this assumption may or may not be true. Another technique is to have the standby processing module 124 receive, and store in memory 220, time-stamped processing state information from the active processing module 124. The time-stamped processing state information relates to any processing task, function or operation currently being performed by the active processing module 124 and the results thereof. A potential issue with this approach is latency between the current and reported states of the active processing module 124. Another technique is a combination of the foregoing techniques. In this technique, the standby processing module 124 performs “shadow processing” but periodically checks its processing state information against the time-stamped processing state information received from the active processing module 124 and resets, alters, or updates its state information to reflect the received processing state information. Where a processing string is being performed correctly, it does not typically need to be revised to reflect a potentially earlier point reflected in the received and time stamped state information (which may be delayed). A reset to an earlier point in the processing string may be appropriate where the standby processing module 124 is too far ahead of the active processing module 124. The primary purpose of this combined approach is to confirm processing accuracy by the standby processing module 124 and to keep the standby processing module 124 from getting too far in advance of the active processing module 124 in processing information.

#### Operation of Remote Control Module 2040

Fig. 27 depicts a particular configuration of a remote node 1500. The remote node 1500, configured as a central repository for vehicle information, includes a server 2700 and associated database 2704. The remote node 1500 is in wireless communication, via network 1504, with first, second, . . . nth vehicles 100a-n. Currently, car drivers have the option to sign up for a service like General Motors OnStar® to remotely unlock cars, and provide other features such as remote start, tracking vehicles, and/or locking cars, etc.

In some embodiments, the present disclosure is directed to a central repository 2704 that can be used in conjunction with an individual vehicle. The central repository may be stored remotely (as shown) or on-board the vehicle. In the event that the central repository is stored remotely, it may be supervised by a law enforcement agency, or secure administrative  
5 agency. It is anticipated that strong security procedures may be employed to avoid hacker attacks, especially if stored at a remote central repository like the Department of Motor Vehicles (DMV), or other security-approved location. In the event that a vehicle is stolen, the true owner of a vehicle may prove ownership to the central repository and locate, lock, shutdown, etc. the vehicle.

10 Commonly, the requested vehicle function is one or more of accelerate, decelerate, activate, deactivate, provide current vehicle location, broadcast audible and/or visual message to vehicle operator, brake, set a maximum, vehicle velocity, and lock doors. The requested vehicle function can be identified by a function-specific code. The remote control module can map the function-specific code in a look up table indexing function-specific  
15 codes with corresponding vehicle functions to determine the requested vehicle function to be performed.

In another embodiment, a police device may communicate to another vehicle to slowly reduce that vehicle's speed, shutdown the engine, cut power, etc. The communication can be securely effected using unique codes or other cryptographic techniques. Moreover,  
20 the communication may be through a server associated with a central repository. It is anticipated that the module controlling these functions is securely guarded and designed to prevent hacking attempts.

The operation of a system stand-by procedure 600 implemented by a remote control module 2040 and/or other component of a processing module 124 will now be discussed with  
25 reference to Fig. 6. Stand-by procedure 600 may be activated when the selected processing module 124 transitions from active to standby or standby to active or in response to a command from the operator or the remote node 1500. In one configuration, stand-by procedure 600 may also be activated manually by the driver of the vehicle or by another third party. For example, the driver or another third party may wish to disable certain aspects of  
30 vehicle 300 (*i.e.*, the driver may wish to disable certain functions, either critical or non-critical, of the vehicle to prevent another user of the vehicle, such as a valet, from accessing

them, a third party, which may be the police or a theft prevention service such as On-Star, may wish to disable a stolen vehicle or a vehicle which is otherwise in violation of the law).

Manual activation of stand-by procedure 600 may be done locally or remotely. For local activation, an additional component in the form of a switch may be added and  
5 connected to the processing module via a bus or as an expansion module 290A-N. The driver may then manually activate the switch as needed.

Most likely, manual activation of stand-by procedure 600 is done remotely (*i.e.*, by the police, theft prevention service, or the owner of the vehicle at a remote location). As such, in one implementation, the corresponding processing module may be accessed via a  
10 non-physical bus such as by wireless interface 280. However, this is not the preferred method. As discussed previously, vehicle components communicating with a processing module wirelessly should only work with a secured scheme. The in-vehicle wireless network should not be accessible to third parties for further security purposes. A direct access to the in-vehicle wireless bus would defeat these principles. The wireless interface 280 may have a  
15 limited range such that connection and control can only be effected within the vicinity of the vehicle. Nevertheless, this implementation may be useful in cases where there is an emergency that is within the vicinity of the vehicle (*i.e.*, emergency road closure) that requires a third party such as the police to disable passing vehicles for safety reasons. In such cases, the authorized third party may activate codes that bypasses securities of the in-  
20 vehicle wireless network that is normally off-limit and directly access the processing module.

In another implementation, the vehicle may have a cellular or satellite communication component that has the capability of accessing an outside cellular or other communication network. Alternatively, this communication component may be installed as an additional expansion module 290A-N as discussed previously. Access to processing module is granted  
25 through a valid security verification within this component. Therefore, access to the processing module using this implementation does not require open access to the in-vehicle wireless bus.

In another configuration, stand-by procedure 600 may also be activated by a control system within the vehicle when some automated condition is met. For example, a leased or  
30 rental car company may wish to limit the geographical location where the vehicle can be

driven. The vehicle may be automatically disabled if it is detected that the vehicle has left the allowed zone of operation (*i.e.*, detected via a GPS).

5 In step 601, the method confirms if any critical subsystem would be unavailable. As discussed above, a critical subsystem may be unavailable because it did not pass the health check, because it was disabled by the driver or a third party, or because some automated condition has been met.

10 If critical subsystems are unavailable, step 610 performs general vehicle stand-by. In one configuration, general vehicle stand-by disables all components of the vehicle rendering the vehicle unusable. However, this may lead to safety issues where a sudden shut-down of the vehicle while operating on the road may be hazardous to both the driver of the vehicle and other vehicle on the road. In another configuration, general vehicle stand-by performs a shut-down of non-critical systems while placing a limit on critical system designed to bring the vehicle to stop. For example, a speed limiter may limit the speed of the vehicle to a minimal speed so that the vehicle can be brought to a safe stop subsequently but cannot  
15 operate effectively. After the vehicle is brought to a stop, general shut-down that disables all components of the vehicle may be performed.

In step 620, an alarm is activated to inform about the status of a general stand-by. Here, similar to step 540, an alarm is normally sent to at least components like display 144 or entertainment system 190 of vehicle 100 via a reliable bus such as the high speed CAN bus  
20 to inform the driver of the generally stand-by. In one implementation, an alarm may also be sent to a remote node 1500, such as a service or maintenance provider, e.g., a nearby or a default car repair facility with possible system diagnosis information, emergency services if it is detected that a emergency affecting road safety has occurred, and/or to car manufacturers for data collection and other purposes..

25 If critical subsystems are not unavailable in step 601, the method further confirms if any non-critical subsystem is unavailable 602. If any of the non-critical subsystem is indeed unavailable, the method performs specific stand-by on the specific subsystem 630.

Specific stand-by 630 involves performing stand-by only for a specific non-critical subsystem. For example, if entertainment system 190 malfunctions, entertainment system  
30 190 can be safely turned off without affecting the operation of the vehicle. However, some non-critical functions may be affected such as an alarm function announcing certain

information that is pre-disposed to be announced by entertainment system 190. In this case, specific stand-by 630 may include rerouting the information to display 144, perhaps with the information to be presented in abbreviated form to ensure the information will be presentable on display 144. Specific stand-by 630 for entertainment system 190 may also involve  
5 rerouting information to other perceptible methods such as by light or sound.

In step 640, the method activates an alarm to information driver and third-party services of specific subsystem stand-by similar to step 620.

Fig. 9 depicts a method of operation of the remote control module 2040. There are a number of examples of operation by a remote control module 2040.

10 In one example, a police officer or other law enforcement authority and/or rule trap sensor can “ping” an automobile for information relating to its speed and driving conditions. By comparing this received data from the automobile to known data relating to stop signs, speed limits, and the like, a decision can be made on whether the law has been broken. For example, the sensor itself may not necessarily determine the speed of a vehicle. The sensor  
15 asks the vehicle to respond to the sensor with the vehicle’s speed and possibly other information. Therefore, the speed detection is achieved through responding to a sensor’s question and the vehicle’s answer. It is anticipated that a specific sensor may use alternate detection methods to verify the accuracy of a received signal. For instance, if a vehicle is asked to respond with a current speed value, and does so, the sensor may send a radar signal  
20 to verify the response. If the response does not match the verification signal, a note is made of the anomaly and the data is recorded. This data may be used by law enforcement to later identify vehicles that are malfunctioning and/or have been compromised. The identity of the car, including serial number, owner identity (e.g., name, home address, and contact information), driver’s license number, insurance information (e.g., name and address of  
25 insurance company, owner’s insurance policy identification, and coverage limits), and the like), and/or licensing information (e.g., license plate number) can be provided by the vehicle to the requestor.

In another example, a law enforcement authority, owner, or other privileged entity may request a critical or non-critical task, function or operation to be disabled or behave in a  
30 selected manner. For instance, a law enforcement officer can cause the vehicle to decelerate in a high speed pursuit or, for a high speed pursuit or stolen car, can disable the engine.



In another example, a remote node 1500, such as a law enforcement authority, an insurance company, an intelligent sign or traffic signal, a roadside monitor, or the owner himself or herself requests historic or current vehicle operating information, such as speed, and/or information received by the vehicle from an external source, such as a stop light, speed limit sign, yield or stop sign, and the like. This information can be compared to identify poor driving practices and/or breaking of the law. It can also be used in accident reconstruction to determine who is at fault in an automobile accident where vehicle operators frequently dishonestly represent who is at fault. Currently, responsible drivers pay inflated insurance premiums because the insurance industry cannot guaranty a particular driver's adherence to the law or general driving behavior. To address this concern, current insurance companies may allow a driver to install a device in a vehicle to randomly monitor behavior. This device can only monitor certain functions and requires the installation of a device separate from the vehicle's ecosystem. The present disclosure is directed to using various data compiled by the system to analyze factors contributing to an individual's driving behavior and/or habits. In the event that an individual wishes to receive better insurance rates for responsible driving, a lower quantity of driving, or other good driving indicators, the driver may agree to provide insurance tracking information. The insurance tracking system may consider GPS and other location-based information (to compare actual speed with speed limit data), g-force sensors (to detect rapid acceleration, hard turns, etc.), perimeter sensors (to detect close-calls, inattention while changing lanes, etc), in order to determine conformance with the good-driving terms established by an insurance company. Because the device may be integrated, and/or associated, with the vehicle's ecosystem total behavioral data may be recorded and sent in real-time to a receiving module. Moreover, the system may detect the user and provide accurate information for each user of a vehicle.

Referring to Fig. 9, the remote control module 2040, in step 900, receives a request to command a vehicle task, function and/or operation and/or to transmit specified information to the requestor.

In step 904, the remote control module 2040 attempts to authenticate the requestor. User authentication is a way of identifying a user and verifying that the user is allowed to access some restricted service. Authentication can be performed by, for example, by encrypted symmetric or asymmetric key exchange, public and private key cryptography, a

secure remote password, multi-factor authentication (e.g., three major factors include verification by something a user knows (such as a password or PIN), something the user has (such as a smart card, ATM card, or a security token), and something the user is (such as the use of biometrics, such as a fingerprint or retina scan)), time-based authentication, a unique digital identity, closed-loop authentication, access control service, and the like.

Control then passes to decision diamond 908 where the remote control module determines whether authentication was successful. When authentication is successful, the remote control module, in decision diamond 912, determines whether the requestor is privileged to make the request. In other words, a first requestor is entitled to a first set of privileges with respect to access to vehicle information and/or control of vehicle tasks, functions, and operations while a second requestor is entitled to a different second set of privileges with respect to access to vehicle information and/or control of vehicle tasks, functions, and operations. A law enforcement entity or vehicle owner, for example, will generally have a highest level of privilege (enabling broad access to vehicle information and/or control of vehicle tasks, functions, and operations) while an insurance company or servicing entity will not have the highest level of privilege.

When the requestor is entitled to make the request, the remote control module, in step 916, executes or causes execution of the request in accordance with rules governing what the privilege accorded the requestor, which may override operator and/or other occupant commands.

When the requestor is not entitled to make the request, the remote control module, in step 920, ignores the request and logs in memory 220 the information surrounding the request, e.g., the identity of the requestor, the time stamp of the request, and the request itself.

The remote control module 2040 can perform other functions at the request of the vehicle owner and/or a vehicle family member. The remote control module 2040 can receive vehicle configuration commands from a remote node 1500 that cause the remote control module 2040 to implement the configuration commands. The configuration commands respect the configuration of any vehicle component, including on board input/output system display appearance and/or content and/or icon configuration, programmable hard button

function mapping, on board cached media selection, alteration of vehicle performance parameters, and vehicle status.

A number of examples will be described to illustrate these remote control module functions. In a first example, a vehicle owner or family member, via a remote node 1500, such as a home computer, tablet or laptop computer, smart phone, and the like, can customize his or her input/output system display settings, appearance, sounds, wall paper, icon selection and location, and the like. Manufacturer or after market defined templates may be provided to assist the user in configuring the input/output system. The user, for instance, could move graphical objects, such as icons, around to where he or she wants them to be. He or she could put in or remove graphics. He or she could add a digital tachometer or navigation application, such as one downloaded from an application store over the Internet. He or she could rearrange preferences. For instance, he or she may cause the default configuration on the infotainment or entertainment system to be the radio presets or the navigation. Because the vehicle is web-based, the user can download third party displays from a commercial entity, such as an on line application store, or even trade with friends. He or she could configure programmable hard buttons, such as stereo or radio buttons, so that a selected button that currently causes the radio to scan can be made to trigger the on board navigation application. Users can apply software-based skins, such as wall paper, that are decorative ways to add personal style to the vehicle. Users can add functionality to the vehicle. For example, he or she can download, over the Internet, media, such as digital movies from an on line rental service, such as Netflix, and digital games to the vehicle memory. He or she can customize vehicle performance, such as by tuning the vehicle through the remote connection. For instance, if the user moves the vehicle to a sport mode, shifting points would be altered and, if the user moves the vehicle into economy mode, cylinders could be disabled at different speeds. He or she can connect to obtain and/or run diagnostics of a selected vehicle component. He or she could use the diagnostics to obtain quotes for and/or schedule repair or maintenance operations by selected service personnel. He or she could check states of selected vehicle operations, including whether cabin lights are on or off, whether headlights are on or off, whether windows are up or down, whether the on board alarm is on or off, whether the on board alarm has been triggered, and whether the sun roof is open or closed. The remote node 1500 could then be used to reset the state as desired, e.g., turn cabin lights

off, turn headlights off, close windows and/or sunroof, activate alarm, and the like. The user could also set up communication paths and/or modalities for vehicle-generated alarms. Exemplary communication paths and/or modalities, including phone call, instant messaging, emails, and the like.

5           A hard reset could be performed to reset all vehicle components to factory default settings.

          This operation of the remote control module 2040 will be discussed with reference to Fig. 31.

          Referring to Fig. 31, the remote control module 2040, in step 3100, receives a  
10       request, via a remote node 1500 and from an owner or family member of the owner, to configure a selected component of the vehicle, such as an on board input/output system, and/or to access vehicle state information.

          In step 3104, the remote control module 2040 attempts to authenticate the requestor. User authentication is a way of identifying a user and verifying that the user is allowed to  
15       access some restricted service. Authentication can be performed by, for example, by encrypted symmetric or asymmetric key exchange, public and private key cryptography, a secure remote password, multi-factor authentication (e.g., three major factors include verification by something a user knows (such as a password or PIN), something the user has (such as a smart card, ATM card, or a security token), and something the user is (such as the  
20       use of biometrics, such as a fingerprint or retina scan)), time-based authentication, a unique digital identity, closed-loop authentication, access control service, and the like.

          Control then passes to decision diamond 3108 where the remote control module determines whether authentication was successful. When authentication is successful, the remote control module, in decision diamond 3112, determines whether the requestor is  
25       privileged to make the request. In other words, a first requestor is entitled to a first set of privileges with respect to access to vehicle information and/or control of vehicle tasks, functions, and operations while a second requestor is entitled to a different second set of privileges with respect to access to vehicle information and/or control of vehicle tasks, functions, and operations.

30       When the requestor is entitled to make the request, the remote control module, in step 3116, executes or causes execution of the request in accordance with rules governing what

the privilege accorded the requestor, which may override operator and/or other occupant commands.

When the requestor is not entitled to make the request, the remote control module, in step 1320, ignores the request and logs in memory 220 the information surrounding the request, *e.g.*, the identity of the requestor, the time stamp of the request, and the request itself.

This functionality can enable a vehicle to have multiple configurations for a selected vehicle component, such as an input/output system, that is indexed or associated with a specific occupant. Techniques can be used to determine where each occupant is seated in the vehicle, map the identified occupant to the set of data structures correlating each occupant with selected vehicle component configuration and configuring the respective input/output system accordingly. Thus, the vehicle can have plural differently configured input/output systems at any one time. When the selected component is a component other than an input/output system, the particular configuration of the selected component to be employed is dependent on who the identified operator of the vehicle is.

In addition to the techniques described elsewhere for identifying a vehicle occupant, other techniques that may be employed include ignition keys that are identified uniquely to an occupant, user input such as selection of one or more keys, entry of an identification code or other identity, or biometric data, such as a fingerprint or retinal scan, and login. When the occupant is identified and associated with a particular seating position, the selected component will autoconfigure.

#### Operation of Computational Module Selector 2052

The operation of a processor off-load procedure 700 by computational module selector 2052 one or more processing module(s) will now be discussed with reference to Fig. 7. This operation is particularly beneficial in an active-active configuration but may be used in an active-standby configuration. As discussed with respect to vehicle 300 of Fig. 3, some configurations of expansion modules 290A-C may require processor off-load to share processing functions of tasks among a number of expansion modules in a common host processing module 124 or across different processing modules 124. For example, a first expansion module 290A and/or host processing module 124 may be specialized for critical functions while a different second expansion module 290B and/or host processing module

124 is specialized for non-critical functions. In an event where the first expansion module 290A and/or its host processing module 124 loses some processing power, the first expansion module 290A and/or its host processing module 124 may be able to off-load some critical function to second expansion module 290B and/or its host processing module 124.

5 In step 701, the method continuously checks if a next processing module, expansion module, and/or external computational device(s) 1532 (in wireless communication with the network controller 1528 via the gateway/firewall 1512) is available with excess processing power. If a next processing module, expansion module, and/or external computational device(s) 1532 is not available, the method will check at some time interval later to see if a  
10 new processing module, expansion module, and/or external computational device(s) 1532 would have a change in a number of available and/or unavailable processing power units and/or bandwidth. Other stimuli for this step 701 include a user request to initiate execution of an application, notification of a processing resource having unused bandwidth below a selected threshold, notification of a processing resource having used bandwidth above a  
15 selected threshold, a power level of a processing resource falling below a selected threshold, notification of a processing resource having an operational error, malfunction, or outage, and the like.

If a next processing module, expansion module, and/or external computational device(s) 1532 is available, the method confirms with the next processing module, expansion  
20 module, and/or external computational device(s) 1532 on its available processing power units and/or bandwidth for a task 710. Other factors considered in determining whether a selected processing module, expansion module, and/or external computational device is available include not only the processing resources available but also the application and operating system requirements as compared to the capabilities of the selected processing module,  
25 expansion module, and/or external computational device and power level in the selected processing module, expansion module, and/or external computational device.

In one configuration, processing module, expansion module, and/or external computational device(s) 1532 may be distinguished depending on the type of processing needed. For example, a critical function might not be suitable for a processing module that  
30 deals only with non-critical functions and vice versa due to safety, security, or other concerns. In other configurations, a critical function might look for a processing module that

is tasked with a disproportionally high non-critical function load to balance the processing load.

If the selected processing module, expansion module, and/or external computational device(s) 1532 is available to process a given task, function or operation 710, the task is off-  
5 loaded to the selected processing module, expansion module, and/or external computational device(s) 1532.

If the selected processing module, expansion module, and/or external computational device(s) 1532 is not available to process a given task, function or operation 710, the procedure continues to check if any other processing module, expansion module, and/or  
10 external computational device(s) 1532 is available 702. If there is a different processing module, expansion module, and/or external computational device(s) 1532 available, the method returns to step 701.

If there is no other processing module, expansion module, and/or external computational device(s) 1532 available, the method informs the active processing module, expansion module, and/or external computational device(s) 1532 of no available offload  
15 capacity 730. In one configuration, the active processing module may decide to drop the task that it is unable to handle. The active processing module, expansion module, and/or external computational device(s) 1532 may also decide to return to step 701 to continue to check for a next available processing module, expansion module, and/or external computational  
20 device(s) 1532.

A further set of operations for the computational module selector 2052 will now be discussed with reference to Fig. 23. This set of operations identifies, for a selected computational module, such as an expansion module, software application, or other computational module, which processing modules or external computational device(s) 1532  
25 contain the selected computational module for purposes of computational module selection. While the prior flow chart depicts a method to balance processing load amongst plural processing devices, the present flow chart selects which duplicative computational module should perform a request by a user.

In step 2300, the computational module selector 2052 detects a stimulus. Exemplary  
30 stimuli include a user or operator request to initiate a computational module and/or perform a selected task, function, or operation, an interrupt based on a passage of a predetermined time,

installation of a computational module, a request by a different user to use a platform currently executing the computational module, notification of a processing resource having unused bandwidth below a selected threshold, notification of a processing resource having used bandwidth above a selected threshold, a power level of a processing resource falling  
5 below a selected threshold, notification of a processing resource having an operational error, malfunction, or outage, and the like.

In step 2304, the computational module selector 2052, in step 2308, determines duplicated computational modules and the host processing platform(s) therefore. Host processing platforms can include a processing module, expansion module, and/or external  
10 computational device(s) 1532. Duplication may be for a specific computational device (e.g., from a common vendor and commonly named) or for a common type of computational device. For example, duplication may be determined for the differing versions of automotive navigation system applications GPS Drive™ by MotionX™, Garmin GPS™, Magellan GPS™, Tomtom GPS™, and other SPS systems or for all navigation applications generally  
15 regardless of vendor, application identity, or version.

In step 2312, the computational module selector 2052 selects a computational module and platform to execute each duplicated computational module. For example, if an occupant requests, by an input/output system of the vehicle, a game or multimedia application and if different versions of the game or multimedia application are on a processing module 124 and  
20 external computational device(s) 1532, the computational module selector 2052 can select the most recent version of the game or multimedia application and host platform containing same, regardless of whether the host platform is a processing module or external computational device 1532 currently in communication with a processing module and by what device, whether an input/output system or user interface of the external computational  
25 device 1532 receiving the request. If the request were to be received by an input/output system 1600 to initiate a game and the most recent version of the game were located on a processing module, the processing module would be selected to execute the game and output would be provided to an occupant by the corresponding input/output system 1600. If the request were to be received by an input/output system 1600 to initiate a game and the most  
30 recent version of the game were located on an external computational device 1532, the external computational device 1532 would be selected to execute the game and output would



be provided to processing module for presentation to an occupant by the occupant's input/output system 1600. If the request were to be received by an external computational device 1532 to initiate a game and the most recent version of the game were located on a processing module, the processing module would be selected to execute the game and output would be provided to an occupant by the external computational device 1532. If the request were to be received by external computational device 1532 to initiate a game and the most recent version of the game were located on the external computational device 1532, the external computational device 1532 would be selected to execute the game and output would be provided to processing module for presentation to an occupant by the external computational device 1532.

In decision diamond 2316, the processing module, or external computational device 1532, by the user interface receiving the stimulus, whether an input/output system or the user interface of the external computational device 1532, queries the user whether or not the older versions of the computational module should be updated to the newer locally available or newest remotely available version.

If no or a negative response is received, the computational module selector 2352 proceeds to decision diamond 2324.

If a positive response is received, the computational module selector 2052, in step 2320, requests the host platform to upgrade the computational module.

In decision diamond 2324, the computational module selector 2052 determines whether the selected platform is currently available to execute the computational module. The selected platform may currently be executing other computational modules and have insufficient available processing resources for execution. The computational module selector 2052, in that event, would attempt to off load some of the processing to another platform to free up sufficient processing resources for execution. In other words, the computational module selector 2052 would perform processing load balancing to more optimally use processing resources. A user may currently be using the selected platform, such as engaged in a call if the selected platform is a cellular phone or watching multimedia content. The computational module selector 2052 would determine if the platform can request the user for permission to use the platform for processing the computational module. When the user is on

a call, such a request cannot be made. If a request can be made, the user is requested. The platform is only deemed to be available when the user provides input indicating availability.

When the platform is not available, the computational module selector 2052 in step 2328 selects a next available platform even though the platform may contain an older version of the computational module.

When the selected module is currently available or when the computational module selector 2052 selects a different platform in step 2328, the computational module selector in step 2328, initiates execution, by the selected platform, of the computational module.

#### Operation of Network Controller 1528

Fig. 24 depicts another operation of the network controller 1528. As noted, security for cyber attacks is important for an Internet-enabled vehicle. Drivers are accessing data from Internet service providers via smart phone, tablet computer, and/or on board or embedded technologies as well as utilizing hands-free communication technology to send and receive phone calls and text messages. Automotive manufacturers are sending and receiving data based on electronic sensor readings and event data recording. Due to the potentially dire consequences of a security breach event on on-board processing module operation, rigorous security measures should be deployed. While the vehicular network can employ passive techniques, such as configuration of access restrictions in access points (such as encryption, checks on MAC addresses, disabling ESSID broadcasting, isolation of the vehicular network by the firewall and gateway, hiding the SSID (Service Set Identifier), MAC ID filtering (allowing access from known, pre-approved MAC addresses, static IP addressing, IEEE 802.11, 802.11i, and/or 802.1x security, use of the wired equivalent privacy encryption, TKIP, EAP, LEAP, PEAP, WPAv 1, and/or WPAv2 protocols, end-to-end encryption (in one or more of 2, 3, and/or application layer), and RF shielding substantially surrounding the interior of the vehicle (to attenuate signals and prevent wireless signals from propagating outside the vehicle), active techniques may also be employed. Communications with external computational devices 1532 can be channeled through the gateway/firewall 1512.

One active technique is depicted in Fig. 24.

In step 2400, the network controller 1528 detects a stimulus, such as an instance of a virus, malware, unauthorized access, misuse, modification, denial-of-service attack,

spoofing, man-in-the-middle attack, ARP poisoning, smurf attack, buffer overflow, heap overflow, format string attack, SQL injection, identity theft (or MAC spoofing), network injection, caffe latte attack, or denial of a computer network and/or network-accessible resource. The stimulus may be a warning signal received by the network controller 1528  
5 from the gateway/firewall 1512, a honeypot (which is a decoy network-assistant resource to provide network surveillance and early-warning tool, a network node, mapping a template corresponding to a specific attack type to received signals, a network probe, and the like.

In step 2404, the network controller 1528 attempts to confirm the instance of potential security breach event. This can be done by reviewing historical behavior, such as shown by  
10 communication logs (containing signal description (e.g., type, source, destination, protocol, and payload type) and signal receipt timestamps) not only for the current node but also for other nodes and comparing the behavior to templates characteristic of differing types of attacks and/or applying rules to the historical behavior. The security breach event details, signal description (e.g., type, source, destination, protocol, and payload type) and signal  
15 receipt timestamps), are recorded in memory 220 and firewall settings, including whitelists and blacklists, are updated.

In decision diamond 2408, the network controller 1528 determines whether or not the computational devices impacted or potentially impacted by the security breach event can be isolated from other vehicular network components or whether the active processing module  
20 can be isolated from other non-critical computational components. This can depend, for example, on whether the affected computational component is physically and/or logically within or internal and/or external to a Dimilitarized Zone (“DMZ”) or perimeter network. As will be appreciated, a DMZ is a physical or logical subnetwork, within the vehicular wireless network, that contains and exposes the network's external-facing services to a larger  
25 untrusted network, usually the Internet. The purpose of a DMZ is to add an additional layer of security to the vehicular wireless network; that is, an external attacker only has access to equipment in the DMZ, rather than any other part of the network. The DMZ typically includes services, such as Web servers, mail servers, FTP servers, and voice mail servers. For an external computational device 1532 (outside the DMZ), such as a tablet computer,  
30 smart phone, laptop computer, personal digital assistant, and the like, and/or device within the DMZ isolation is possible simply by denying vehicular wireless network access or access,

by a component of the vehicular wireless network, to the external computational device 1532. For components in the vehicular wireless network, communications to and from the affected components, which normally do not pass through the gateway/firewall, can be redirected through and filtered by the gateway/firewall or, depending on the criticality of the affected component(s), such communications can be blocked. For the active processing module 124, non-critical communications to and from other non-critical computational components, which normally do not pass through the gateway/firewall, can be redirected through and filtered by the gateway/firewall before being provided to the active processing module or, depending on the criticality of the communication(s), such communications can be blocked. Critical communications, or communications with critical components, typically cannot be delayed by firewall processing. In one variation, a critical communication security mechanism is activated for the components physically and/or logically within the vehicular wireless network and internal to the DMZ when a security breach event is detected. The security mechanism can include, for example, one or more of encrypting access restrictions in critical components and the active processing module (such as encryption, checks on MAC addresses, disabling ESSID broadcasting, hiding the SSID (Service Set Identifier), MAC ID filtering (allowing access from known pre-approved MAC addresses, static IP addressing, IEEE 802.11, 802.11i, and/or 802.1x security, use of wired equivalent privacy encryption, TKIP, EAP, LEAP, PEAP, WPAv 1, and/or WPAv2 protocols, and end-to-end encryption (in one or more of 2, 3, and/or application layer(s))).

When isolation is possible, the network controller 1528, in step 2412, isolates the affected computational device(s) from further communications with or filters communications with the active processing module 124 or the active processing module from further communications with the affected computational component(s) and alerts the user and/or a remote node 1500 of the security breach event and details regarding it.

When isolation is not possible, the network controller 1528 alerts the user and/or a remote node 1500 of the security breach event and details regarding it. The critical security mechanism may be activated to protect the critical components and active processing module.

### Operation of Network Selector 2036

The operation of the network selector 2036, a subcomponent of the network controller 1528, will now be discussed with reference to Figs. 8 and 10-11.

Referring to Fig. 8, an active processing module 124, in step 800, receives a signal to transmit to a separate vehicle component. The signal can be, for example, from any on board computational component, including an on board sensor 1516 (including those discussed above), a critical or non-critical system controller 2012 or 2016, an on board sensor monitor 2020, the displayed object movement module 2024, the diagnostic module 2028, the media filter 2032, the remote control module 2040, the installation supervisor 2044, the multimedia control module 2048, the computational module selector 2052, the media controller 1524, the gateway/firewall 1512, another processing module 124, the transceiver 1508, an input/output system 1520, a network controller 1528, and/or an external computational device 1532.

The network selector 2036, in step 804, selects a network compatible with the type and/or required format of the signal, such as one or more of local wired network 808, local wireless network 812, and/or the internet 816, to deliver the signal to a selected local or remote endpoint, including those set forth in the prior paragraph. The selection is based on one or more factors, including a type, urgency, importance and/or requirements of the signal (e.g., whether the signal contains an urgent flag or other urgency indicator, a source of the signal (such as from an on-board sensor or sensor monitor, a critical component, a non-critical component, and the like), a type of signal payload (such as whether the signal contains multimedia), transmission and/or bandwidth requirements for the signal (e.g., requisite maximum latency, packet loss, jitter, and/or transmission rate, transport protocol, quality of service, and the like)), an operational status (e.g., operational or nonoperational) of each of the compatible networks, an operational status of an intermediate node on the compatible networks, a signal/noise ratio over each of the compatible networks, available and/or unavailable bandwidth for each of the compatible networks, current compatible network performance parameters (e.g., packet drop, latency, jitter, throughput, quality of service, availability, bandwidth utilization, error rate, delay, and the like), and other factors influencing signal quality, reliability, and/or transmission speed.

Network and node performance parameters and characteristics can be collected by any number of techniques. One technique uses the Simple Network Management Protocol

(SNMP), which is a protocol for sending and transmitting network performance information. Network performance monitoring tools vary from simple one device applications to a complex hierarchical system. These systems employ a variety of monitoring techniques. Some systems use passive monitoring to gather information about network traffic while  
5 others actively poll network devices to gather network performance data. Exemplary network performance monitoring tools include packet sniffers, flow monitors, and application monitors. Flow monitoring aggregates network traffic based on individual connections, users, protocols, or applications. The network selector can obtain information regarding network and node performance by accessing a node's management information  
10 base (MIB). A MIB is a database used to store management information in networks. MIBs are used by network management systems to identify network data objects that are stored, retrieved and set by the system. A MIB uses a hierarchical tree structure to store an extensible collection of data. A subset of Abstract Syntax Notation One (ASN.1) is used to specify an object. The network selector can be configured as a network management system,  
15 which includes a centralized network management station and management agents running on network devices. Using a management protocol, the management station polls agents distributed throughout the network, such as in network nodes, for information about the network devices. Agents return requested information ranging from bandwidth usage to CPU load. Using this information, the network management system provides performance  
20 and error reporting information.

Generally, the network selector 2036 determines the type, urgency, importance and/or requirements of the signal and one or more of the above parameters for each of the compatible networks, compares the signal parameters with the compatible network parameters and selects the compatible network able to currently best satisfy the requisite  
25 signal parameters. For example, a signal from a critical component generally is transmitted by a local wired network 808, such as a bus, due to the high signal quality, reliability and/or transmission speed required for the signal. A multimedia signal would generally not be transmitted by a local wired network as it is not commonly incompatible with the signal payload. Such a signal would more typically be transmitted by a local wireless network 812  
30 (e.g., by Bluetooth™ or WiFi™ or a “hot spot”) or, if the signal recipient (whether or not an on board component or remote node) has a corresponding IP address, by the internet 816.

In one configuration, the network selector 2036 determines, for each of the plural communication networks, a corresponding one or more of a network status, a node status, a signal/noise ratio, an available and/or unavailable bandwidth, a current performance parameter(s), and a quality of service and selects the selected network based on one or more relative values associated with the corresponding value(s). The network selector can, for example, determine a composite value for each of the plural networks. The composite value is based on one or more of the corresponding one or more of a network status, a node status, a signal/noise ratio, an available and/or unavailable bandwidth, a current performance parameter(s), and a quality of service. The composite value computational algorithm can weight (or hierarchically rank) some of the individual values of network status, node status, signal/noise ratio, available and/or unavailable bandwidth, current performance parameter(s), and quality of service more or higher than others. The composite is used, rather than multiple values, in selecting the selected network.

By way of example, a signal relating to a critical task, function, and/or operation is deemed to have a higher level of importance than a signal relating to a non-critical task, function, and/or operation. The former signal may be transmitted by a low error-rate and low latency network, such as a bus-type network, while the latter signal may be transmitted over a wireless network or even the Internet.

Once the compatible network is selected for signal transmission, the network selector 2036, in step 820, configures or causes to be configured the signal in accordance with the selected network's transmission protocol. For example, when the signal is to be transmitted over a local wireless network 812, the signal payload and/or signal itself would generally be packaged (such as by a protocol stack) in a header and trailer in accordance with an appropriate one of the WiFi™ or Bluetooth™ protocols. By way of further example, when the signal is to be transmitted over the Internet 816, the signal payload and/or signal itself would generally be packaged (such as by a protocol stack) in a header and trailer in accordance with TCP/IP suite of protocols.

The properly configured or formatted signal is then transmitted over the selected compatible network.

A further operation of the network selector 2036 will now be discussed with reference to Fig. 10. In this operation, the network selector 2036 receives a media stream from a

remote node 1500, such as a radio or television station or other Web site, and selects an intermediate local network to carry the media stream to an input/output system for presentation to an occupant of the vehicle.

5 In step 1000, a processing module 124 receives the media stream from the remote node 1500. The media stream packets contain destination information associating the media stream with one or more input/output systems of the vehicle.

10 In step 1004, the network selector 2036 determines the transmission mode and/or network based on various parameters, including network status, intermediate node status, signal/noise ratio of the network, type and/or source of media, available and/or unavailable bandwidth, network performance parameters (e.g., availability, packet drop, latency, jitter, throughput, etc.), quality of service, and the like. The network selector 2036 selects which of the local on board wireless network 812 (e.g., generated by a on board or portable component within the vehicle), local wired network 808, and nearby independent wireless network 1008 (e.g., generated by a component external to the vehicle) is to carry the media to the  
15 destination input/output system(s) of the vehicle.

In step 1012, the media is provided, over the selected network, to the destination input/output system(s).

#### Operation of Media Controller 1524

20 A further operation of the network selector 2036 and operations of the media controller 1524 will now be discussed with reference to Fig. 11. In this operation, the network selector 2036 receives a signal, which typically includes a media payload, from a local or remote node and selects an intermediate local compatible network to carry the media stream to an input/output system for presentation to an occupant of the vehicle. Depending on an input/output system mode, the signal is directed by the media controller 1524 only to a  
25 subset or to all of the input/output systems. In a dependent mode, common content is provided synchronously to each of the input/output systems while in an independent mode different content is provided to different ones of the input/output systems. While each occupant controls his or her input/output system in independent mode, the operator controls all input/output systems in the dependent mode. This is particularly beneficial for young  
30 children as occupants. The operator typically selects which of the modes is in effect in the vehicle at any one time.



In step 1100, the processing module 124 receives a signal for graphical presentation to one or more occupants. The signal typically comprises media as a payload.

5 In step 1104, the network selector 2036 determines the transmission mode and/or compatible network based on various parameters, including network status, intermediate node status, signal/noise ratio of the network, type and/or source of media, available and/or unavailable bandwidth, network performance parameters (e.g., availability, packet drop, latency, jitter, throughput, etc.), quality of service, and the like. The network selector 2036 selects which of the local on board wireless network 812 (e.g., generated by a on board or portable component within the vehicle), local wired network 808, and Internet 818 is to carry  
10 the media to the destination input/output system(s) of the vehicle.

In step 1108, the media controller 1524 determines which of the input/output systems are to receive the media. There are a number of factors that can influence this decision. The first is whether the input/output systems are in dependent or independent mode. The second is whether an applicable law, whether federal, state, provincial, or local, limits the operation  
15 of one or more of the input/output systems. The satellite positioning system receiver on board the vehicle can provide, at any time, the precise vehicle position to a processing module. The processing module can use the position coordinates to determine a set of applicable laws and, from the set of applicable laws, determine one or more restrictions on input/output systems of vehicles within that jurisdiction. Restrictions may also be configured  
20 by the operator of the vehicle. These legal and operator restrictions are collectively referred to as rule set(s) 1612. For example, exemplary restrictions, or rule sets 1612, include not providing videos to the operator when the vehicle is in gear or moving, banning texting in the vehicle when the vehicle is in gear or moving, and banning cellular calls when the vehicle is in gear or moving. Restrictions may, alternatively, require the media to be presented to the  
25 operator and/or occupant in a specific manner. For example, the audio channel of a video may be permitted to be played in the absence of the video channel of the video. A cellular call may be permitted using a hands-free mode but not using a handheld phone.

In step 1112, the media controller 1524 configures and transmits the signal in accordance with the selected network and the restrictions, if any, determined in step 1108.  
30 Configuration refers not only to formatting and including the addresses of the input/output

systems to receive the signal but also to changing the media payload, such as, for instance, removing video content while leaving audio content.

Upon receipt, the signal is processed by the display and/or audio controllers 1604 and 1608 and presented, by the recipient input/output system and over the corresponding

5 input/output system to the occupant.

Fig. 17 depicts another operation of the media controller 1524.

In step 1700, the media controller 1524 detects a stimulus, such as an occupant request to change the operational mode of an input/output system.

10 In step 1704, the media controller 1524 determines a current operational mode of the input/output system associated with each of the occupants (e.g., independent or dependent operation) and whether the occupant has authority or is privileged to request the change. The mode is changed only when the occupant is authorized or privileged to make the change.

15 In step 1708, the media controller 1524 determines when the requestor is authorized or privileged to request the operational mode change, the input/output system preferences of each of the occupant user(s) including the requestor.

In step 1712, the media controller 1524 determines when the requestor is authorized or privileged to request the operational mode change, the pertinent rule set(s) 1612. As noted, the rule set(s) 1612 include rules set by the owner or operator of the vehicle, manufacturer of the vehicle, and as a matter of applicable law.

20 In step 1716, the media controller 1524 determines, when the requestor is authorized or privileged to request the operational mode change, a current state of each of the input/output system(s). The current state includes not only the on/off status and settings but also the content being displayed and operations currently being performed by the occupant for each of the input/output systems.

25 In step 1720, the media controller 1524 determines when the requestor is authorized or privileged to request the operational mode change, a current display configuration of each of the input/output systems.

30 In step 1724 and when the requestor is authorized or privileged to request the operational mode change, the media controller 1524 configures or reconfigures each of the input/output systems and the corresponding displays as required by the new operational mode. For example, when the current operational mode is independent and the new

operational mode is dependent, the media controller 1524 blocks content currently being provided to each of the subservient input/output displays in favor of providing to each of the subservient input/output displays the content provided to the master input/output display controlled by the requestor or to display content selected by the requestor. When the current  
5 operational mode is dependent and the new operational mode is independent, the media controller 1524 continues to provide the content formerly provided to all of the input/output systems to the requestor's input/output system but returns each of the other input/output systems to a default display. From the default display, the respective user can select customized content, which may be the same as or different from the content being provided  
10 to the requestor's input/output system.

Fig. 18 depicts another operation of the media controller 1524.

In step 1800, the media controller 1524 receives a signal from a local or remote node 1500. The signal includes, for example, media from a web site or server or communication from a third party.

15 In optional step 1804, the media controller 1524 unpacketizes the signal and analyzes the payload. This is done, for example, when the destination for the signal and/or type of payload is not clear from the packet header and/or trailer.

In step 1808, the media controller 1524 selects an input/output system to receive the packet payload. This can be based, for example, on the destination information in the header  
20 and/or results of the analysis of optional step 1804.

In step 1812, the media controller 1524 determines the applicable rule set 1612 (or set of restrictions), if any, governing the destination input/output system and/or payload type or content.

In step 1816, the media controller 1524 determines a current input/output system  
25 configuration(s). The current configuration includes not only settings and capabilities but also whether the input/output system is in the dependent or independent operational mode.

Based on the above information, the media controller 1524 determines whether the payload can be provided to each of the destination input/output systems and, if so, generates a command incorporating the payload and including commands to the input/output system on  
30 how to render and display the content. As noted, the payload cannot be provided to a subservient input/output system when in the dependent operational mode and the content

differs from that provided to the master input/output system. It cannot be provided when an applicable rule set 1612 prohibits such presentation. It may need to be filtered to remove some of the payload to comply with the applicable rule set 1612.

5 In step 1824, the command is forwarded to each of the destination input/output systems.

Fig. 19 depicts another operation of the media controller 1524.

10 In step 1900, the media controller 1524 determines a location of each external computational device 1532 by a suitable technique. In one example, a signal receiver or transceiver or other connectivity access point, such as a wireless access point, WiFi™ antenna, and the like is placed at each input/output system and/or near each occupant seating location and/or at the operator's seat. The network interface on the network controller can force external computational devices to connect via a specified communication protocol, such as by Bluetooth™ or WiFi™.

15 In step 1904, the media controller 1524 determines a spatial location of each of the external computational devices relative to one or more selected connectivity access points. Continuing the example of the prior paragraph, the media controller 1524 measures, at each connectivity access point, a signal strength for each detected external computational device and, using the measured signal strengths and a suitable algorithm such as triangulation, determines a spatial location of each external computational device and, in step 1908 for each  
20 located external computational device, a nearest input/output system and/or occupant seat.

In step 1912, the media controller 1524 determines a pertinent rule set 1612 for the determined location of each external computational device.

25 In decision diamond 1916, the media controller 1524, based on the pertinent rule set 1612, determines whether or not to accept connectivity access by each of the external computational devices or what limitations to place on such access. In the latter case, specific tasks, functions, and/or operations may be permitted by the pertinent rule set but not others. For example, a cellular phone may be forced into hands free calling mode or prevented from texting or using an instant messaging application or protocol when located at the operator's seat. The rule set 1612 may be configured as a table listing, by vehicle location, an applicable  
30 set of legal restrictions and/or permissions and the restrictions or permissions on specific tasks, functions, and/or operations.

When unlimited or limited access is permitted by the rule set 1612, such access is provided by the media controller.

5 In decision diamond 1920, the media controller 1524 monitors each of the external computational devices for a change in spatial location. In other words, the media controller detects movement of any external computational device from a first connectivity access point or input/output system or seat governed by a first rule set to a second different connectivity access point or input/output system or seat governed by a different rule set. This is so because each connectivity access point or input/output system or seat has a corresponding rule set. When no change detected, decision diamond 1920 is repeated by the media  
10 controller substantially continuously or periodically.

When limited or unlimited access is not accepted (decision diamond 1916) or a location change is detected (decision diamond 1920), the media controller returns to step 1904.

Fig. 25 depicts a further operation of the media controller 1524. Currently, a  
15 particular vehicle radio may have access to XM, AM, FM, and in some cases “streaming audio” capabilities through separate sources (remote node(s) 1500). However, it is necessary to change the input on a console to receive the information and music from a specific source.

It is an aspect of the present disclosure to provide a console capable of compiling and playing music and multimedia information (such as a streaming video) by a general and/or  
20 specific category. It is anticipated that the console may adaptively select the source providing the content according to specific rules, such as music type. For example, the console may select the strongest signal, or highest quality of channel. Furthermore the data is collected regardless of the source and represented by icons (independent of source) on the console. These icons may be selected by the user to access content. In one configuration, the  
25 icon corresponds to a type of music. The music is band and/or communication mode independent. For example, a “classical music” icon indexes and/or links to all classical music channels, whether AM, FM, streaming, XM, etc.

In some cases, a user may be listening to one station/source while media information is being received and cached from another station/source. In the event that the first signal is  
30 lost, the cached media signal or stream may play. Additionally, the system may adaptively “signal surf,” for a given category, to determine the best channel to receive the highest or

best quality signal (e.g., S/N ratio, stream or radio wave). Moreover, the system may be able to determine that a reception limit is being neared (by pilot signal back or satellite positioning system receiver location) and may push delayed broadcast media information or other content to a vehicle computer to be cached and listened to after coverage is lost.

5 In step 2500, the media controller 1524 detects a stimulus indicating that caching of media content is to be performed. This may be a request by a user, a media signal falling below a specified signal-noise ratio, the vehicle nearing an estimated broadcast limit or range of the media source (or remote node 1500), a request by a remote node 1500 (or signal source) to forward content to the vehicle for caching for later presentation to the user, a user  
10 action requiring the media not to be presented by the vehicle (e.g., the vehicle operation moves from being “parked” to being in gear (or in “drive” or “reverse”), and the like. As will be appreciated, many jurisdictions’ laws prohibit displaying media to a driver while a vehicle is in operation.

In decision diamond 2504, the media controller 1524 determines whether or not to  
15 cache media. Depending on the stimulus, rules configured by the user or default rules, may cause the stimulus to be ignored. For example, when the request is from a remote node 1500 the media controller 1524 may have a rule denying such SPAM-like requests, may determine that insufficient memory resources are available to cache the content, may determine that the media content or remote node 1500 constitutes a potential security breach event, or may have  
20 the remote node 1500 address, identity, or other identifier on a blacklist. When the media is a video, the video may be cached for one input/output system, namely that of the driver, but not for another input/output system, namely that of a passenger.

In step 2508, when caching is to be performed the media controller 1524 commences caching the streaming media for delayed presentation to the user. As will be appreciated, the  
25 media controller 1524 can continue normal buffering of streaming media packets.

In step 2512, when caching is not to be performed, the media controller 1524 can continue normal buffering of streaming media packets but does not perform media caching.

Fig. 26 depicts a further operation of the media controller 1524. The operation involves conforming media presentation, by input/output system, in a manner comply with a  
30 pertinent rule set 1612. For example, instant messages, RSS feeds, Twitter messages, can, in response to a vehicle moving from a parked (non-operational) to an operational (in motion)

state, cease displaying this content to the driver and, instead, audibly present the content and message source identifier to the driver, such as reading the source name or address and RSS feeds or Twitter or instant messages or enabling the audio channel for streaming multimedia while disabling the video channel.

5 In step 2600, the media controller 1524 detects a stimulus indicating that media presentation is to be altered for one or more input/output systems. This may be a request by a user or a change in vehicle state from operational to non-operational or from non-operational to operational (e.g., a user action requiring the media not to be presented by the vehicle (e.g., the vehicle operation moves from being “parked” or a non-operational state to  
10 being in gear (or in “drive” or “reverse” or in motion), or an operational state). As will be appreciated, many jurisdictions’ laws prohibit displaying media to a driver while a vehicle is in operation.

In decision diamond 2604, the media controller 1524 determines whether or not to alter the media presentation for a selected input/output system. When, for example, the  
15 vehicle moves from an operational to a non-operational state, the media presentation for the selected input/output system can revert automatically to a more functional format. For instance, multimedia can have all channels, both audio and video, enabled for presentation, by the selected input/output system to the user. An RSS feed or Twitter or instant message, among others, can revert to text presentation, with automated reading being disabled.

20 In step 2608, the media presentation is altered, as determined, for one or more selected input/output systems.

In step 2612, media continues to be presented, in an unchanged format, on the selected input/output system.

#### Operation of Installation Supervisor 2044

25 An operation of the installation supervisor 2044 will now be discussed with reference to Fig. 12. The operation can provide a plug-and-play functionality for automotive components, whether device, hardware and/or software.

In step 1200, the installation supervisor 2044 detects an attempt to install a new computational component in the vehicle. The attempt can be detected by receipt of an  
30 installation notification or request from a user or the computational component itself. The computational component can be software, hardware, or a combination thereof. Exemplary

computational components include an on board sensor 1516, a media controller 1524, a gateway/firewall 1512, a processing module 124, a network controller 1528, an input/output system 1520, a display and/or audio controller 1604 and/or 1608, an arbitration module 2000, a health check module 2008, a critical system controller 2012, a non-critical system  
5 controller 2016, an on board sensor monitor 2020, a displayed object movement module 2024, a diagnostic module 2028, a media filter 2032, a network selector 2036, a remote control module 2040, a computational module selector 2052, an expansion module 290, an application, a plug-in module, and the like.

10 In step 1204, the installation supervisor 2044 determines the characteristics of the computational component. Exemplary characteristics include manufacturer, model number, serial number, date of manufacturer, and capabilities.

In decision diamond 1208, the installation supervisor 2044 determines whether the component is already linked to another vehicle. This can be done by accessing the memory of the installation component itself to check for a prior installation or accessing the records of  
15 the manufacturer via remote node 1500.

When the component has not yet been linked to another vehicle, the installation supervisor 2044, in decision diamond 1212, determines whether the installation is in compliance with licensing restrictions on the use of the computational component. Licensing conditions and/or restrictions can include payment of funds to vendor, use  
20 restrictions (e.g., user-based license restrictions (e.g., authorized user, concurrent user, floating user, and user value unit restrictions), capacity-based license restrictions (e.g., install, processor value unit, server and virtual server restrictions), territorial restrictions (e.g., use permitted only in certain countries, states, provinces, and the like), and other license restrictions (e.g., client device (or host vehicle-based restrictions) and resource value unit  
25 restrictions)), and other conditions and/or restrictions.

When the component installation is in compliance with applicable license restrictions, the installation supervisor 2044, in decision diamond 1216, determines whether the computational component is eligible for use in the current vehicle. Eligibility is based not only on specifications and capabilities of the computational component but also vehicle  
30 manufacturer approval or disapproval of the computational component for vehicles having this particular make, model and year of manufacture.



When the computational component is eligible for use in the current vehicle, the installation supervisor 2044, in step 1220, creates data structures in the memories of the computational component and computational module binding the computational component to the vehicle. This can be done, for example, by creating data structures in the memory of

5 the computational component containing a serial number or vehicle identification number of the vehicle and in the memory 220 of the processing module containing a serial number or other unique identifier for the computational component and a description of the type, make, model, year of manufacture, and date of installation of the computational component.

When any of the following is true, namely the computational component is already

10 linked to another vehicle (decision diamond 1208), the license does not permit the installation of the computational component (decision diamond 1212), and/or the component is ineligible for use with the current vehicle (decision diamond 1216), the installation supervisor 2044, in step 1224, ignores the computational component, and therefore refuses installation of same, logs the attempted installation (including a description of the

15 computational component and time stamp associated with the attempted installation) and/or notifies a remote node 1500 (such as a manufacturer for purposes of warranty invalidation) and/or the operator of the invalid attempt.

#### Operation of Media Filter 2032

An operation of the media filter 2032 will be discussed with reference to Fig. 13.

20 In step 1300, a processing module 124 receives a signal from a third party source, such as a web site or server (in response to web browsing) or a communication from a third party, such as email, text, cellular call, and the like, for presentation to an occupant.

In step 1304, the media filter 2032 determines preferences of the occupant and/or other restrictions. Preferences include, for example, a white or black list (of approved or

25 disapproved message sources respectively), presence of the destination occupant as received from a presence server or service associated with the destination occupant, preferences of or rules relating to the destination occupant as determined by another occupant having privileges to control content presented to the destination occupant (e.g., parental control of content and/or communications presented to a child), context of the destination occupant

30 (e.g., driving the vehicle, engaging in an unrelated higher priority activity on the input/output system associated therewith, etc.), and governing laws (or an applicable rule set 1612).

In decision diamond 1308, the media filter 2032 determines, based on the determined preferences and/or restrictions from step 1304, whether or not to block the signal or alter the payload of the signal to conform with the preferences and/or restrictions.

5 When the signal is not to be blocked, the media filter 2032 proceeds to step 1312 and presents the signal or its payload to the destination occupant. The signal may be blocked, for example, when it is a call to an operator while the vehicle is in motion (to comply with a state or local law). Electronic SPAM may be blocked.

10 When the signal is to be blocked, the media filter 2032 proceeds to step 1316 and blocks the signal. The signal may be blocked, for example, when it is a call to an operator while the vehicle is in motion (to comply with a state or local law). Electronic SPAM may be blocked.

#### Operation of Diagnostic Module 2028

15 The diagnostic module 2028 queries on board sensors 1516 and/or on board sensor monitor(s) 2020, and/or critical and/or non-critical system controller(s) 2012 and 2016 to determine states of various parts, components, subsystems, tasks, functions, and/or operations of the vehicle. The diagnostic module 2028 can then perform diagnostics using locally stored or remotely stored (at remote node 1500) pre-determined logic to identify faults, malfunctions, or other problems and, optionally, generate repair advice and/or warnings and/or instructions and/or recommendations to the vehicle operator. This diagnosis  
20 can also locate and/or determine and/or identify any parts or components required to repair the vehicle, the source and/or source(s) for replacement parts and/or components, identify a nearest and/or preferred service or repair facility or service, provide an estimate of the repair cost at a selected facility and/or comparative estimates at different facilities in proximity to the vehicle's current location, and/or obtain any manufacturer's and/or vendor's update  
25 information required to repair or resolve the identified fault, malfunction, or other problem. The diagnostic module 2028 can provide any repair instructions and/or recommendations to the operator, pre-order the replacement parts and/or components, contact the nearest and/or preferred service facility for a repair estimate, contact the nearest and/or preferred service facility to schedule an appointment for the repair or service, and/or forward, optionally at the  
30 owner's and/or operator's instructions, the collected information regarding the fault, malfunction, or other problem to a remote node 1500 (specified by the operator and/or

owner) for monitoring and/or evaluation. The owner and/or operator can have a default location or select a location for fault, malfunction, or other problem analysis assistance.

Fig. 14 depicts an operation of the diagnostic module 2028.

5 In step 1400, the diagnostic module 2028 receives, from a local or remote source (such as the remote node 1500), a signal warning of an actual or potential malfunction of an on board component, including any of the components discussed above.

10 In step 1404, the diagnostic module 2028, in step 1404, determines user and/or default preferences regarding treatment of the signal. The various options include one or more of present the signal to a third party such as a manufacturer or servicing entity (option 1408), presenting the signal to an occupant of the vehicle (option 1412), contacting an emergency service provider or first responder (e.g., request tow truck or roadside service provider, contact police, and/or request dispatch of an ambulance), a service facility located in proximity to a current vehicle location, a manufacturer, a replacement part source, and a remotely located diagnostic service to diagnose a cause of the warning and/or error signal  
15 and performing on board diagnostics (option 1416) to obtain more diagnostic information regarding the actual or potential malfunction followed by option 1408 or 1412. In one application, the signal is forwarded to a manufacturer or repair service vendor that compares the reported fault and vehicle-specific parameters (e.g., mileage, date of last service, and/or environmental conditions) to the maintenance and/or fault history for the vehicle model and  
20 provides, to the vehicle operator, the result of the comparison along with a probability of the diagnosis being correct. The signal can include, for example, a current (SPS or map) location of the vehicle, an identity of the vehicle and/or vehicle owner or occupant, and diagnostic information and/or diagnosed cause of the warning signal. The manufacturer or service vendor also updates its database for the particular model of the vehicle to reflect the reported  
25 fault. The manufacturer or service vendor can dispatch an emergency service provider or first responder to the location reported by the vehicle SPS, and/or schedules the workload for the repair shop and pre-orders the required part(s) for the repair shop. The diagnostic module can recommend a source of conduct or action (including those discussed above) for the vehicle operator and, if accepted, execute or cause execution of same.

In step 1420, the diagnostic module 2028 determines a further treatment of the warning or error signal. The determination may be based, for instance, on a command or request received from the third party or occupant or an applicable set of rules and/or policies.

Fig. 28 depicts another operation of the diagnostic module 2028.

5         Fig. 28 depicts a vehicle ecosystem capable of providing accurate indications for purposes of service and maintenance in accordance with embodiments of the present disclosure. Currently, vehicles may offer a warning light and/or series of lights to provide information to a user regarding vehicle condition. These lights may have a multitude of meanings that may require further inspection by a mechanic or other qualified individual. In  
10         order to interpret and decode the meanings behind a light combination, the user is routinely required to consult the owner's manual, the Internet, or to call the dealer. In some cases, these lights are only maintenance reminders and need not be immediately addressed. However, in other cases, the lights are urgent and require immediate attention.

       The present disclosure can provide an Internet enabled car that is capable of  
15         transmitting vehicle codes, error code readings, and to remotely diagnose and display these codes to a user and/or a mechanic. This diagnostic information may be performed on-board or remotely. It is anticipated that the information may be accessed according to chosen preferences. Additionally, it is anticipated that based on the type of warning/error code, the system may suggest a recommended course of action. For example, if the error code  
20         indicates a severe or catastrophic failure the system may suggest to pull-over, stop the car, and proceed to a safe area away from the automobile.

       In some embodiments, the system may provide "conversational" warnings to a user. These warnings and associated codes may also be simultaneously transmitted to a selected garage and/or postponed for approval to transmit to the nearest garage (either wired or  
25         wirelessly). In addition, the system may estimate an approximate time to fix (based on past garage fix times, garage inventory, severity of problem, combinations, etc.) and make appropriate suggestions. For example, the system may provide the conversational warning "Please do not be alarmed, your engine is running slightly low on oil; there are four garages in the general area. You have time to get a cup of coffee while you wait; here are three  
30         coffee shops in the immediate location" and/or "It appears that the rear left suspension is malfunctioning and the upper strut will need to be replaced. It is noticed that you are greater

than 80 miles from home, would you like to book a reservation at a local hotel? There are five hotels in the area rated three stars or above.”

Referring to Fig. 28, the diagnostic module 2028, in step 2800, receives and interprets a maintenance and/or system error and/or warning code. Such codes are known in the art of automotive design and generally depend on the automotive and/or component manufacturer. Accordingly, the diagnostic module 2028 will, generally, have a lookup table or other set of data structures to map the code not only to a corresponding condition and/or conversational meaning but also behavioral rule in a rule set. In appropriate applications, the conversational meaning can be further determined based on the condition.

The diagnostic module 2028, in step 2808, provides the conversational meaning, such as audibly and/or visually, to the vehicle operator.

The diagnostic module 2028, in step 2812, determines other factors related to the received code(s). The pertinent rule in the rule set, for example, can cause the diagnostic to query other components potentially impacted by the condition and/or having other data points relevant to the condition. The diagnostic module 2028, in accordance with the pertinent rule, may contact a remote node for additional information relevant to the code, including the conversational advice to be provided to the vehicle operator.

In step 2816, the diagnostic module 2028 provides the conversational advice to the operator. The advice may be interactive in which event the operator would query the diagnostic module 2028 for information not clear from the initially provided conversation meaning and/or advice. A menu-type structure can be used by the diagnostic module to respond to the operator request for further information. Such further information may require the diagnostic module to initiate a contact, on behalf of the operator, with a remote node 1500.

In step 2820, the diagnostic module logs codes, internally and/or provides the codes to a remote node 1500 for logging, and provides for transfer of the operator to a selected entity or entities, such as one or more remote nodes 1500.

In step 2824, the diagnostic module 2028 optionally transfers the codes, on a predetermined stimulus, to a remote node 1500.

### Operation of Displayed Object Movement Module 2024

An operation of the displayed object movement module 2024 will now be discussed with reference to Figs. 21 and 22. The displayed object movement module 2024 enables a user to share displayed content or other image, in substantial real time and not via a message transmitted by a component located physically outside of the vehicle, with one or more other input/output systems. Typically, the displayed content is simply directed by the media controller to the target display (and/or a computational device associated with the target occupant as discussed in more detail below). The displayed object can be any displayed image, including streaming video, a web page, an icon, a window, an application, other content, and the like.

In step 2100, the displayed object movement module 2024 detects a stimulus. The stimulus can be, for example, receipt of a gesture by a touchscreen display of an input/output system, user selection on a first input/output system of a different second input/output system to which the displayed object is to be moved, and the like.

In step 2104, the displayed object movement module 2024 determines, based on the stimulus, to which input/output system display to move the displayed object.

Fig. 22A depicts one technique to determine the destination input/output system(s). Each of the dashed lines 2208a-connecting to the displayed object 2204 in the display 2200 indicates a direction, or vector, along which the displayed object 2204 is to be moved. The displayed object movement module 2024 projects the direction to determine an input/output display intersected by or nearest the projection of the vector. By way of illustration, the first gesture 2208a (if received by an input/output system in a back seat) will cause the displayed object 2204 to move to the driver's input/output system (which corresponds to position "1"), the second gesture 2208b (if received by an input/output system in a back seat) will cause the displayed object 2204 to move to the input/output system positioned in the middle front seating position (which corresponds to position "2"), the third gesture 2208c (if received by an input/output system in a back seat) will cause the displayed object 2204 to move to the input/output system positioned in the right (facing the front of the vehicle) front seating position (which corresponds to position "3"), the fourth gesture 2208d (if received by an input/output system in either a front or back seat) will cause the displayed object 2204 to move to the left adjacent input/output system (relative to the gesture receiving input/output

system) (which corresponds to position “4”), the fifth gesture 2208e (if received by an input/output system in either a front or back seat) will cause the displayed object 2204 to move to the right adjacent input/output system (relative to the gesture receiving input/output system) (which corresponds to position “5”), the sixth gesture 2208f (if received by an

5 input/output system in a front seat) will cause the displayed object 2204 to move to the input/output system positioned in the left rear seating position (which corresponds to position “6”), the seventh gesture 2208g (if received by an input/output system in a front seat) will cause the displayed object 2204 to move to the input/output system positioned in the middle rear seating position (which corresponds to position “7”), and finally the eighth gesture

10 2208h (if received by an input/output system in a front seat) will cause the displayed object 2204 to move to the input/output system positioned in the right rear seating position (which corresponds to position “8”).

Fig. 22B depicts one technique to determine the destination input/output system(s). The display 2200 of the user’s input/output system displays a seating diagram of the vehicle.

15 The first seat icon 2212a corresponds to the driver’s seating position, the second seat icon 2212b to the middle front seating position (if present), the third seat icon 2212c to the right front seating position, the fourth seat icon 2212d to the left rear seating position, the fifth seat icon 2212e to the middle rear seating position (if present), and the sixth seat icon 2212f to the right rear seating position. This display would typically be selected from the display

20 containing the displayed object to be moved and would be selected before or after selection of the displayed object for movement. Unlike the prior technique, which generally requires the displayed object to be moved to multiple input/output systems sequentially or entry of multiple gestures, which can be laborious, the seating diagram enables the displayed object to be moved substantially simultaneously to multiple input/output systems. Specifically,

25 selection of a seating position selects the input/output system servicing the seating position. Multiple seating positions can be selected from the display 2200, which, when a movement command is received, causes the displayed object to be moved to each of the input/output system(s) servicing the seating position(s) selected.

Other modalities for sharing the displayed object or content are possible. The

30 displayed object movement module 2024 can provide the user seeking to share content with a list of the sensed identities of the various vehicle occupants. The user can simply select the

occupants, by his or her corresponding unique identifier, to receive the shared content. When selected, the vehicle processing module would have a corresponding seating position and display for each named occupant. The content is, upon receipt of a “share” or “send” command then shared with each selected occupant’s respective delay. The identity can be

5 name, nickname, contact address (such as email address or instant message handle), and the like. The identity of each occupant can be sensed by any suitable technique, including parameters, such as weight, received by a seating sensor of the occupant’s seat, seat or other settings selected by the occupant and received by a processing module, a computational device, such as a cell phone, laptop, tablet computer, e-reader, personal digital assistant, and

10 the like carried by the occupant (such information would be exchanged, such as by a handshake, by the vehicle’s processing module and the computational device), direct input from the occupant or user, sensed biometric information, and the like.

Returning to Fig. 21, the displayed object movement module 2024 moves the displayed object selected for movement to the display of each of the selected input/output

15 systems and alters the current display of each of the selected input/output systems to include the moved displayed object. Alteration of the display can depend on the content currently being viewed at each of the targeted displays. For example, if a target display is displaying streaming video, the moved displayed object could be minimized, giving the user the option of opening the displayed object and interrupting the video display. If a target display is

20 inactive for a specified time period and therefore in “sleep” or “power down” mode, the moved displayed object could be maximized and the display awakened from a “sleep” or “power down” mode to display the maximized displayed object. The format and other display parameters of the shared content or displayed object can also be based on default or preferences of the sharing user or selected recipient (or target occupant) or a further

25 command received from the sharing user or target occupant.

In decision diamond 2112, the displayed object movement module 2024 determines whether to continue display of the displayed object on the source display which received the movement command for the displayed object. The determination can be based on default or preferences of the sharing user or target occupant or a further command received from the the

30 sharing user or target occupant. When the source display is to be altered, the displayed object movement module 2024, in step 2116, alters the source display to remove the



displayed object. When the source display is not to be altered, the displayed object movement module 2024, in step 2120, continues to display the displayed object.

Problems can arise when the display of the target occupant is not activated. The vehicle processing module can determine which of the displays are activated and not  
 5 activated. The vehicle processing module can cause each of the targeted displays to be activated if not already activated. Alternatively, the processing module can simply ignore any share command for those targeted displays that are not activated but perform the command for those targeted displays that are activated.

One optional operating mode of the displayed object movement module 2024 is to  
 10 share the displayed object or other selected content with a computational device such as a cell phone, laptop, tablet computer, e-reader, personal digital assistant, and the like, carried and/or associated with one or more selected occupants and currently present in the vehicle. In that event, the content can be shared with the targeted display if activated and/or with the computational device if activated. The sharing user could specify which of the display and  
 15 computational device is to be the recipient of the shared content. Alternatively, an order of priority could govern the selection. For example, the display is selected if activated and, if not activated, any activated computational device associated with the recipient and currently physically present in the vehicle would be selected as the recipient.

#### Operation of Presence Reporting Module 2056

20 A presence reporting module considers local laws, individual (or contactee) context, and other factors in determining whether an individual is present (*e.g.*, for unified communications) and, if so, by what communication modalities and/or channel(s) (*e.g.*, Voice over IP, cellular call, email, texting, tweeting, instant messaging, short message service, audio and video enabled call, and the like. Local laws, for example, may prohibit  
 25 cellular calls and/or texting and/or tweeting while the car is in motion. In that event, a permissible communication channel, such as email or paging, is reported to the presence service 1500. The context could include, for example, the contactee is in the driver's seat (as determined by an on board sensor, such as a seating sensor), and the like), the vehicle is in motion, the vehicle is parked, the contactee is absent from vehicle (as determined by an on  
 30 board sensor, such as a seating sensor, and the like), the contactee is currently using his or her corresponding input/output system and therefore is or is not available (depending on

contactee preference), a current seating position of the contactee (e.g., whether the contactee is a driver or passenger), a current geographical and/or geopolitical location of the vehicle, and so on. Other factors include, for example, the on board communication system and/or external computational device(s) 1532 are currently out of cellular phone range, the on board communication system and/or external computational device(s) 1532 are currently roaming, the wireless connection, such as over a cellular network, with the on board communication system and/or external computational device(s) is currently unacceptable (e.g., unacceptably low signal-to-noise ratio or quality or grade of service), and the like.

In one exemplary application, the presence reporting module can determine, based on the vehicle occupant context, whether the vehicle occupant is present and available for receiving an inbound communication and/or by what communication channel and/or modality to contact the vehicle occupant. The vehicle occupant context can be one or more of whether the vehicle occupant is in the driver's seat, whether the vehicle is in motion and/or in gear, whether the vehicle is parked, whether the vehicle occupant is absent from vehicle, whether the vehicle occupant is currently using his or her corresponding on board input/output system, whether an on board vehicle transceiver to receive in bound communications is contactable, whether the on board vehicle transceiver is currently roaming, and whether a quality and/or grade of service of a wireless connection with the vehicle transceiver is unacceptable.

With reference to Fig. 29, the presence reporting module 2056, in step 2900, detects a stimulus, such as a passage of time, a query by the presence service 1500, an incoming or inbound contact, a change in user context, a change in the applicable local law due to a change in location of the vehicle, a change in contactee context, or a change in another factor.

In step 2904, the presence reporting module 2056 collects the context of the contactee, such as by querying on board sensors 1516, a input/output system 1520 corresponding to a seating location of the contactee to determine a current state of the input/output system (operational or non-operational) and/or activity of the contactee (e.g., web surfing, playing media, engaged in a phone call, etc.), an external computational device 1532 associated with the contactee, and/or the transceiver 1508 and/or network controller

1528 for information regarding the available networks for a communication and/or the quality of a connection over each network.

5 In decision diamond 2908, the presence reporting module 2056 determines whether the previously reported presence information requires updating (e.g., the previously reported presence information is no longer valid due a sensed change). When no update is required, the presence reporting module 2056 returns to step 2900. When an update is required, the presence reporting module 2056 proceeds to step 2912.

In step 2912, the presence reporting module 2056 reports the update(s) (or changes to the previously reported presence information) to the presence service 1500.

10 In step 2916, the presence service 1500 receives the update(s) and updates the current presence information for the associated contactee.

#### Operation of Networking Module 2070

An operation of the networking module 2070 will now be discussed with reference to Fig. 30.

15 Networking, particularly social networking, among vehicles can add a new dimension to driving. For example, an operator can socially network with a friend driving in the next lane. Although this can be done with cell phones, it can be difficult to retrieve the number while driving let alone to dial it without increasing accident risk. Rather than fuming silently, occupants of different vehicles can conduct a social round table as they sit in  
20 gridlock. If an operator wanted to communicate with another car, he or she could address it using the license plate number. When the networking session is a social networking session, the networking participants in each of the networked vehicles can be members of a preexisting online community, e-community, and/or virtual community.

25 There are a myriad of other examples of networked vehicles. Networked vehicles, for example, can enable multiple cars to connect while on car trips to share information about how much gas is left in the fuel tanks, competing fuel economy between the cars, shared routes, and land marks and gas stations on the route ahead. Networked vehicles can record the real-time fuel economy of a vehicle and then compare that fuel economy to peers, thereby enabling the driver to see other drivers that have driven the same, or similar routes, and  
30 receive suggestions from other drivers on the best route for the best fuel economy. A ride-sharing network can encourage ad hoc carpooling and provide a rating and recommendation

system for its users. Networked vehicles can play games with one another. Since the game could have access to car metrics, games could incorporate actual car data, such as speed, fuel, *etc.* Games could simulate what would happen if an operator drove the way he or she wanted to. Kids in socially networked vehicles can play games against one another.

5           With reference to Fig. 30, the processing module of a vehicle receives a stimulus in step 3000. The stimulus can be a request by a user to initiate a network with a vehicle identified by the user providing the license plate number, receipt of a request for initiating a networking session from another vehicle, the determination that a vehicle of a socially networked contact is available to initiate a networking session, and the like.

10           In step 3004, the social networking module 2070 identifies the vehicles in wireless communication with the selected vehicle and having one or more occupants in a networking relationship with a current vehicle occupant. The networked vehicles are typically in spatial proximity to one another, with the networking messages being exchanged over a short-range wireless technology forming a personal area network such that the information is not  
15           exchanged over the Internet. The networked vehicles can be in spatial proximity to one another, the networking messages can be exchanged using a short wavelength radio transmission having a limited range, and the radio transmission can use a frequency band ranging from about 2 to about 3 GHz.

            In step 3008, the networking module 2070 determines whether or not to initiate a  
20           networking session. This can be determined by receiving user input, predetermined rules provided by the user, legal restrictions on the ability of the current or other vehicle to engage in a networking session, and the like.

            When a networking session is to be initiated, the networking module 2070, in step 3012, initiates the session.

25           In optional step 3016, the networking module 2070 collects vehicle information and provides the information to the networked vehicle. The other vehicle, in return, can provide its collected vehicle information.

            In step 3020, the networking module terminates or suspends the session when a  
30           vehicle occupant leaves one of the networked vehicles and/or at the request of a vehicle occupant.

After step 3020 or when no networking session is to be initiated (decision diamond 3008), the networking module 2070 returns to step 3000.

The exemplary systems and methods of this disclosure have been described in relation to vehicle processing modules. However, to avoid unnecessarily obscuring the present disclosure, the preceding description omits a number of known structures and devices. This omission is not to be construed as a limitation of the scopes of the claims. Specific details are set forth to provide an understanding of the present disclosure. It should however be appreciated that the present disclosure may be practiced in a variety of ways beyond the specific detail set forth herein.

Furthermore, while the exemplary aspects, embodiments, and/or configurations illustrated herein show the various components of the system collocated, certain components of the system can be located remotely, at distant portions of a distributed network, such as a LAN and/or the Internet, or within a dedicated system. Thus, it should be appreciated, that the components of the system can be combined in to one or more devices, such as a vehicle computer system, a Personal Computer (PC), laptop, netbook, smart phone, Personal Digital Assistant (PDA), tablet, *etc.*, or collocated on a particular node of a distributed network, such as an analog and/or digital communications network, a packet-switch network, or a circuit-switched network or collocated on a particular node of a distributed network, such as an analog and/or digital communications network, a packet-switch network, or a circuit-switched network. It will be appreciated from the preceding description, and for reasons of computational efficiency, that the components of the system can be arranged at any location within a distributed network of components without affecting the operation of the system. For example, the various components can be located in a server. Similarly, one or more functional portions of the system could be distributed between a communications device(s) and an associated computing device.

Furthermore, it should be appreciated that the various links connecting the elements can be wired or wireless links, or any combination thereof, or any other known or later developed element(s) that is capable of supplying and/or communicating data to and from the connected elements. These wired or wireless links can also be secure links and may be capable of communicating encrypted information. Transmission media used as links, for example, can be any suitable carrier for electrical signals, including coaxial cables, copper

wire and fiber optics, and may take the form of acoustic or light waves, such as those generated during radio-wave and infra-red data communications.

Also, while the flowcharts have been discussed and illustrated in relation to a particular sequence of events, it should be appreciated that changes, additions, and omissions to this sequence can occur without materially affecting the operation of the disclosed embodiments, configuration, and aspects.

A number of variations and modifications of the disclosure can be used. It would be possible to provide for some features of the disclosure without providing others.

For example in one alternative embodiment, the application store is applied in a vehicle other than a wheeled or tracked vehicle. For example, the application store can be implemented in an aircraft, boat, ship, and the like.

In another alternative embodiment, the application store can include not only media player software but also media itself. Media, for example, can involve one or more media types (e.g., audio and/or video). Media can thus refer to music, movies, videos, audio books, pictures, screen savers, display wallpaper, and the like.

In yet another embodiment, the systems and methods of this disclosure can be implemented in conjunction with a special purpose computer, a programmed microprocessor or microcontroller and peripheral integrated circuit element(s), an ASIC or other integrated circuit, a digital signal processor, a hard-wired electronic or logic circuit such as discrete element circuit, a programmable logic device or gate array such as PLD, PLA, FPGA, PAL, special purpose computer, any comparable means, or the like. In general, any device(s) or means capable of implementing the methodology illustrated herein can be used to implement the various aspects of this disclosure. Exemplary hardware that can be used for the disclosed embodiments, configurations and aspects includes computers, handheld devices, telephones (e.g., cellular, Internet enabled, digital, analog, hybrids, and others), and other hardware known in the art. Some of these devices include processors (e.g., a single or multiple microprocessors), memory, nonvolatile storage, input devices, and output devices. Furthermore, alternative software implementations including, but not limited to, distributed processing or component/object distributed processing, parallel processing, or virtual machine processing can also be constructed to implement the methods described herein.

In yet another embodiment, the disclosed methods may be readily implemented in conjunction with software using object or object-oriented software development environments that provide portable source code that can be used on a variety of computer or workstation platforms. Alternatively, the disclosed system may be implemented partially or fully in hardware using standard logic circuits or VLSI design. Whether software or hardware is used to implement the systems in accordance with this disclosure is dependent on the speed and/or efficiency requirements of the system, the particular function, and the particular software or hardware systems or microprocessor or microcomputer systems being utilized.

In yet another embodiment, the disclosed methods may be partially implemented in software that can be stored on a storage medium, executed on programmed general-purpose computer with the cooperation of a controller and memory, a special purpose computer, a microprocessor, or the like. In these instances, the systems and methods of this disclosure can be implemented as program embedded on personal computer such as an applet, JAVA® or CGI script, as a resource residing on a server or computer workstation, as a routine embedded in a dedicated measurement system, system component, or the like. The system can also be implemented by physically incorporating the system and/or method into a software and/or hardware system.

Although the present disclosure describes components and functions implemented in the aspects, embodiments, and/or configurations with reference to particular standards and protocols, the aspects, embodiments, and/or configurations are not limited to such standards and protocols. Other similar standards and protocols not mentioned herein are in existence and are considered to be included in the present disclosure. Moreover, the standards and protocols mentioned herein and other similar standards and protocols not mentioned herein are periodically superseded by faster or more effective equivalents having essentially the same functions. Such replacement standards and protocols having

The present disclosure, in various aspects, embodiments, and/or configurations, includes components, methods, processes, systems and/or apparatus substantially as depicted and described herein, including various aspects, embodiments, configurations embodiments, subcombinations, and/or subsets thereof. Those of skill in the art will understand how to make and use the disclosed aspects, embodiments, and/or configurations after understanding

the present disclosure. The present disclosure, in various aspects, embodiments, and/or configurations, includes providing devices and processes in the absence of items not depicted and/or described herein or in various aspects, embodiments, and/or configurations hereof, including in the absence of such items as may have been used in previous devices or  
5 processes, e.g., for improving performance, achieving ease and/or reducing cost of implementation.

The foregoing discussion has been presented for purposes of illustration and description. The foregoing is not intended to limit the disclosure to the form or forms disclosed herein. In the foregoing Detailed Description for example, various features of the  
10 disclosure are grouped together in one or more aspects, embodiments, and/or configurations for the purpose of streamlining the disclosure. The features of the aspects, embodiments, and/or configurations of the disclosure may be combined in alternate aspects, embodiments, and/or configurations other than those discussed above. This method of disclosure is not to be interpreted as reflecting an intention that the claims require more features than are  
15 expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed aspect, embodiment, and/or configuration. Thus, the following claims are hereby incorporated into this Detailed Description, with each claim standing on its own as a separate preferred embodiment of the disclosure.

Moreover, though the description has included description of one or more aspects, embodiments, and/or configurations and certain variations and modifications, other variations, combinations, and modifications are within the scope of the disclosure, e.g., as  
20 may be within the skill and knowledge of those in the art, after understanding the present disclosure. It is intended to obtain rights which include alternative aspects, embodiments, and/or configurations to the extent permitted, including alternate, interchangeable and/or  
25 equivalent structures, functions, ranges or steps to those claimed, whether or not such alternate, interchangeable and/or equivalent structures, functions, ranges or steps are disclosed herein, and without intending to publicly dedicate any patentable subject matter.



**What is claimed is:**

1. A vehicle, comprising:

a microprocessor executable network controller operable to at least one of (a) isolate at least one other on board computational component in a vehicular wireless network not affected by a security breach event from a computational component affected by the security breach event and (b) isolate an on board computational component in the vehicular wireless network and affected by the security breach event from the at least one other on board computational component not affected by the security breach event.

2. The vehicle of claim 1, wherein the security breach event is one or more of an instance of a virus, malware, unauthorized access, misuse, modification, denial-of-service attack, spoofing, man-in-the-middle attack, ARP poisoning, smurf attack, buffer overflow, heap overflow, format string attack, SQL injection, identity theft (or MAC spoofing), network injection, caffe latte attack, or denial of a computer network and/or network-accessible resource and wherein the network controller receives a warning signal associated with the security breach event from a gateway, a firewall, a honeypot, a network node impacted by the security breach event, and a network probe.

3. The vehicle of claim 2, wherein the at least one other board computational component is one or more of an on-board sensor, processing module, software application, expansion module, critical device, non-critical device, and cellular upgrade module.

4. The vehicle of claim 3, wherein the at least one other board computational component is one or more of an on board sensor, a media controller, a gateway, a firewall, a processing module, a network controller, an input/output system, a display controller, an audio controller, an arbitration module, a health check module, a critical system controller, a non-critical system controller, an on board sensor monitor, a displayed object movement module, a diagnostic module, a media filter, a network selector, a remote control module, a computational module selector, an expansion module, an application, and a plug-in module.

5. The vehicle of claim 1, wherein the network controller analyzes the security breach event by one or more of reviewing historical behavior and comparing the behavior to templates characteristic of differing types of attacks and/or applying rules to the historical behavior.

6. The vehicle of claim 1, wherein the computational component affected by the security breach event is an external computational device and wherein the at least one other on board computational component not affected by the security breach event is isolated from the external computational device by the vehicular wireless network denying vehicular wireless network access by the external computational component.

7. The vehicle of claim 1, wherein at least one of the following is true about the isolation: (a) communications between the at least one other on board computational component in a vehicular wireless network not affected by the security breach event and the computational component affected by the security breach event, the communications not normally passing through a gateway and/or firewall are redirected through and filtered by the gateway and/or firewall and (b) communications between the at least one other on board computational component in a vehicular wireless network not affected by the security breach event and the computational component affected by the security breach event are blocked in whole or part.

8. The vehicle of claim 1, wherein the at least one other on board computational component in a vehicular wireless network not affected by the security breach event is a critical component, wherein the computational component affected by the security breach event is a node on the vehicular wireless network and physically and/or logically positioned outside of but interiorly and/or internally to the DMZ, and wherein isolation is effected by enabling a critical communication security mechanism that is one or more of (a) encryption of access restrictions in the at least one other on board computational component in a vehicular wireless network, (b) disabling ESSID broadcasting, (c) hiding the SSID, (d) performing MAC ID filtering, (e) performing static IP addressing, (f) implementing IEEE 802.11, 802.11i, and/or 802.1x security, (g) using wired equivalent privacy encryption, (h) using one or more of TKIP, EAP, LEAP, PEAP, WPAv 1, and/or WPAv2 protocols, and (i) using end-to-end encryption.

9. A method, comprising:  
a microprocessor executable network controller identifying a possible security breach event; and

in response, the microprocessor executable network controller at least one of (a) isolating at least one other on board computational component in a vehicular wireless

network not affected by the security breach event from a computational component affected by the security breach event and (b) isolating an on board computational component in the vehicular wireless network and affected by the security breach event from the at least one other on board computational component not affected by the security breach event.

5           10.     The method of claim 9, wherein the security breach event is one or more of an instance of a virus, malware, unauthorized access, misuse, modification, denial-of-service attack, spoofing, man-in-the-middle attack, ARP poisoning, smurf attack, buffer overflow, heap overflow, format string attack, SQL injection, identity theft (or MAC spoofing), network injection, caffe latte attack, or denial of a computer network and/or network-  
10     accessible resource and wherein the network controller receives a warning signal associated with the security breach event from a gateway, a firewall, a honeypot, a network node impacted by the security breach event, and a network probe.

          11.     The method of claim 10, wherein the at least one other board computational component is one or more of an on-board sensor, processing module, software application,  
15     expansion module, critical device, non-critical device, and cellular upgrade module.

          12.     The method of claim 11, wherein the at least one other board computational component is one or more of an on board sensor, a media controller, a gateway, a firewall, a processing module, a network controller, an input/output system, a display controller, an audio controller, an arbitration module, a health check module, a critical system controller, a  
20     non-critical system controller, an on board sensor monitor, a displayed object movement module, a diagnostic module, a media filter, a network selector, a remote control module, a computational module selector, an expansion module, an application, and a plug-in module.

          13.     The method of claim 9, wherein the network controller detects a possible security breach event by one or more of reviewing historical behavior and comparing the  
25     behavior to templates characteristic of differing types of attacks and/or applying rules to the historical behavior.

          14.     The method of claim 9, wherein the computational component affected by the security breach event is an external computational device and wherein the at least one other on board computational component not affected by the security breach event isolation is  
30     isolated from the external computational device by the vehicular wireless network denying vehicular wireless network access by the external computational component.

15. The method of claim 9, wherein at least one of the following is true about the isolation: (a) communications between the at least one other on board computational component in a vehicular wireless network not affected by the security breach event and the computational component affected by the security breach event, the communications not  
5 normally passing through a gateway and/or firewall are redirected through and filtered by the gateway and/or firewall and (b) communications between the at least one other on board computational component in a vehicular wireless network not affected by the security breach event and the computational component affected by the security breach event are blocked in whole or part.

10 16. The method of claim 9, wherein the at least one other on board computational component in a vehicular wireless network not affected by the security breach event is a critical component, wherein the computational component affected by the security breach event is a node on the vehicular wireless network and physically and/or logically positioned outside of but interiorly and/or internally to the DMZ, and wherein isolation is effected by  
15 enabling a critical communication security mechanism that is one or more of (a) encryption of access restrictions in the at least one other on board computational component in a vehicular wireless network, (b) disabling ESSID broadcasting, (c) hiding the SSID, (d) performing MAC ID filtering, (e) performing static IP addressing, (f) implementing IEEE 802.11, 802.11i, and/or 802.1x security, (g) using wired equivalent privacy encryption, (h)  
20 using one or more of TKIP, EAP, LEAP, PEAP, WPAv 1, and/or WPAv2 protocols, and (i) using end-to-end encryption.

17. A non-transient, tangible computer readable medium comprising a microprocessor executable network controller on board a selected vehicle that, when executed, (a) identifies a possible security breach event and (b) in response, at least one of (i)  
25 isolates at least one other on board computational component in a vehicular wireless network not affected by the security breach event from a computational component affected by the security breach event and (ii) isolates an on board computational component in the vehicular wireless network and affected by the security breach event from the at least one other on board computational component not affected by the security breach event.

30 18. The computer readable medium of claim 17, wherein the security breach event is one or more of an instance of a virus, malware, unauthorized access, misuse, modification,



denial-of-service attack, spoofing, man-in-the-middle attack, ARP poisoning, smurf attack, buffer overflow, heap overflow, format string attack, SQL injection, identity theft (or MAC spoofing), network injection, caffe latte attack, or denial of a computer network and/or network-accessible resource and wherein the network controller receives a warning signal associated with the security breach event from a gateway, a firewall, a honeypot, a network node impacted by the security breach event, and a network probe.

19. The computer readable medium of claim 18, wherein the at least one other board computational component is one or more of an on-board sensor, processing module, software application, expansion module, critical device, non-critical device, and cellular upgrade module.

20. The computer readable medium of claim 19, wherein the at least one other board computational component is one or more of an on board sensor, a media controller, a gateway, a firewall, a processing module, a network controller, an input/output system, a display controller, an audio controller, an arbitration module, a health check module, a critical system controller, a non-critical system controller, an on board sensor monitor, a displayed object movement module, a diagnostic module, a media filter, a network selector, a remote control module, a computational module selector, an expansion module, an application, and a plug-in module.

21. The computer readable medium of claim 17, wherein the network controller detects a possible security breach event by one or more of reviewing historical behavior and comparing the behavior to templates characteristic of differing types of attacks and/or applying rules to the historical behavior.

22. The computer readable medium of claim 17, wherein the computational component affected by the security breach event is an external computational device and wherein the at least one other on board computational component not affected by the security breach event is isolated from the external computational device by the vehicular wireless network denying vehicular wireless network access by the external computational component.

23. The computer readable medium of claim 17, wherein at least one of the following is true about the isolation: (a) communications between the at least one other on board computational component in a vehicular wireless network not affected by the security

breach event and the computational component affected by the security breach event, the communications not normally passing through a gateway and/or firewall are redirected through and filtered by the gateway and/or firewall and (b) communications between the at least one other on board computational component in a vehicular wireless network not  
5 affected by the security breach event and the computational component affected by the security breach event are blocked in whole or part.

24. The computer readable medium of claim 17, wherein the at least one other on board computational component in a vehicular wireless network not affected by the security breach event is a critical component, wherein the computational component affected by the  
10 security breach event is a node on the vehicular wireless network and physically and/or logically positioned outside of but interiorly and/or internally to the DMZ, and wherein isolation is effected by enabling a critical communication security mechanism that is one or more of (a) encryption of access restrictions the at least one other on board computational component in a vehicular wireless network, (b) disabling ESSID broadcasting, (c) hiding the  
15 SSID, (d) performing MAC ID filtering, (e) performing static IP addressing, (f) implementing IEEE 802.11, 802.11i, and/or 802.1x security, (g) using wired equivalent privacy encryption, (h) using one or more of TKIP, EAP, LEAP, PEAP, WPAv 1, and/or WPAv2 protocols, and (i) using end-to-end encryption.

20

**ABSTRACT**

The present disclosure describes a microprocessor executable network controller operable to at least one of (a) isolate at least one other on board computational component in a vehicular wireless network not affected by a security breach event from a computational  
5 component affected by the security breach event and (b) isolate an on board computational component in the vehicular wireless network and affected by the security breach event from the at least one other on board computational component not affected by the security breach event.



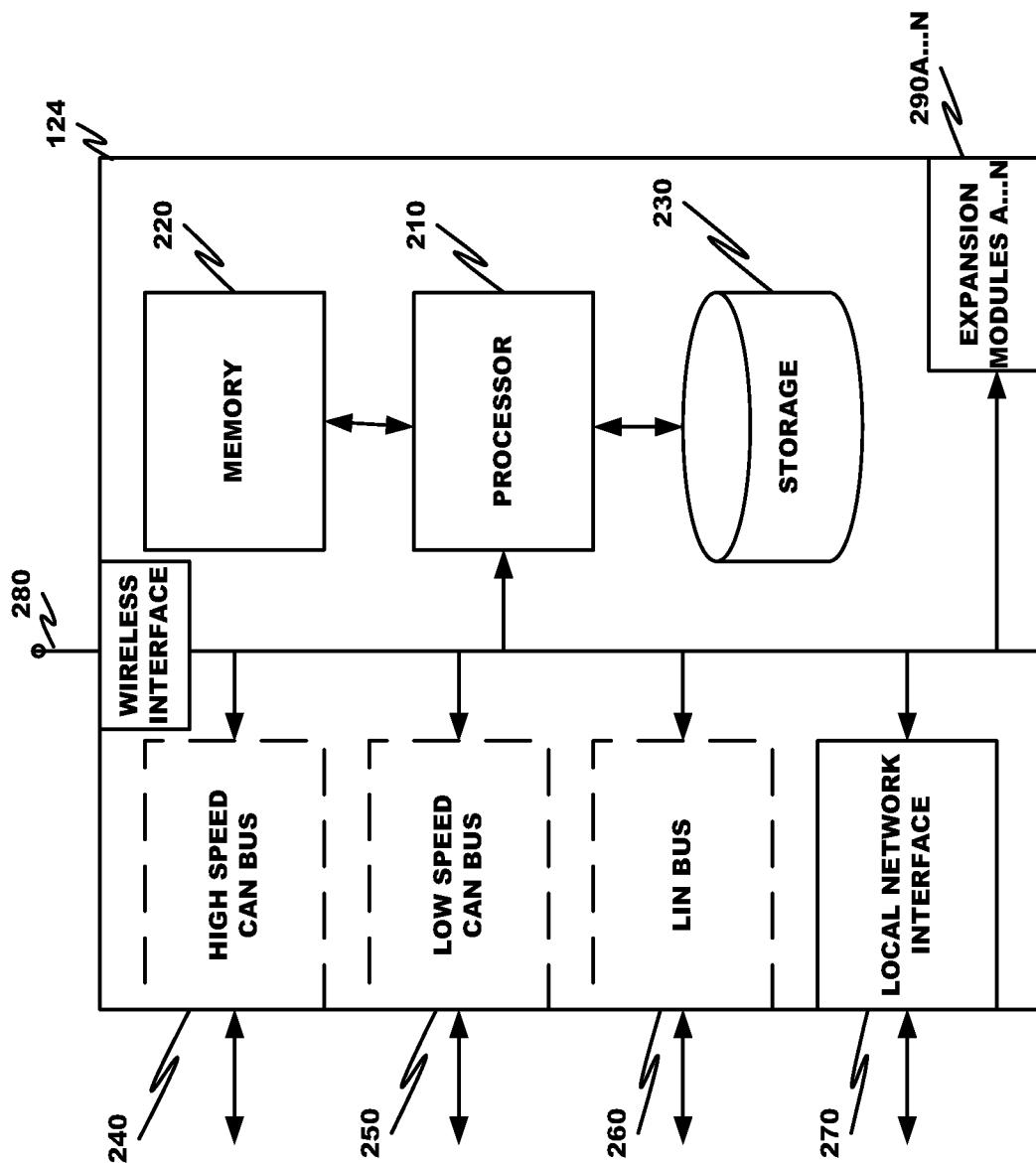


**Fig. 2**

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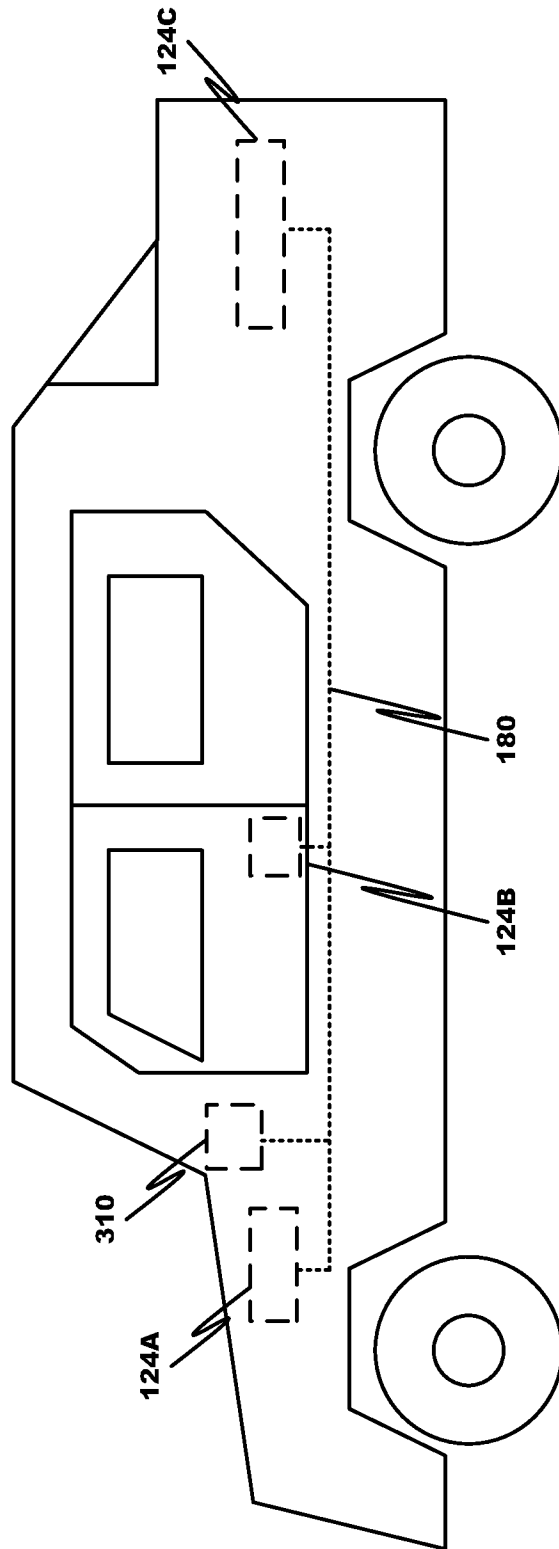


**Fig. 3**

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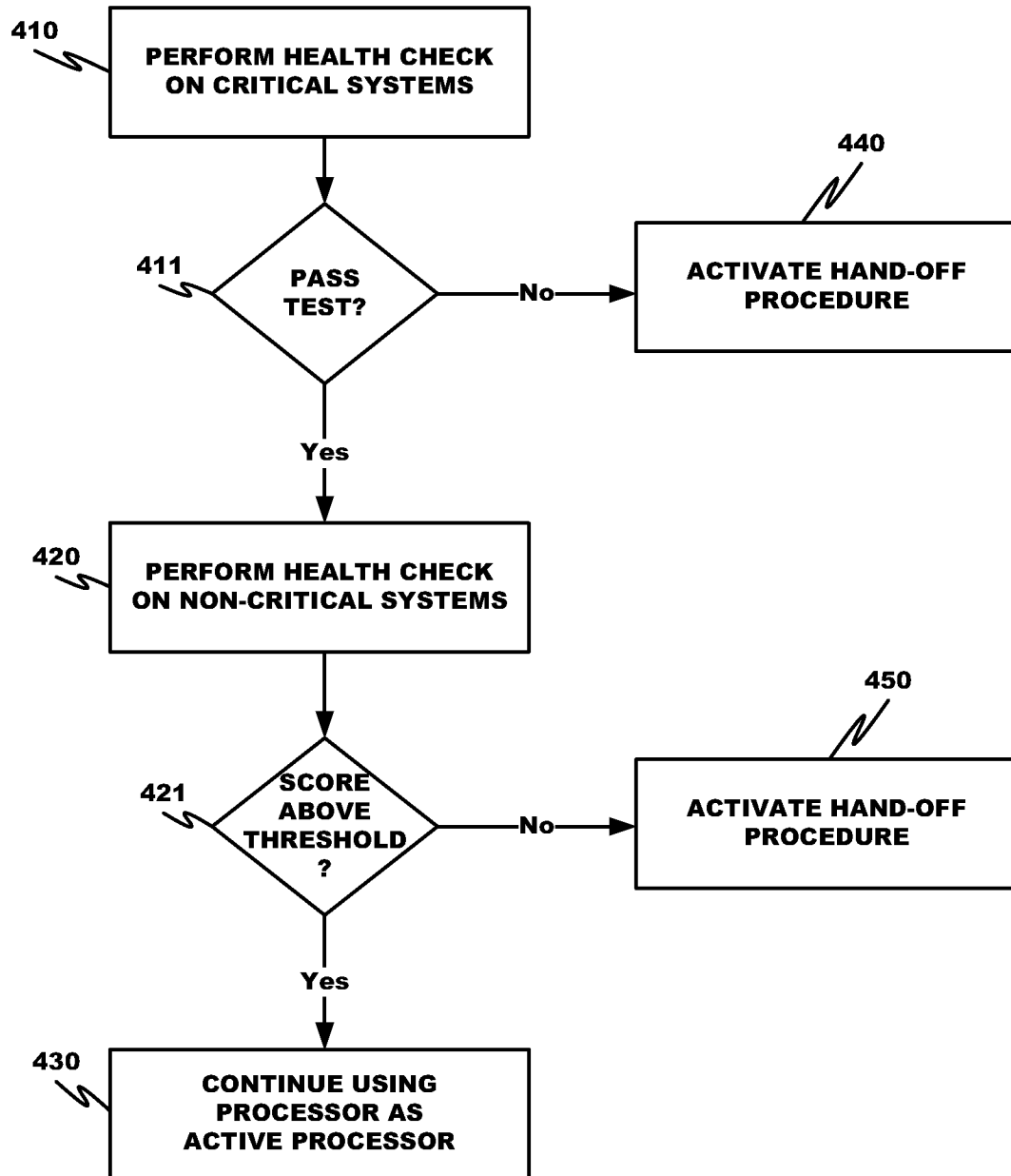


**Fig. 4**

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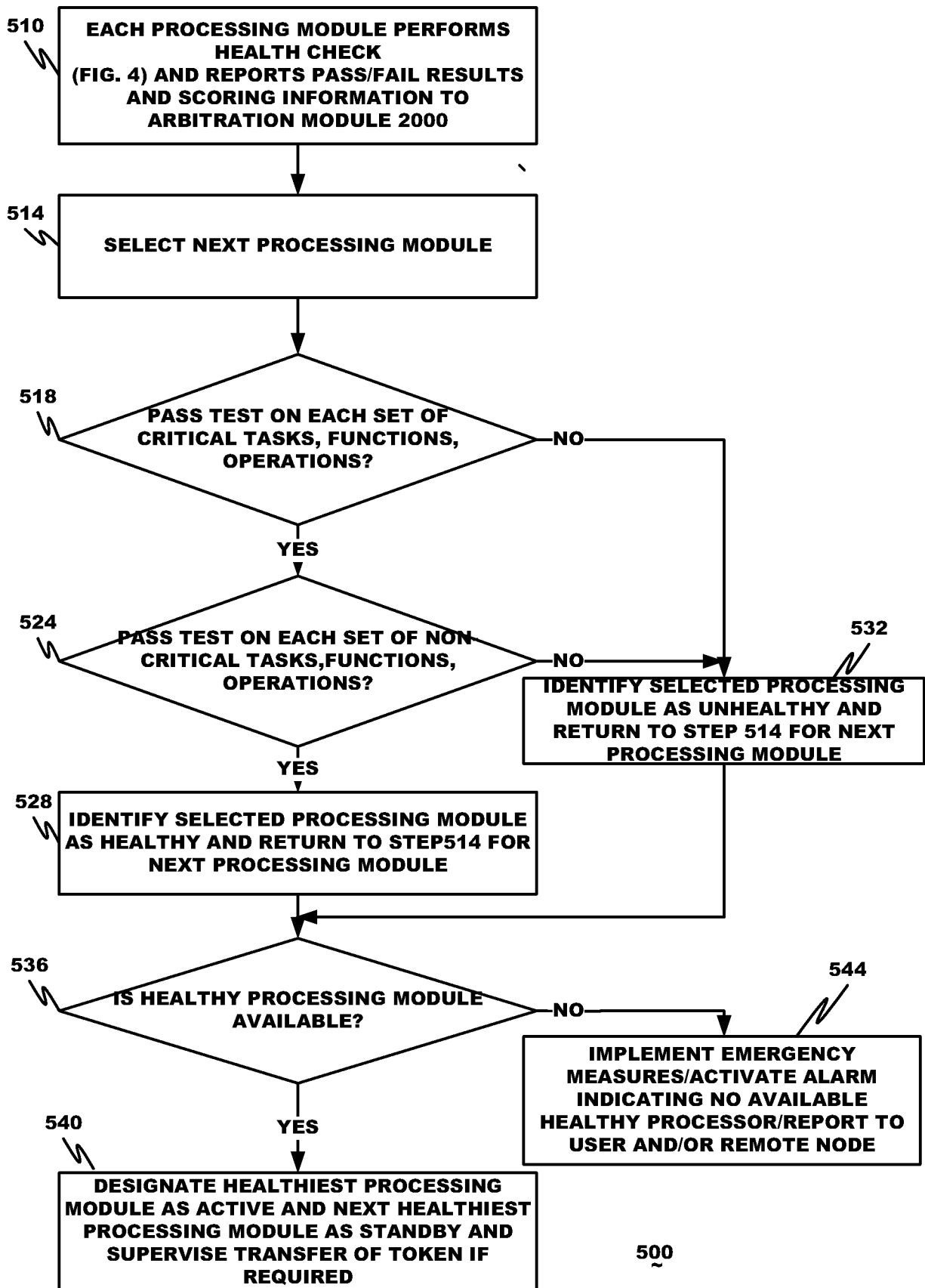


**Fig. 5**



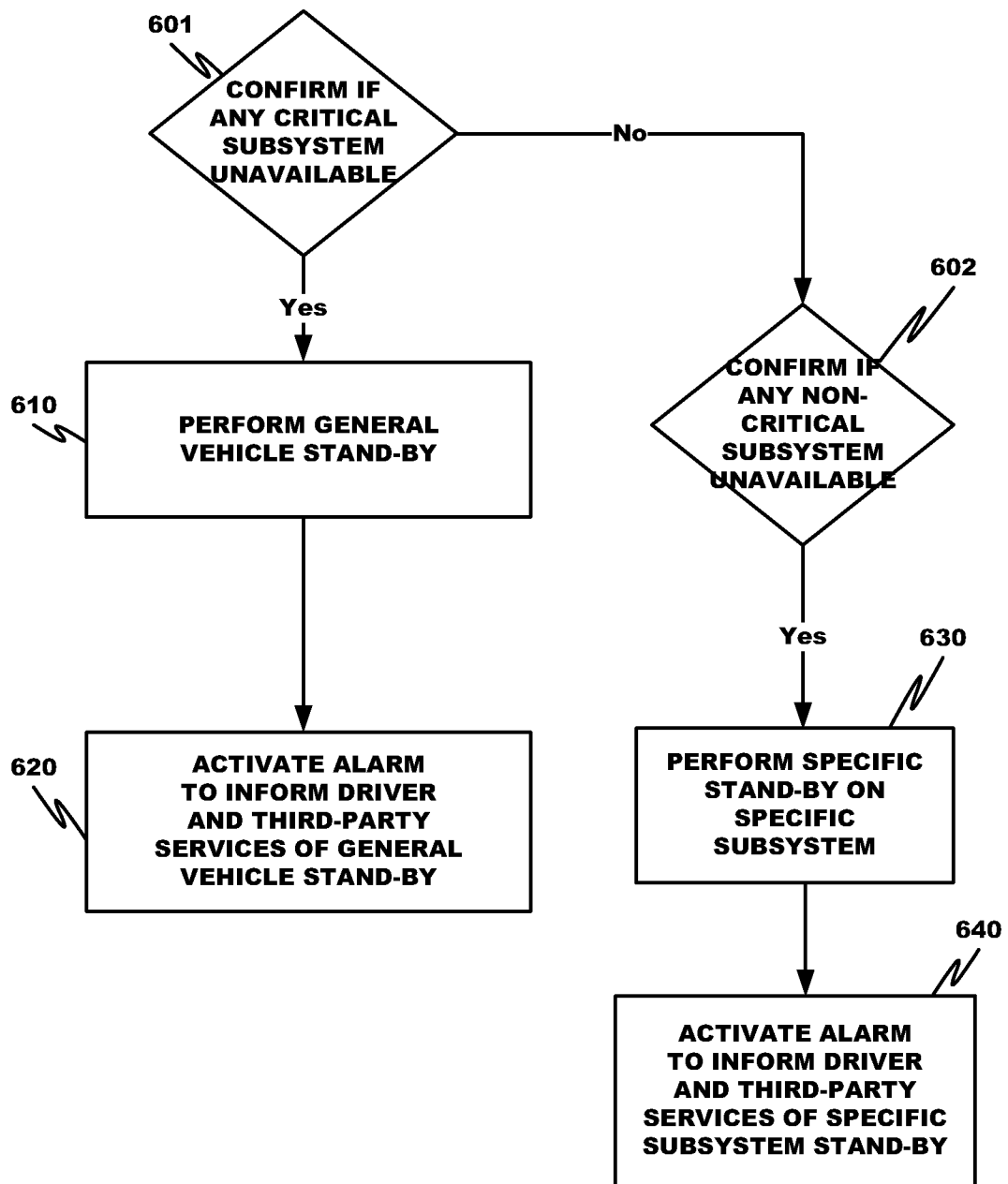


**Fig. 6**

600

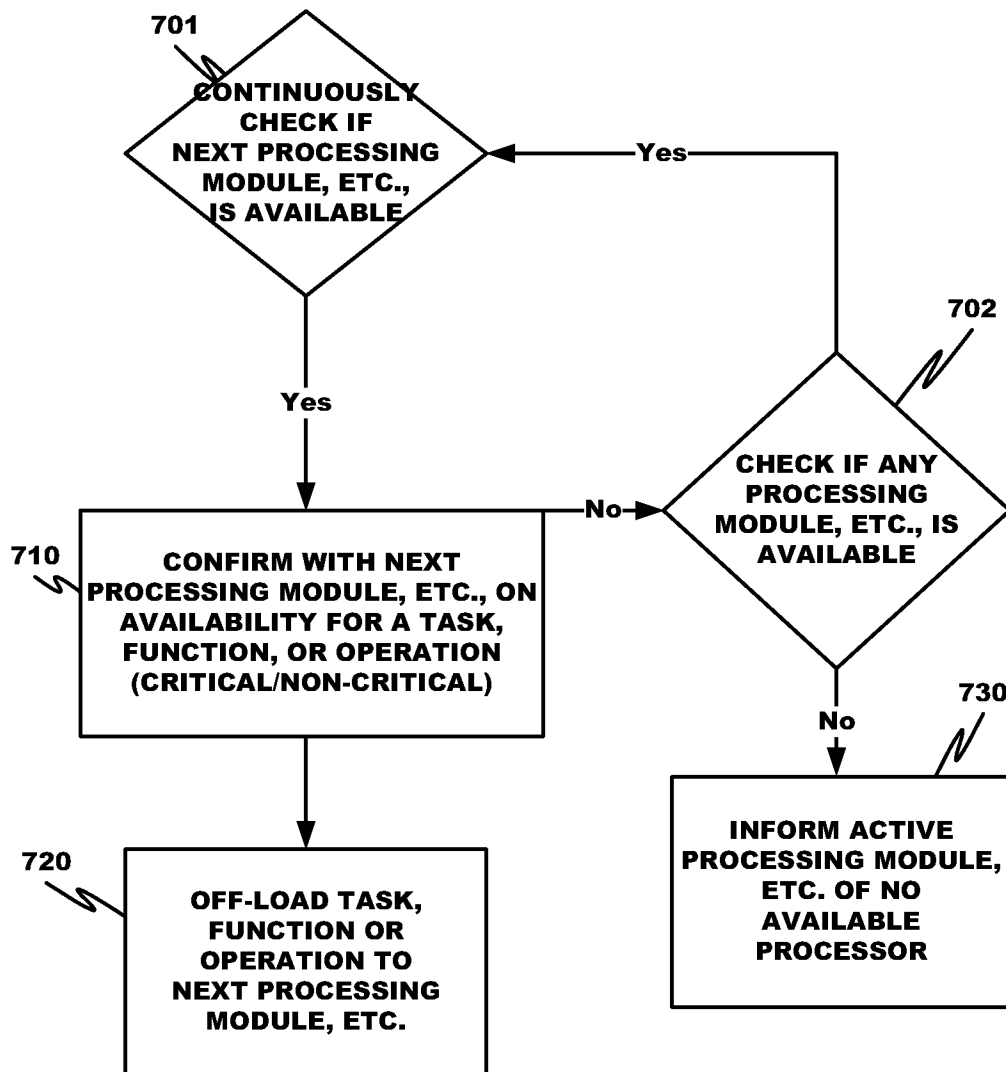


**Fig. 7**

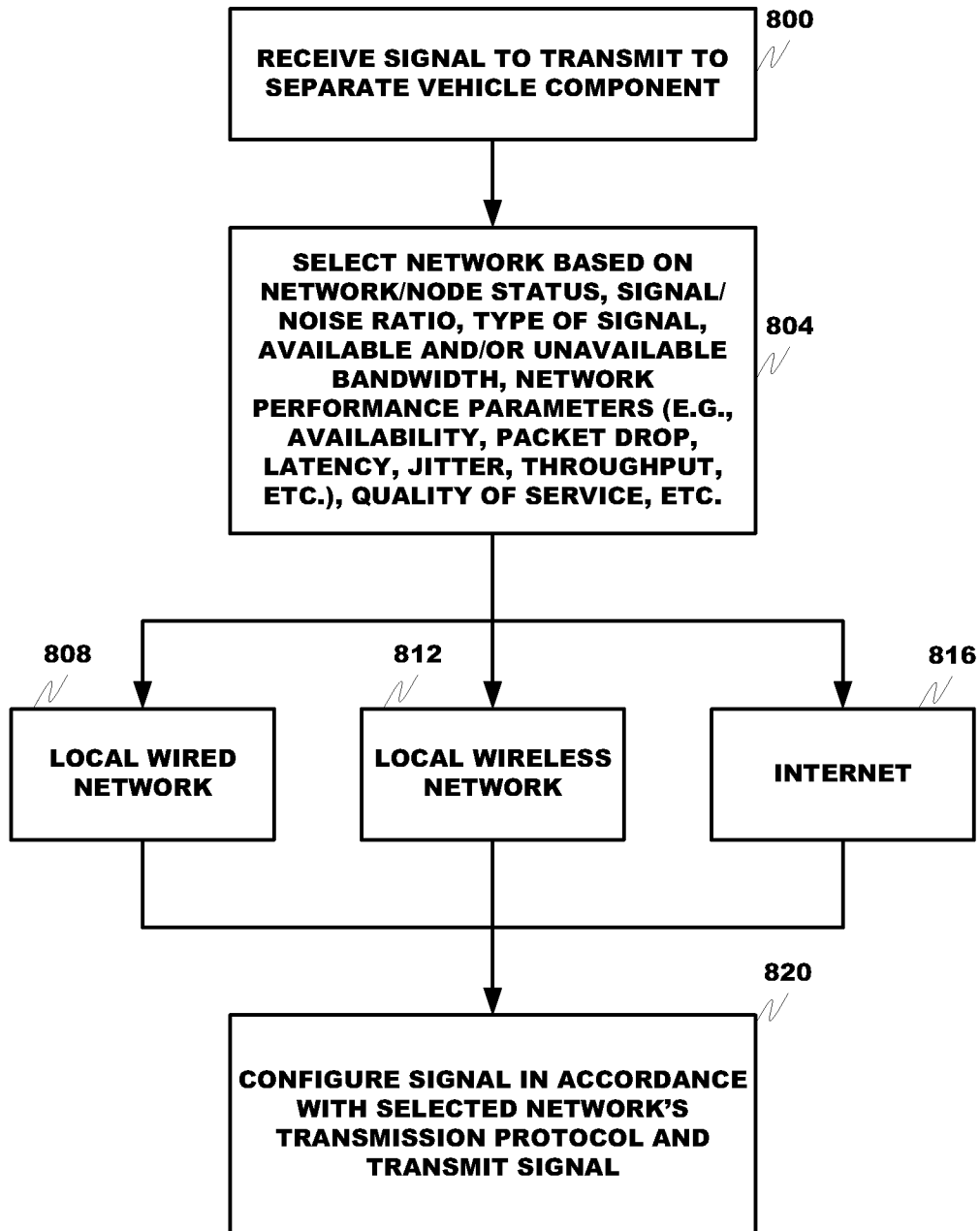


**FIG. 8**

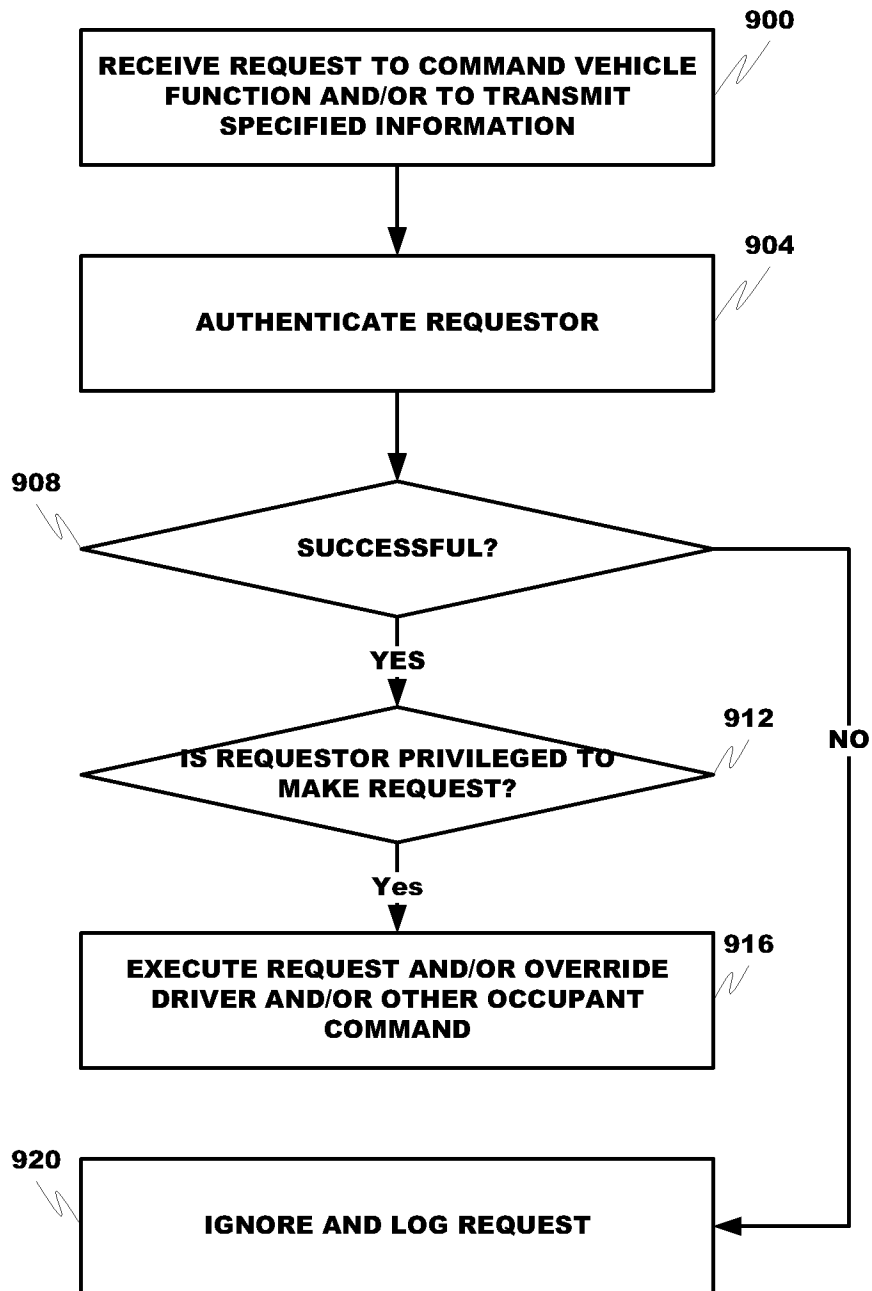


**FIG. 9**

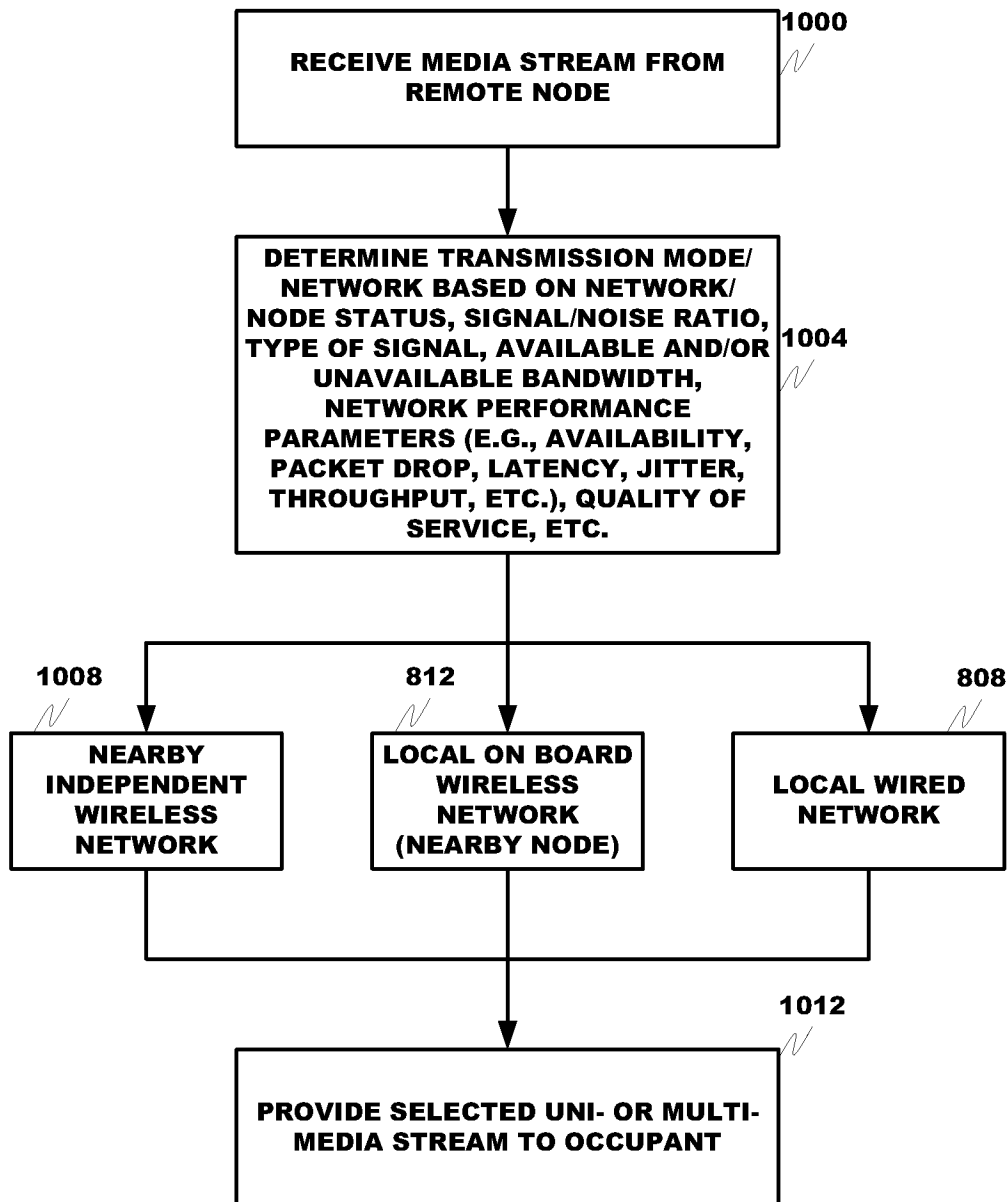


**FIG. 10**

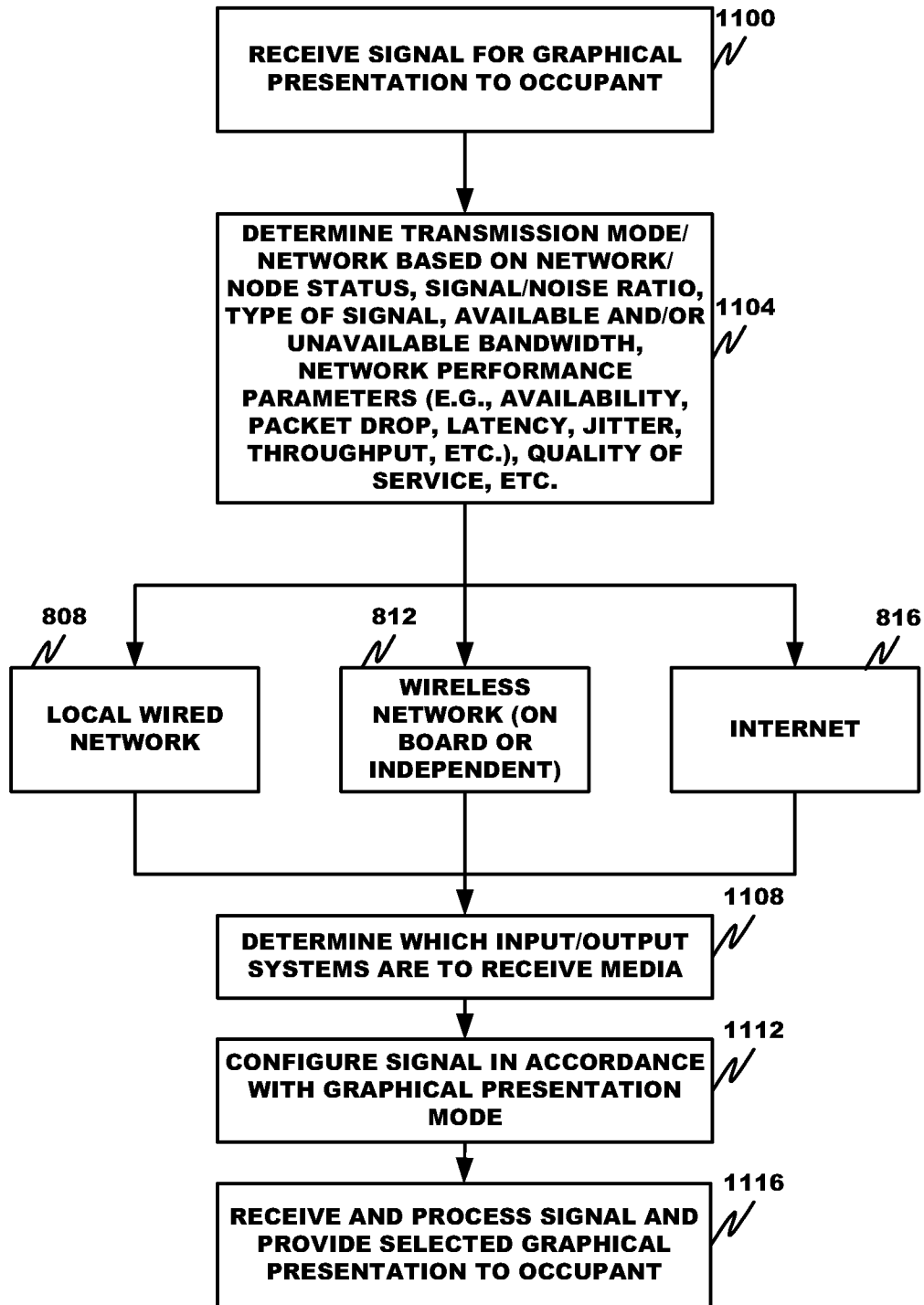


**FIG. 11**

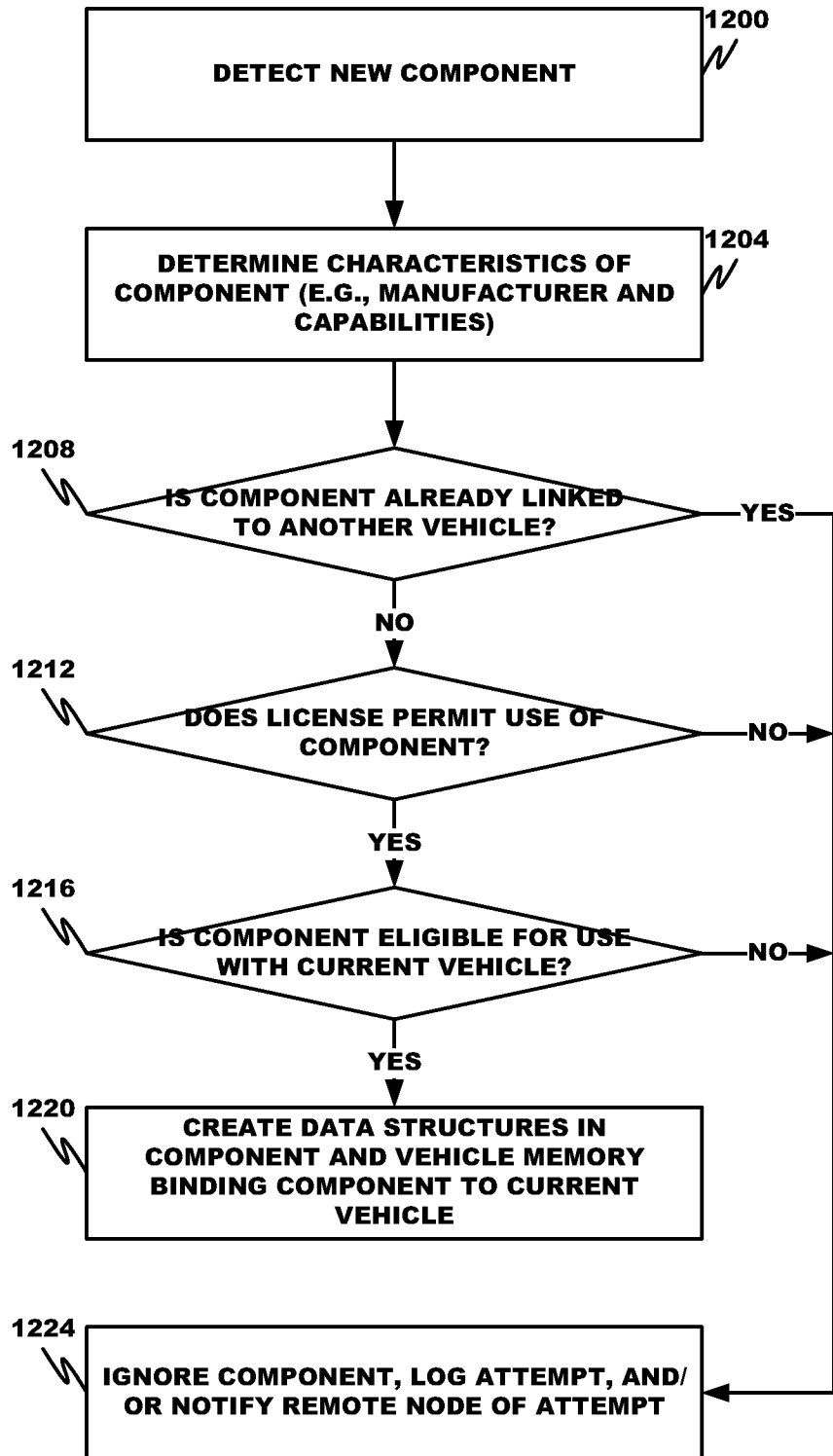


**FIG. 12**

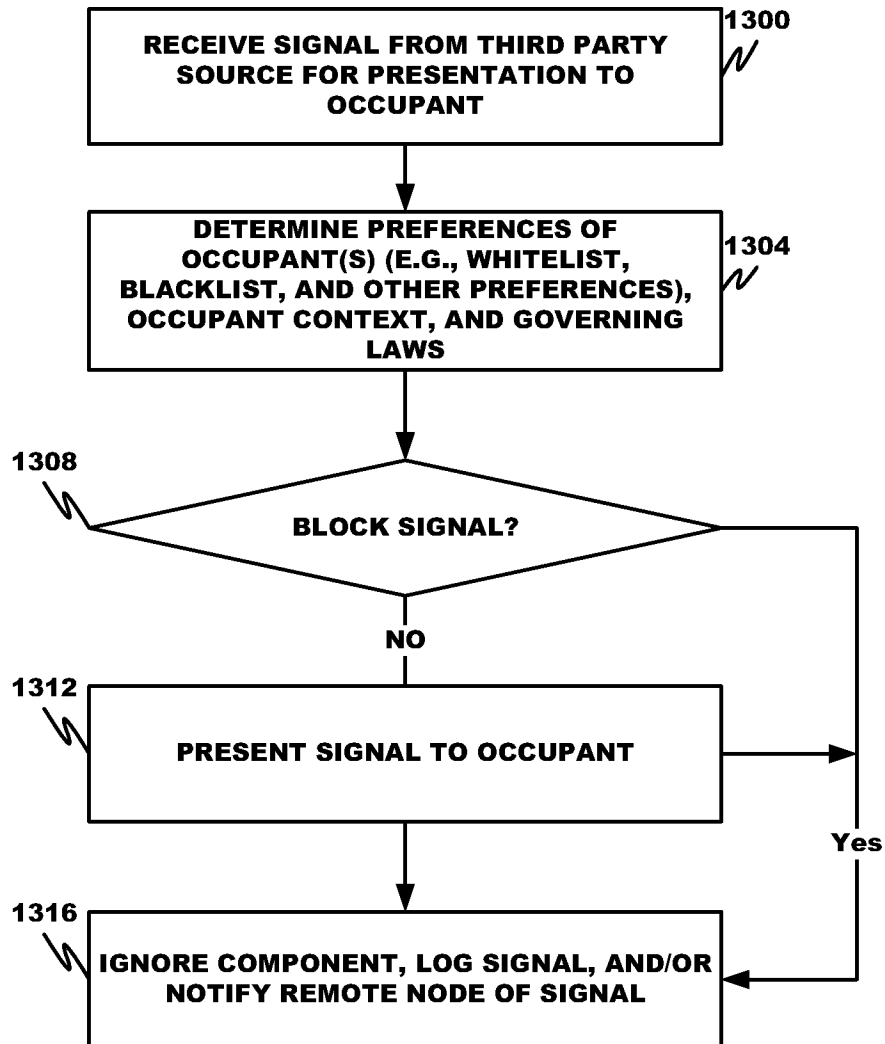


**FIG. 13**



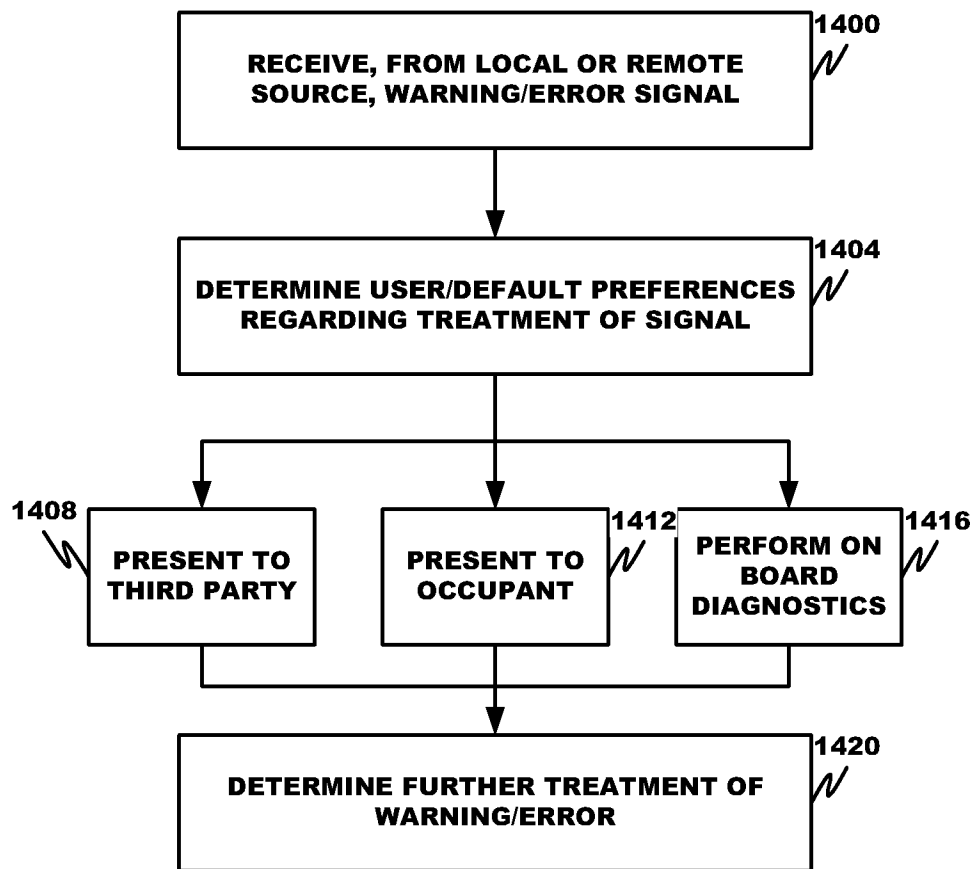


**FIG. 14**

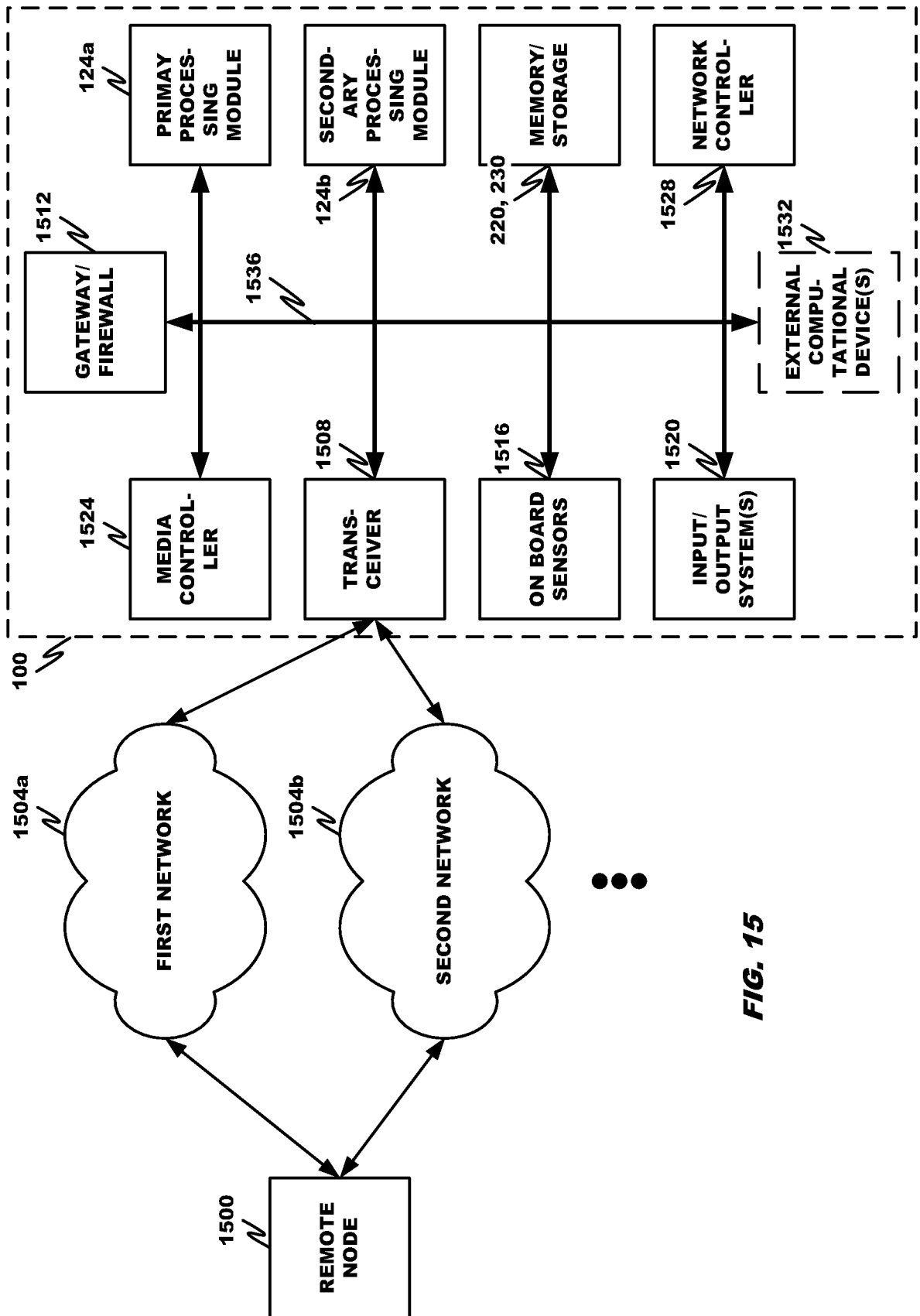


**FIG. 15**

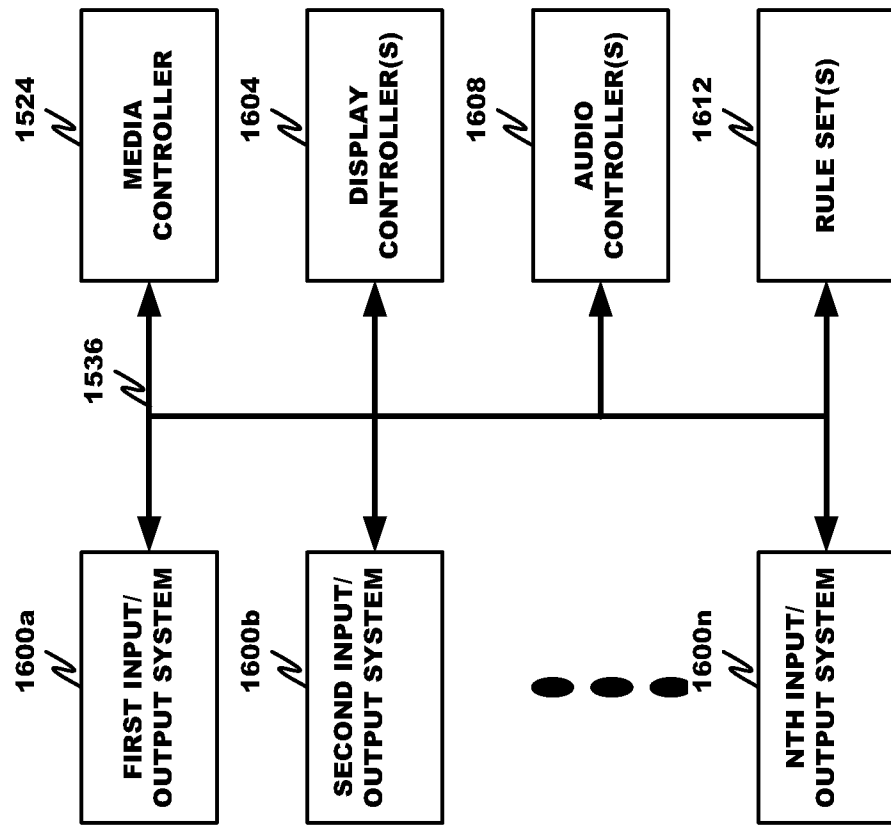


**FIG. 16**

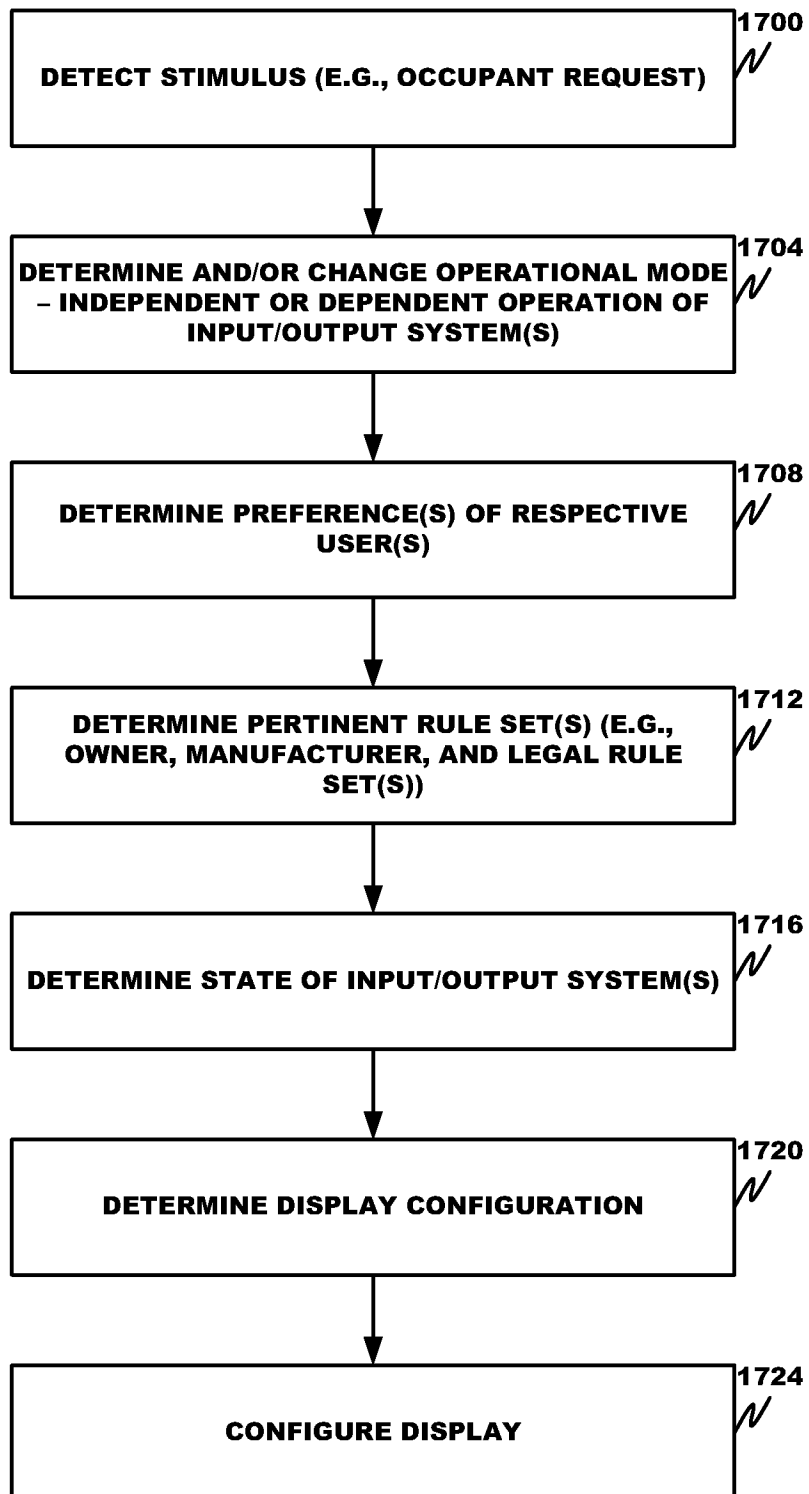


**FIG. 17**

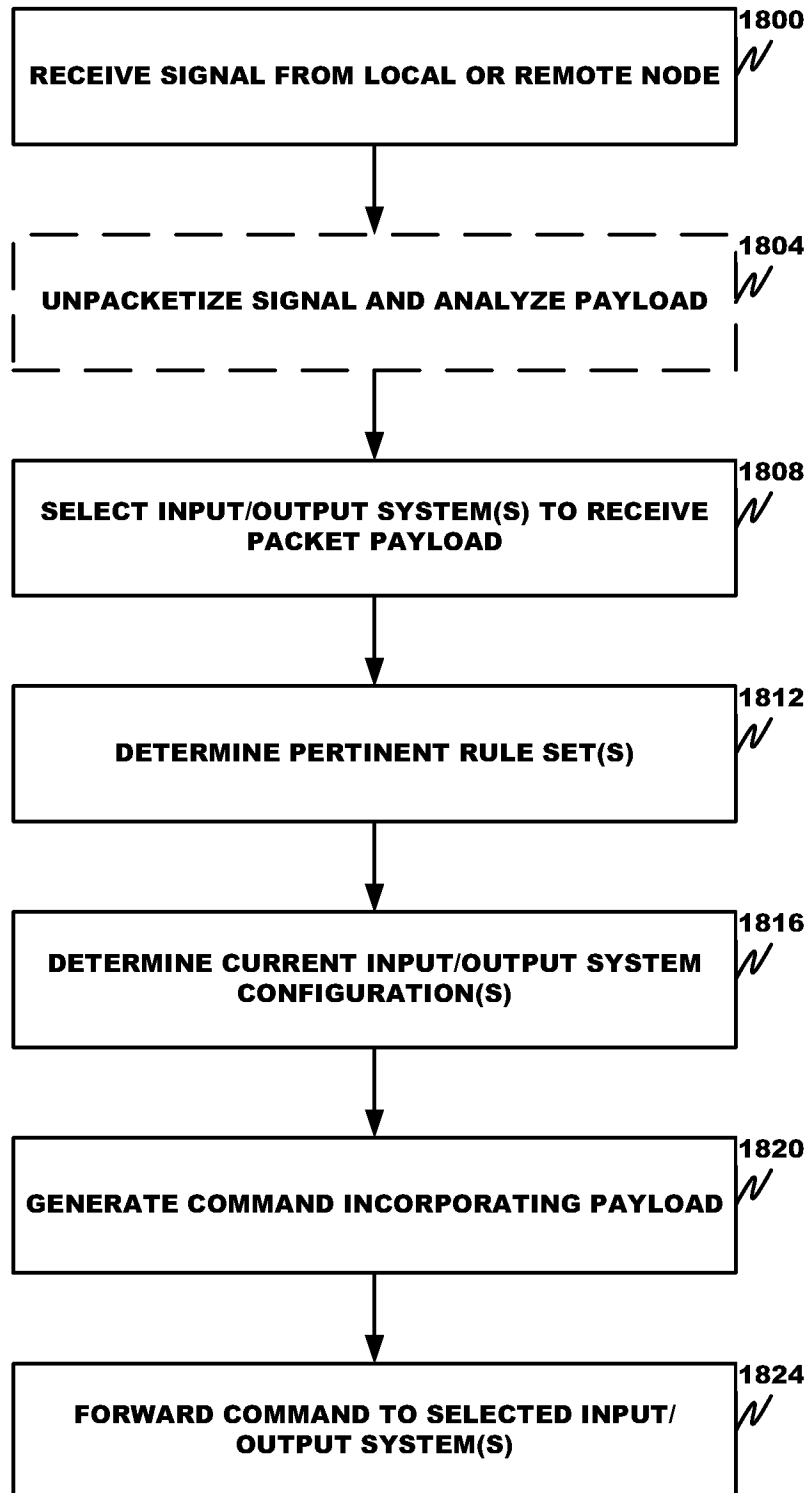


**FIG. 18**

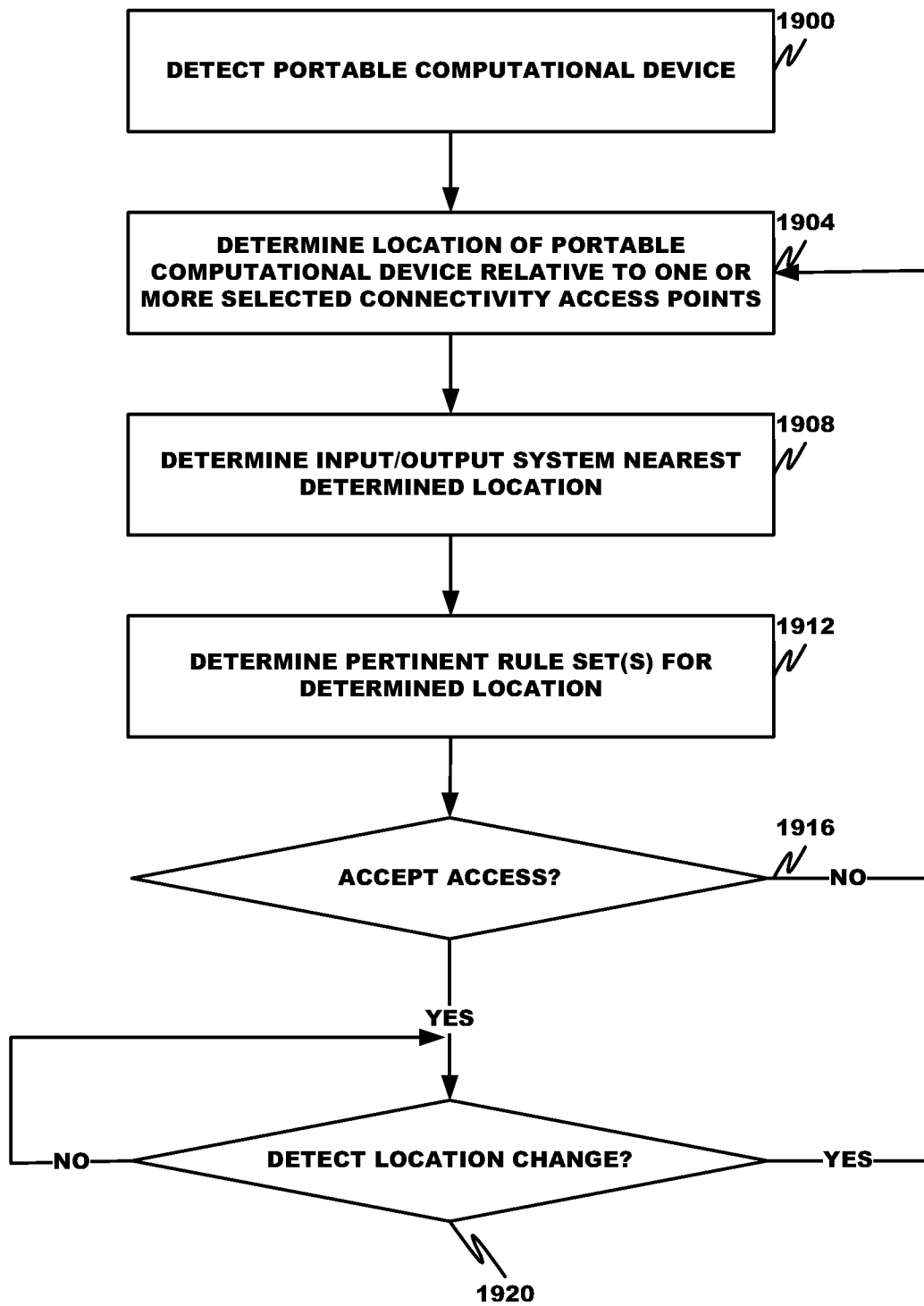


**FIG. 19**

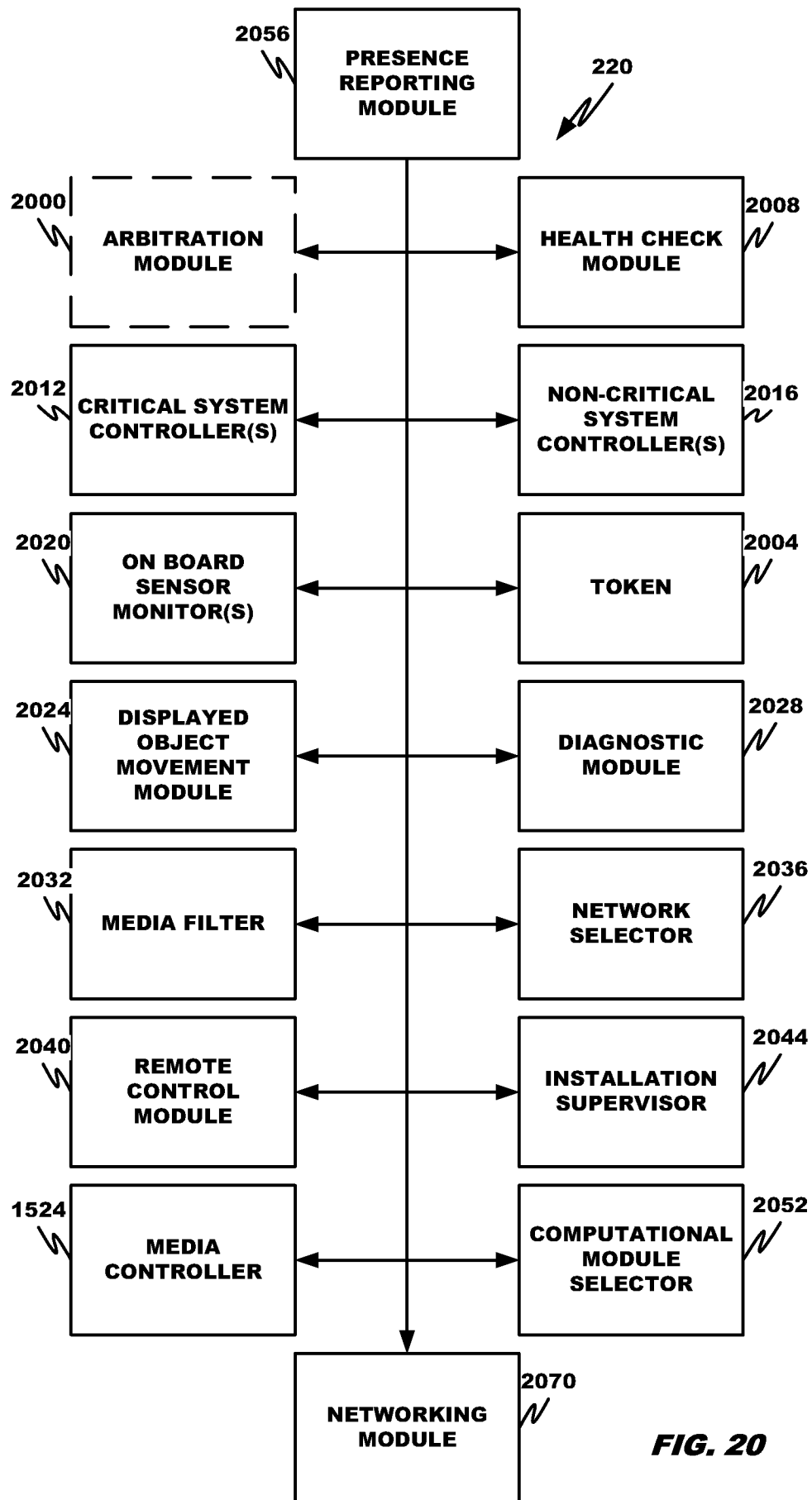


**FIG. 20**

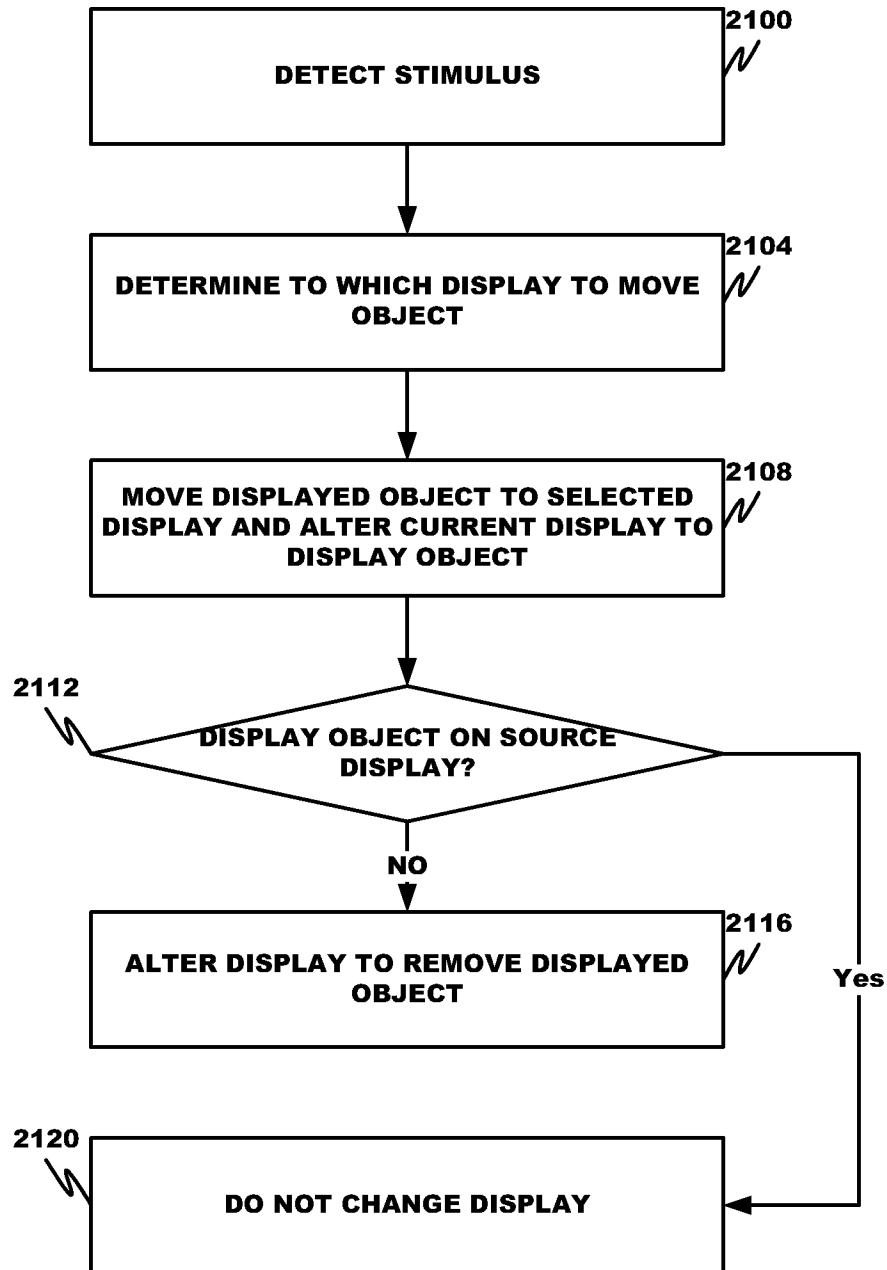
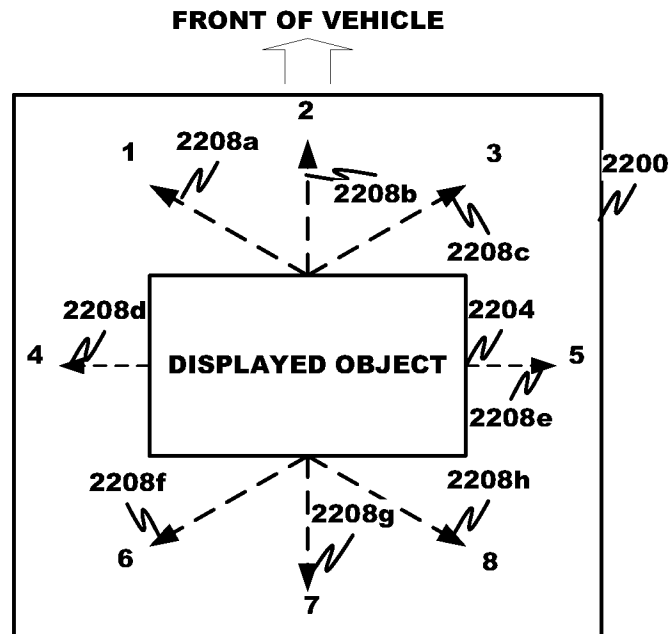
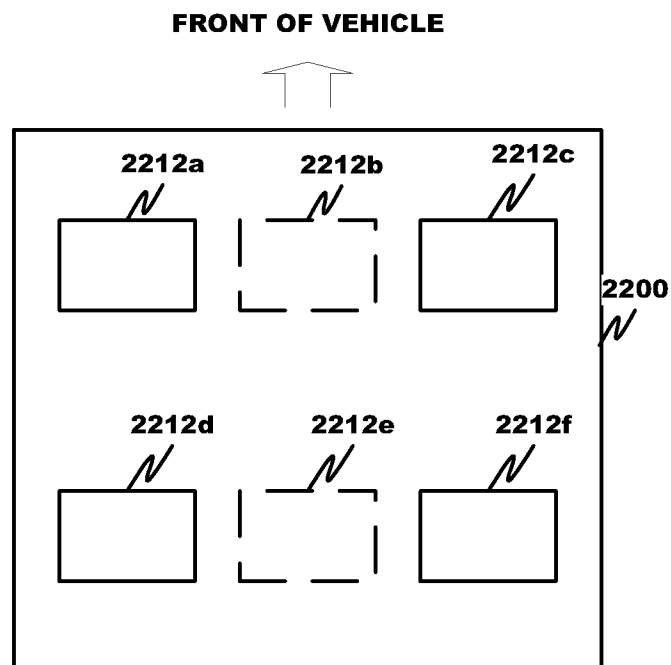
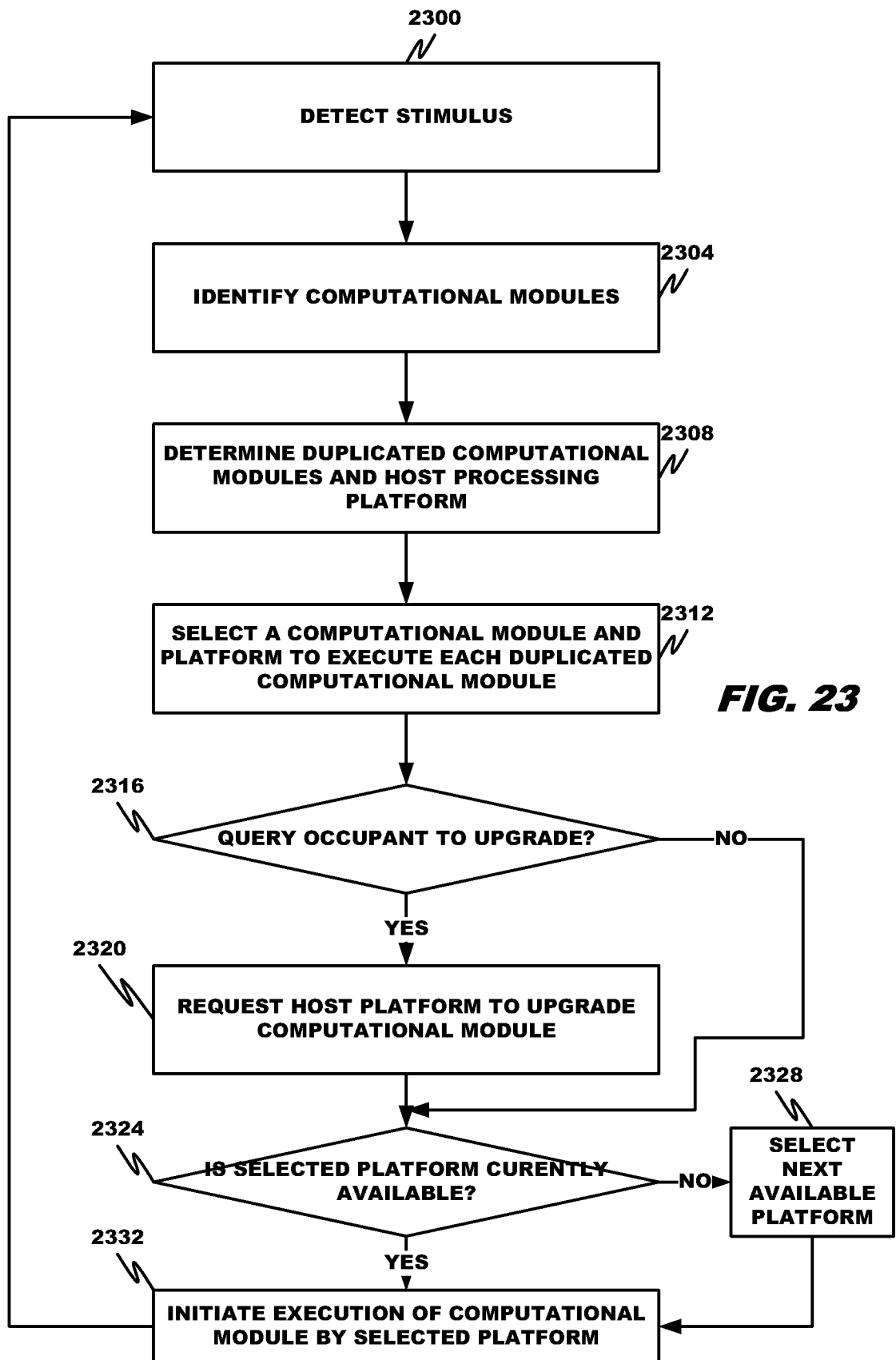


**FIG. 21**







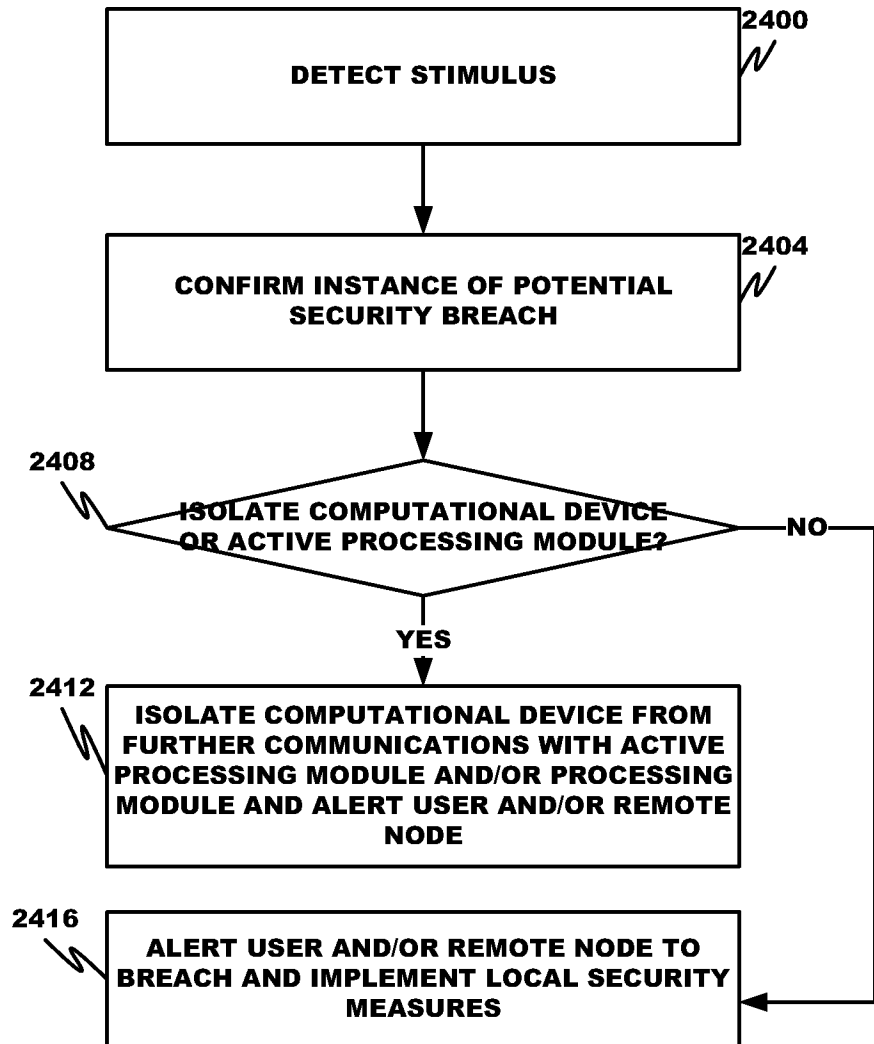


**FIG. 24**

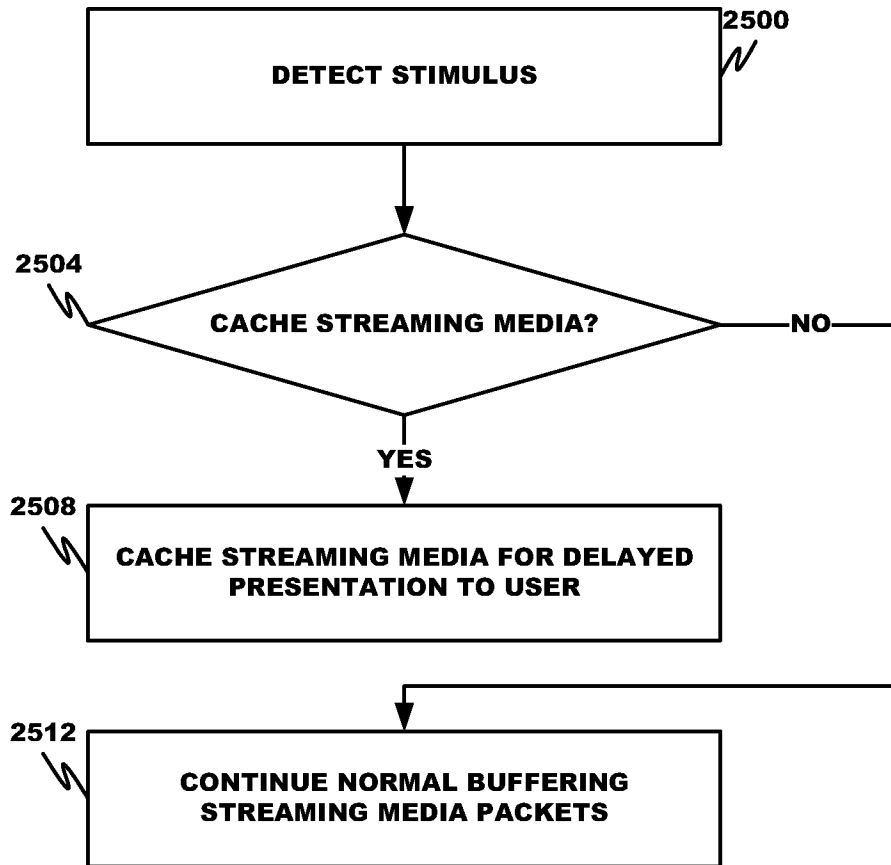


**FIG. 25**

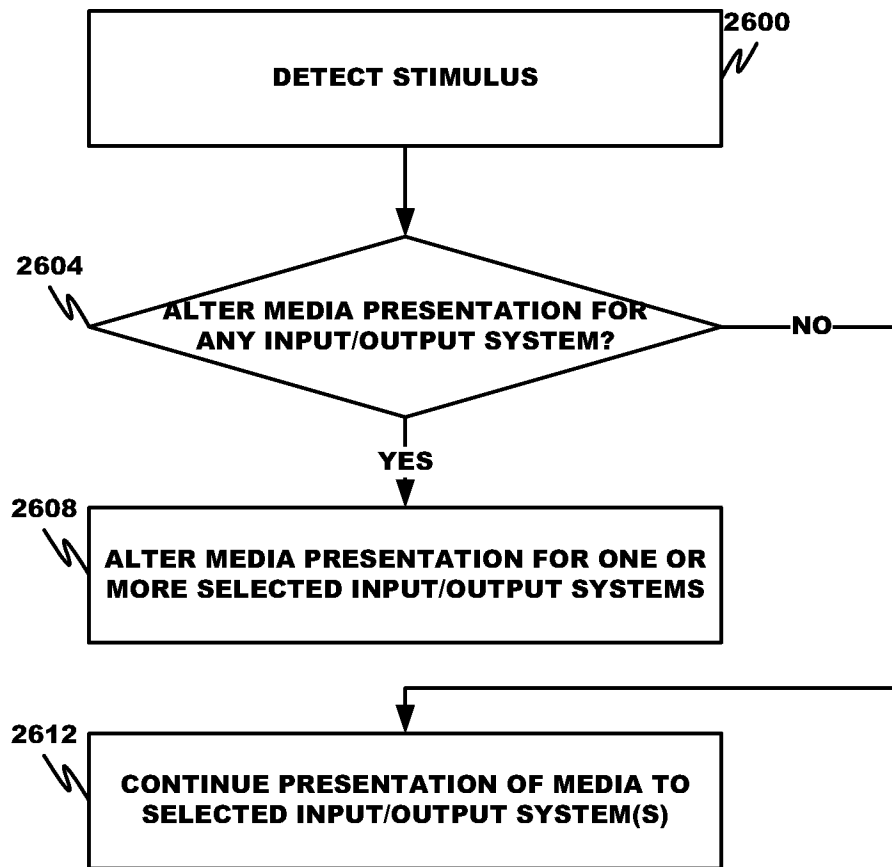


**FIG. 26**

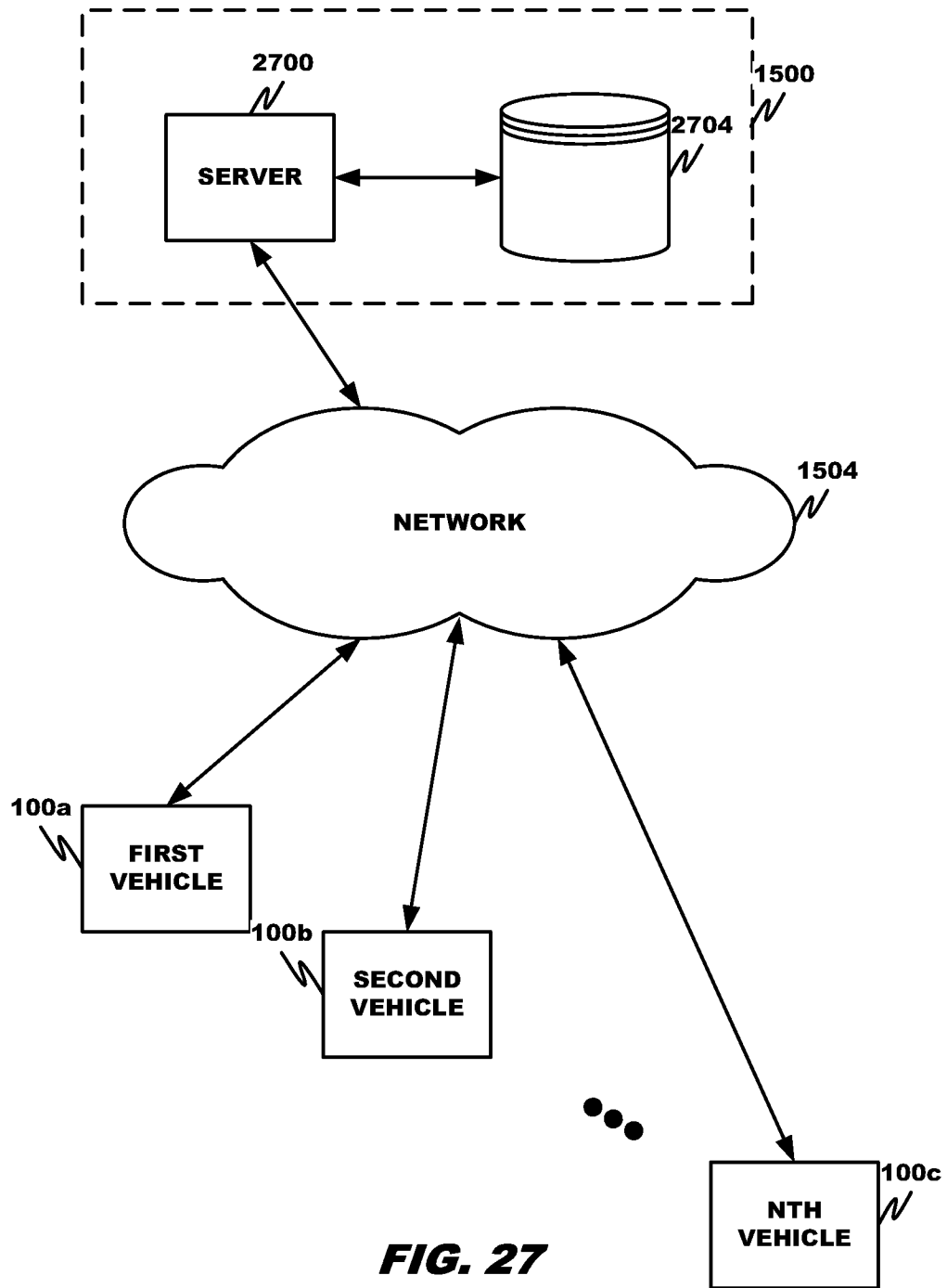


**FIG. 27**

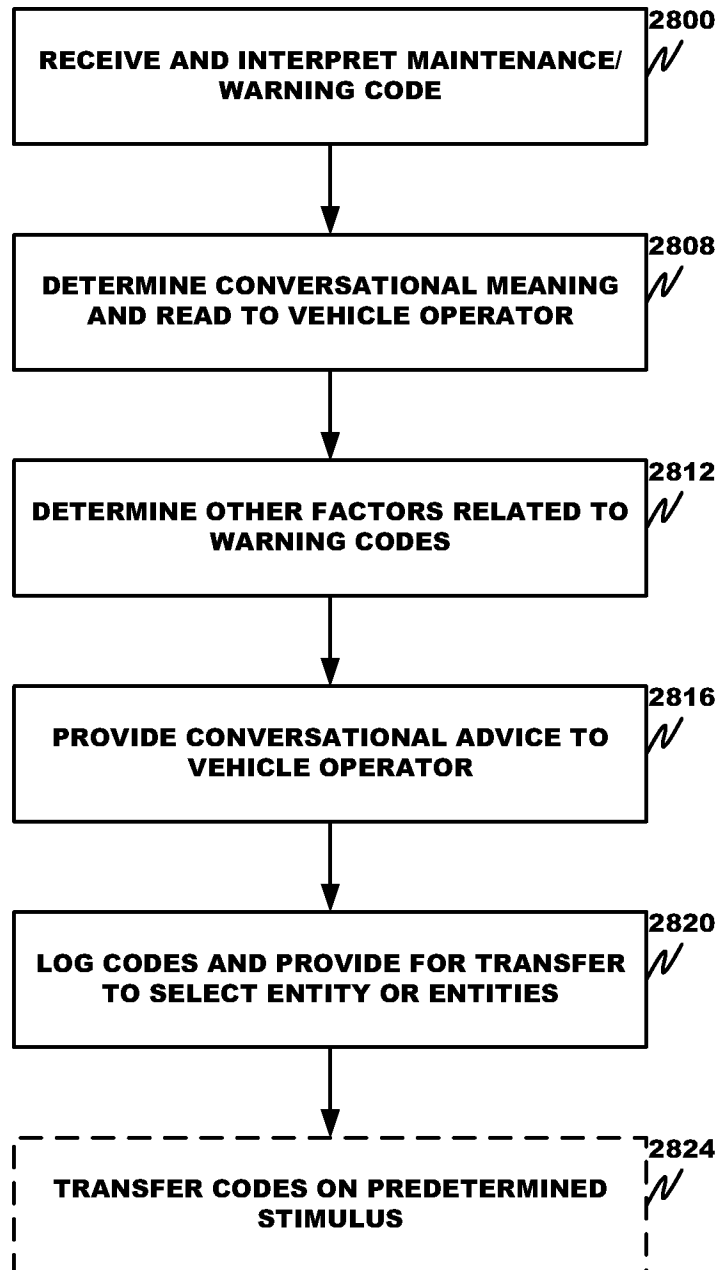


**FIG. 28**

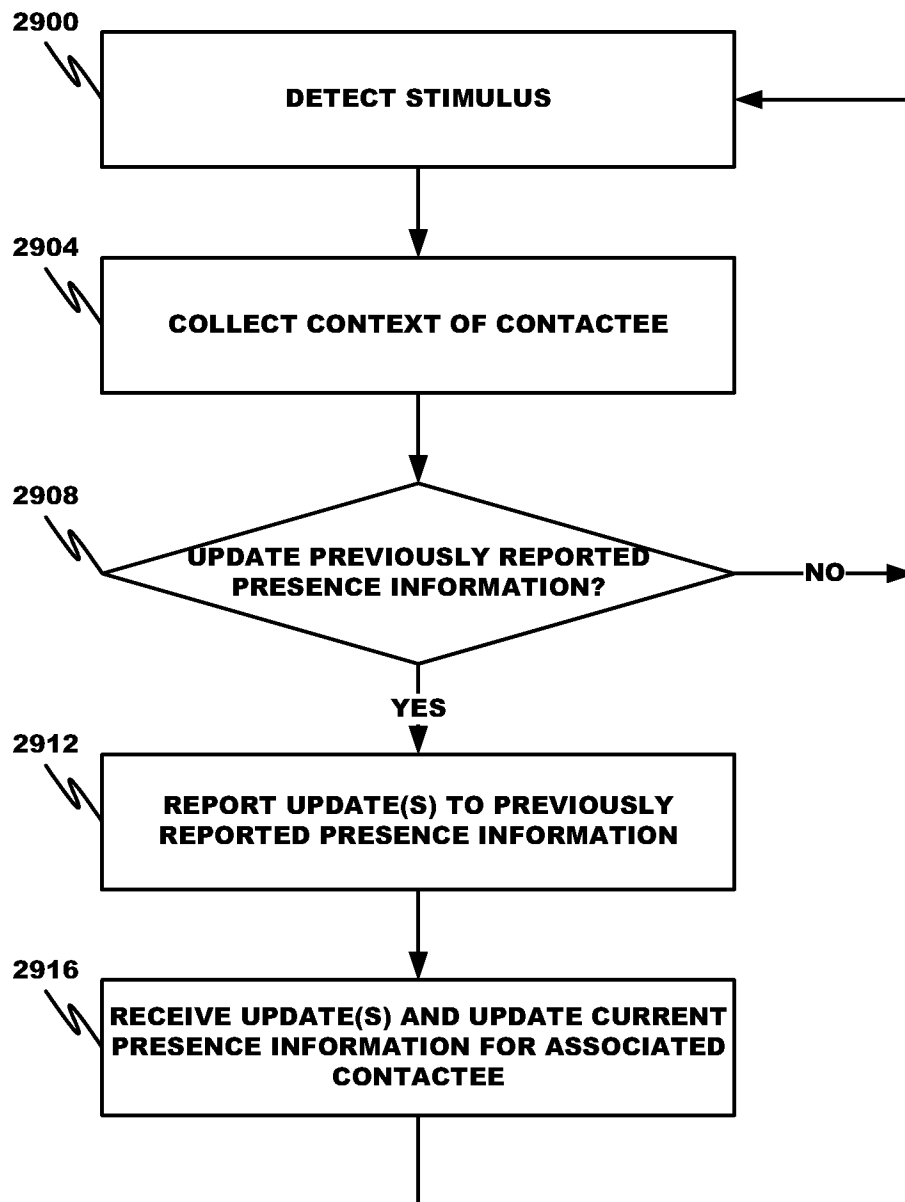


**FIG. 29**



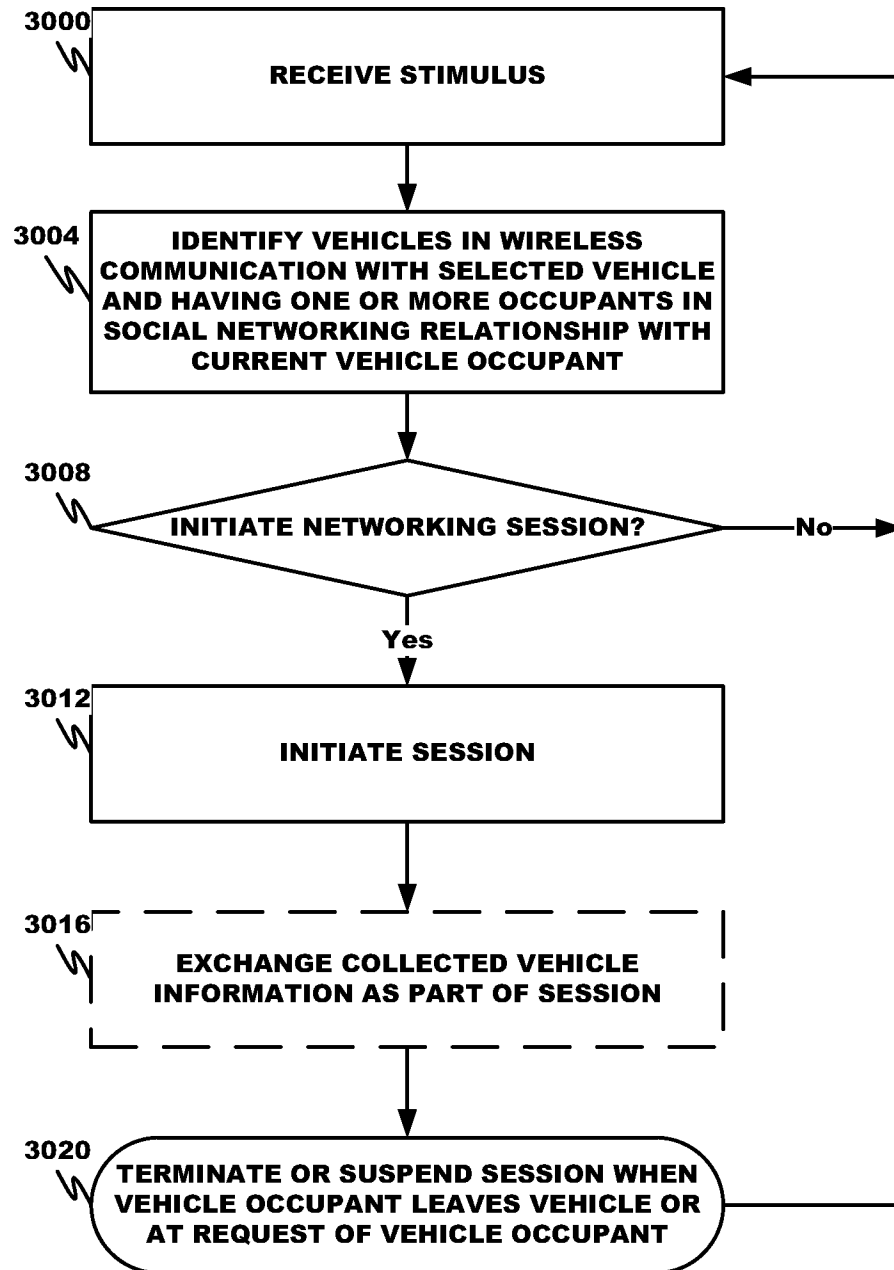


**FIG. 30**

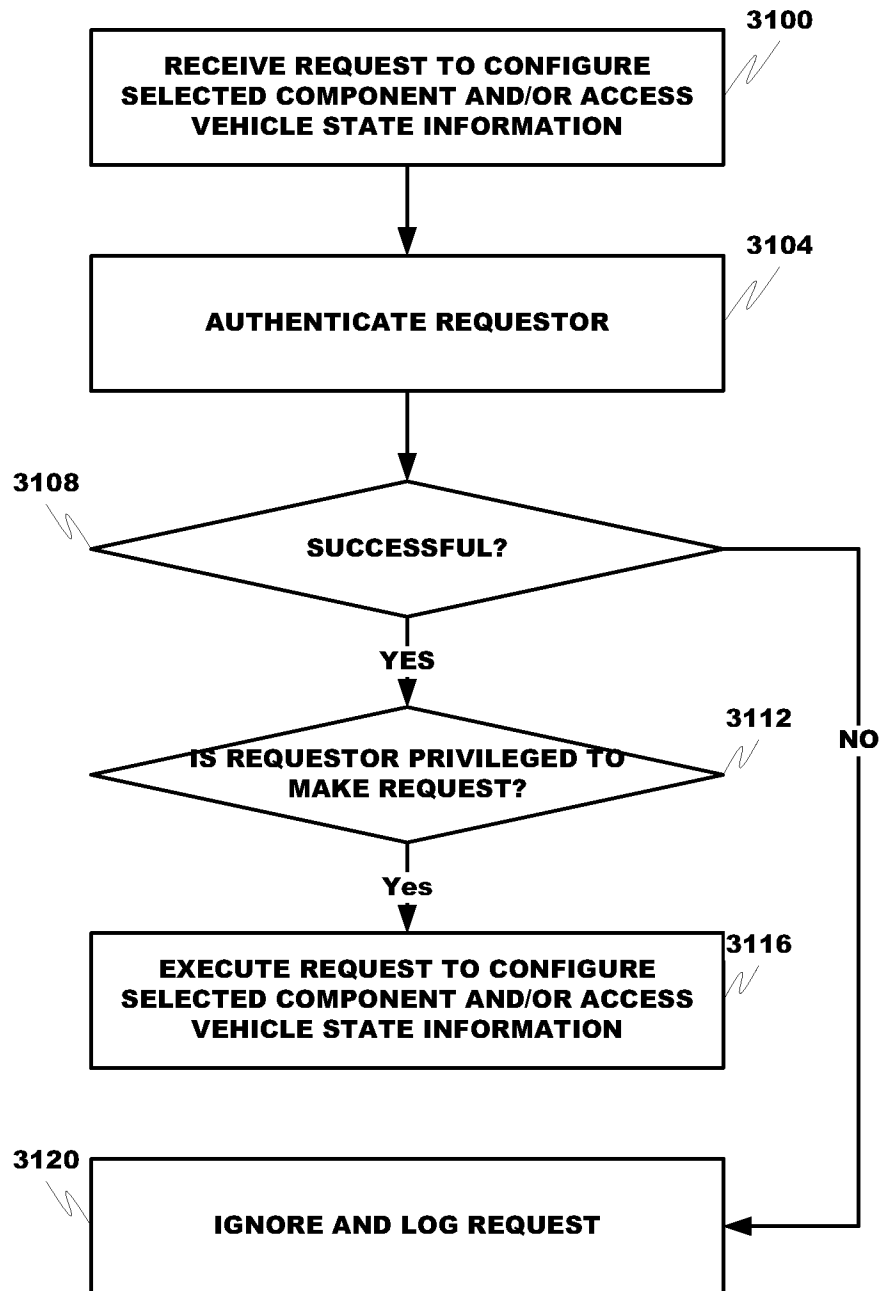


**FIG. 31**

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I hereby appoint:



Practitioners associated with Customer Number:

111285

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Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

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As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

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The address associated with Customer Number:

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OR

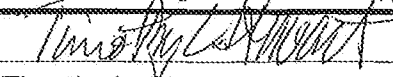
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| <input type="checkbox"/> | Firm or Individual Name |       |     |  |
|                          | Address                 |       |     |  |
|                          | City                    | State | Zip |  |
|                          | Country                 |       |     |  |
|                          | Telephone               | Email |     |  |

Assignee Name and Address: FLEXTRONICS AP, LLC  
847 Gibraltar Drive, Building 5  
Milpitas, CA 95035

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

#### SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

|           |                                                                                     |           |              |
|-----------|-------------------------------------------------------------------------------------|-----------|--------------|
| Signature |  | Date      | 12/10/2012   |
| Name      | Timothy L. Stewart                                                                  | Telephone | 408-576-7746 |
| Title     | Secretary                                                                           |           |              |

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 36 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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| <b>Application Number:</b>                  | 13828960                            |
| <b>International Application Number:</b>    |                                     |
| <b>Confirmation Number:</b>                 | 1085                                |
| <b>Title of Invention:</b>                  | ON BOARD VEHICLE NETWORK SECURITY   |
| <b>First Named Inventor/Applicant Name:</b> | Christopher P. Ricci                |
| <b>Customer Number:</b>                     | 111285                              |
| <b>Filer:</b>                               | Douglas W. Swartz/Christine Jacquet |
| <b>Filer Authorized By:</b>                 | Douglas W. Swartz                   |
| <b>Attorney Docket Number:</b>              | 6583-247-CIP-5                      |
| <b>Receipt Date:</b>                        | 22-APR-2013                         |
| <b>Filing Date:</b>                         |                                     |
| <b>Time Stamp:</b>                          | 18:17:28                            |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)         |

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| Document Number | Document Description | File Name                           | File Size(Bytes)/<br>Message Digest                 | Multi Part /.zip | Pages (if appl.) |
|-----------------|----------------------|-------------------------------------|-----------------------------------------------------|------------------|------------------|
| 1               |                      | 6583-247-CIP-5TransmittalAndPOA.pdf | 1072393<br>19a1b05e9e78c3047335e088d649358a067486c4 | yes              | 2                |

| Multipart Description/PDF files in .zip description |  |       |     |
|-----------------------------------------------------|--|-------|-----|
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| Transmittal Letter                                  |  | 1     | 1   |
| Power of Attorney                                   |  | 2     | 2   |

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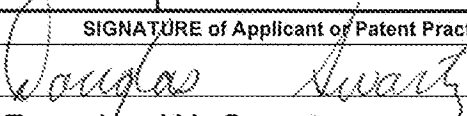
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**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

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**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**  
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

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**NOTE:** This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B or equivalent) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

|                                                      |                                                                                    |                |              |
|------------------------------------------------------|------------------------------------------------------------------------------------|----------------|--------------|
| Application Number                                   | 13/828,960                                                                         |                |              |
| Filing Date                                          | March 14, 2013                                                                     |                |              |
| First Named Inventor                                 | Christopher P. Ricci                                                               |                |              |
| Title                                                | ON BOARD VEHICLE NETWORK SECURITY                                                  |                |              |
| Art Unit                                             |                                                                                    |                |              |
| Examiner Name                                        |                                                                                    |                |              |
| Attorney Docket Number                               | 6583-247-CIP-5                                                                     | CONF. NO. 1085 |              |
| <b>SIGNATURE of Applicant or Patent Practitioner</b> |                                                                                    |                |              |
| Signature                                            |  | Date           | 4/22/13      |
| Name                                                 | Douglas W. Swartz                                                                  | Telephone      | 303-863-9700 |
| Registration Number                                  | 37,739                                                                             |                |              |

**NOTE:** This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications.

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| <b>PATENT APPLICATION FEE DETERMINATION RECORD</b><br>Substitute for Form PTO-875                                                                                                                                                                                                                                                                                                                          |                                                                 |                                    |                                                                                                                                                                                                                               |                    |                    | Application or Docket Number<br>13/828,960 |                    |                               |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|--------------------------------------------|--------------------|-------------------------------|--|
| <b>APPLICATION AS FILED - PART I</b>                                                                                                                                                                                                                                                                                                                                                                       |                                                                 |                                    |                                                                                                                                                                                                                               |                    |                    |                                            |                    |                               |  |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                 | (Column 2)                         |                                                                                                                                                                                                                               | SMALL ENTITY       |                    | OR<br>OTHER THAN SMALL ENTITY              |                    |                               |  |
| FOR                                                                                                                                                                                                                                                                                                                                                                                                        | NUMBER FILED                                                    | NUMBER EXTRA                       | RATE(\$)                                                                                                                                                                                                                      | FEE(\$)            |                    | RATE(\$)                                   | FEE(\$)            |                               |  |
| BASIC FEE<br>(37 CFR 1.16(a), (b), or (c))                                                                                                                                                                                                                                                                                                                                                                 | N/A                                                             | N/A                                | N/A                                                                                                                                                                                                                           |                    |                    | N/A                                        | 280                |                               |  |
| SEARCH FEE<br>(37 CFR 1.16(k), (l), or (m))                                                                                                                                                                                                                                                                                                                                                                | N/A                                                             | N/A                                | N/A                                                                                                                                                                                                                           |                    |                    | N/A                                        | 600                |                               |  |
| EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q))                                                                                                                                                                                                                                                                                                                                                           | N/A                                                             | N/A                                | N/A                                                                                                                                                                                                                           |                    |                    | N/A                                        | 720                |                               |  |
| TOTAL CLAIMS<br>(37 CFR 1.16(j))                                                                                                                                                                                                                                                                                                                                                                           | 24                                                              | minus 20 = *                       | 4                                                                                                                                                                                                                             |                    |                    | x 80 =                                     | 320                |                               |  |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h))                                                                                                                                                                                                                                                                                                                                                                     | 3                                                               | minus 3 = *                        |                                                                                                                                                                                                                               |                    |                    | x 420 =                                    | 0.00               |                               |  |
| APPLICATION SIZE FEE<br>(37 CFR 1.16(s))                                                                                                                                                                                                                                                                                                                                                                   |                                                                 |                                    | If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). |                    |                    | 0.00                                       |                    |                               |  |
| MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))                                                                                                                                                                                                                                                                                                                                                          |                                                                 |                                    |                                                                                                                                                                                                                               |                    |                    | 0.00                                       |                    |                               |  |
| * If the difference in column 1 is less than zero, enter "0" in column 2.                                                                                                                                                                                                                                                                                                                                  |                                                                 |                                    |                                                                                                                                                                                                                               | TOTAL              |                    | TOTAL                                      | 1920               |                               |  |
| <b>APPLICATION AS AMENDED - PART II</b>                                                                                                                                                                                                                                                                                                                                                                    |                                                                 |                                    |                                                                                                                                                                                                                               |                    |                    |                                            |                    |                               |  |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                 | (Column 2)                         |                                                                                                                                                                                                                               | (Column 3)         |                    | SMALL ENTITY                               |                    | OR<br>OTHER THAN SMALL ENTITY |  |
| AMENDMENT A                                                                                                                                                                                                                                                                                                                                                                                                | CLAIMS REMAINING AFTER AMENDMENT                                | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA                                                                                                                                                                                                                 | RATE(\$)           | ADDITIONAL FEE(\$) | RATE(\$)                                   | ADDITIONAL FEE(\$) |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Total<br>(37 CFR 1.16(i))                                       | *                                  | Minus **                                                                                                                                                                                                                      | =                  | x =                | x =                                        | =                  |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Independent<br>(37 CFR 1.16(h))                                 | *                                  | Minus ***                                                                                                                                                                                                                     | =                  | x =                | x =                                        | =                  |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Application Size Fee (37 CFR 1.16(s))                           |                                    |                                                                                                                                                                                                                               |                    |                    |                                            |                    |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                    |                                                                                                                                                                                                                               |                    |                    |                                            |                    |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                 |                                    |                                                                                                                                                                                                                               | TOTAL<br>ADD'L FEE |                    | TOTAL<br>ADD'L FEE                         |                    |                               |  |
| AMENDMENT B                                                                                                                                                                                                                                                                                                                                                                                                | CLAIMS REMAINING AFTER AMENDMENT                                | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA                                                                                                                                                                                                                 | RATE(\$)           | ADDITIONAL FEE(\$) | RATE(\$)                                   | ADDITIONAL FEE(\$) |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Total<br>(37 CFR 1.16(i))                                       | *                                  | Minus **                                                                                                                                                                                                                      | =                  | x =                | x =                                        | =                  |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Independent<br>(37 CFR 1.16(h))                                 | *                                  | Minus ***                                                                                                                                                                                                                     | =                  | x =                | x =                                        | =                  |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Application Size Fee (37 CFR 1.16(s))                           |                                    |                                                                                                                                                                                                                               |                    |                    |                                            |                    |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                    |                                                                                                                                                                                                                               |                    |                    |                                            |                    |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                 |                                    |                                                                                                                                                                                                                               | TOTAL<br>ADD'L FEE |                    | TOTAL<br>ADD'L FEE                         |                    |                               |  |
| * If the entry in column 1 is less than the entry in column 2, write "0" in column 3.<br>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".<br>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".<br>The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1. |                                                                 |                                    |                                                                                                                                                                                                                               |                    |                    |                                            |                    |                               |  |



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|-----------------------|--------------------------|-----------------|---------------|-----------------|------------|------------|
| 13/828,960            | 03/14/2013               | 2117            | 1508          | 6583-247-CIP-5  | 24         | 3          |

CONFIRMATION NO. 1085

111285  
Sheridan Ross P.C.  
1560 Broadway  
Suite 1200  
Denver, CO 80202

## FILING RECEIPT



\*OC000000061173693\*

Date Mailed: 05/20/2013

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

### Inventor(s)

Christopher P. Ricci, Saratoga, CA;

### Applicant(s)

Flextronics AP, LLC, San Jose, CA

### Assignment For Published Patent Application

Flextronics AP, LLC, San Jose, CA

**Power of Attorney:** The patent practitioners associated with Customer Number 111285

### Domestic Priority data as claimed by applicant

This application is a CIP of 13/679,476 11/16/2012  
which claims benefit of 61/560,509 11/16/2011  
and claims benefit of 61/637,164 04/23/2012  
and claims benefit of 61/663,335 06/22/2012  
and claims benefit of 61/646,747 05/14/2012  
and claims benefit of 61/653,275 05/30/2012  
and claims benefit of 61/653,264 05/30/2012  
and claims benefit of 61/653,563 05/31/2012  
and claims benefit of 61/672,483 07/17/2012  
and claims benefit of 61/714,016 10/15/2012  
and claims benefit of 61/715,699 10/18/2012

**Foreign Applications** for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

*Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.*



**If Required, Foreign Filing License Granted:** 05/10/2013

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/828,960**

**Projected Publication Date:** 08/29/2013

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

ON BOARD VEHICLE NETWORK SECURITY

**Preliminary Class**

714

**Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:**

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|--------------------|-----------------------|-----------------------|------------------------|
| 13/828,960         | 03/14/2013            | Christopher P. Ricci  | 6583-247-CIP-5         |

**CONFIRMATION NO. 1085**

**POA ACCEPTANCE LETTER**



111285  
Sheridan Ross P.C.  
1560 Broadway  
Suite 1200  
Denver, CO 80202

Date Mailed: 05/20/2013

## NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/22/2013.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/fstephanos/

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|-------------|--------------|---------------|---------------------|
| 13828960    | APP.FILE.REC | 05/20/2013    | 6583-247-CIP-5      |
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|--------------------|-----------------------|-----------------------|------------------------|
| 13/828,960         | 03/14/2013            | Christopher P. Ricci  | 6583-247-CIP-5         |

**CONFIRMATION NO. 1085**

## PUBLICATION NOTICE



\*OC00000063506066\*

111285  
Sheridan Ross P.C.  
1560 Broadway  
Suite 1200  
Denver, CO 80202

**Title:**ON BOARD VEHICLE NETWORK SECURITY

**Publication No.**US-2013-0227648-A1

**Publication Date:**08/29/2013

## NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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|                                                                                                                                          |   |    |   | Application Number       | 13/828,960          |
|                                                                                                                                          |   |    |   | Filing Date              | March 14, 2013      |
|                                                                                                                                          |   |    |   | First Named Inventor     | Christopher Ricci   |
|                                                                                                                                          |   |    |   | Art Unit                 | 2432                |
|                                                                                                                                          |   |    |   | Examiner Name            | Gilberto Barron Jr. |
| Sheet                                                                                                                                    | 1 | of | 4 | Attorney Docket Number   | 6583-247-CIP-5      |

| U.S. PATENT DOCUMENTS |                       |                                                             |                                |                                                    |                                                                                 |
|-----------------------|-----------------------|-------------------------------------------------------------|--------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------|
| Examiner Initials*    | Cite No. <sup>1</sup> | Document Number<br>Number-kind Code <sup>2</sup> (if known) | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, Columns, Lines, Where<br>Relevant Passages or Relevant<br>Figures Appear |
|                       | 1                     | 5794164                                                     | 08/11/1998                     | Beckert et al.                                     |                                                                                 |
|                       | 2                     | 6484082                                                     | 11/19/2002                     | Millsap et al.                                     |                                                                                 |
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|                       | 5                     | 7295921                                                     | 11/13/2007                     | Spencer et al.                                     |                                                                                 |
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|                       | 8                     | RE41449                                                     | 07/20/2010                     | Krahnstoeve et al.                                 |                                                                                 |
|                       | 9                     | 7891004                                                     | 02/15/2011                     | Gelvin et al.                                      |                                                                                 |
|                       | 10                    | 2005/0149752                                                | 07/07/2005                     | Johnson et al.                                     |                                                                                 |
|                       | 11                    | 2006/0042846                                                | 03/02/2006                     | Kojori et al.                                      |                                                                                 |
|                       | 12                    | 2006/0125631                                                | 06/15/2006                     | Sharony                                            |                                                                                 |
|                       | 13                    | 2006/0250272                                                | 11/09/2006                     | Puamau                                             |                                                                                 |
|                       | 14                    | 2008/0140278                                                | 06/12/2008                     | Breed                                              |                                                                                 |
|                       | 15                    | 2008/0148374                                                | 06/19/2008                     | Spaur et al.                                       |                                                                                 |
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|                                                                                                                                          |   |    |   | Examiner Name            | Gilberto Barron Jr. |
| Sheet                                                                                                                                    | 2 | of | 4 | Attorney Docket Number   | 6583-247-CIP-5      |

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| Examiner<br>Signature |    |              |            | Date<br>Considered |  |

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| Sheet                                                                                                                                    | 3 | of | 4 | Attorney Docket Number   | 6583-247-CIP-5      |

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| Examiner Initials*                | Cite No. <sup>1</sup> | Document Number<br>Number-kind Code <sup>2</sup> (if known) | Filing Date<br>MM-DD-YYYY | Name of Applicant<br>of Cited Document | Pages, Columns, Lines, Where<br>Relevant Passages or Relevant<br>Figures Appear |
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|--------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------|----------------|
| Examiner Initials*       | Cite No. <sup>1</sup> | Foreign Patent Document<br>Country Code <sup>3</sup> ; Number <sup>4</sup> ; Kind Code <sup>5</sup> (if known) | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, Columns, Lines, Where<br>Relevant Passages or<br>Relevant Figures<br>Appear | T <sup>6</sup> |
| Examiner Signature       |                       |                                                                                                                |                                | Date Considered                                    |                                                                                    |                |

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| Sheet                                                                                                                                    | 4 | of | 4 | Attorney Docket Number   | 6583-247-CIP-5      |

| NON-PATENT LITERATURE DOCUMENTS |                       |                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Examiner Initials*              | Cite No. <sup>1</sup> | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published. |
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## 2013 XTS

HIGHLIGHTS

CUE

SAFETY

PERFORMANCE

INTERIOR

EXTERIOR

SHOPPING TOOLS

## 2013 XTS LUXURY SEDAN

FROM \$44,075 - \$61,805

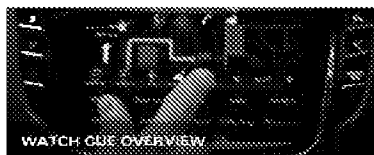
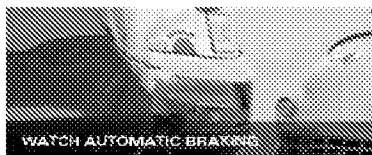
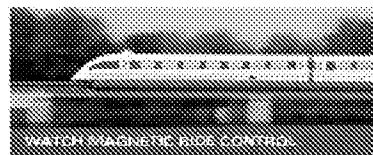
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From the innovative CUE® driver interface, which leaps two generations ahead, to its groundbreaking safety technology, the all-new Cadillac XTS is a bold look at what the future holds. Its provocative profile pulls you in, while our revolutionary dual-mode Magnetic Ride Control and 304 HP underfoot provide immediate exhilaration. Stunningly modern, yet meticulously crafted. Powerful, yet efficient. Tautly proportioned, yet spacious. Explore the XTS and discover a car that not only moves you, but accelerates you well into tomorrow.

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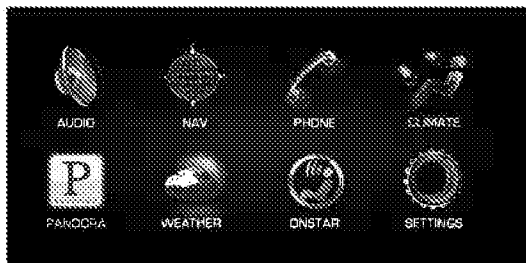
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## CUE

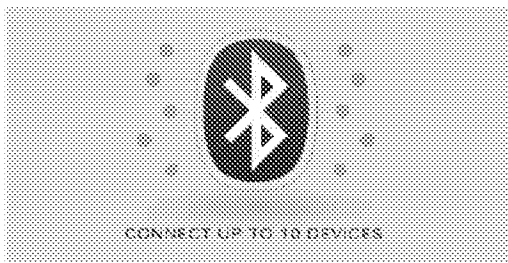
## THE FUTURE IS HERE, AND IT'S EFFORTLESS.

Speak, and let Natural Voice Recognition help you place a phone call. Spread your fingers to zoom into a map. Swipe to breeze through music. The simplicity of a tablet has come to your car.



## DEVICE SYNCHRONIZATION

With CUE®, the Cadillac User Experience, you're connected to a world of content. Pair up to ten Bluetooth®-enabled smartphones and effortlessly access all your contacts and wirelessly stream music. Then, place a call or select a song on command with CUE's Natural Voice Recognition.



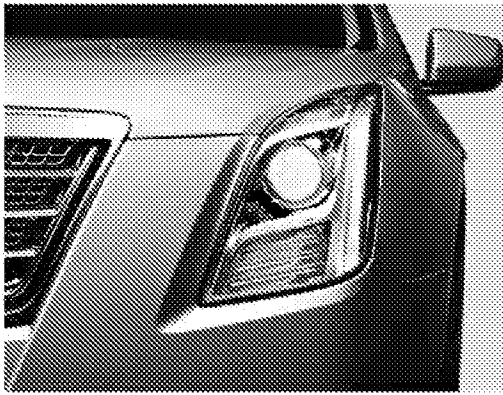
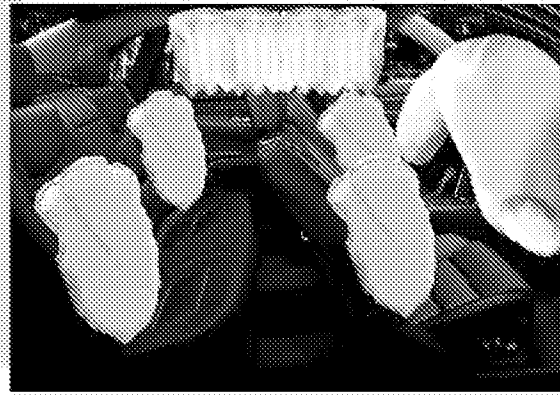
## SAFETY

## ADAPTIVE FORWARD LIGHTING

To help light the way at night, the XTS is available with Adaptive Forward Lighting. Employing sensors to determine the car's speed and steering, the headlamps swivel to cast light precisely into your path of travel.

## AIRBAGS

With ten standard airbags®, the all-new XTS is as defensive as it is dynamic. It even includes the added protection of progressive driver and front-passenger knee airbags. Not because it's required, but because it's a Cadillac.



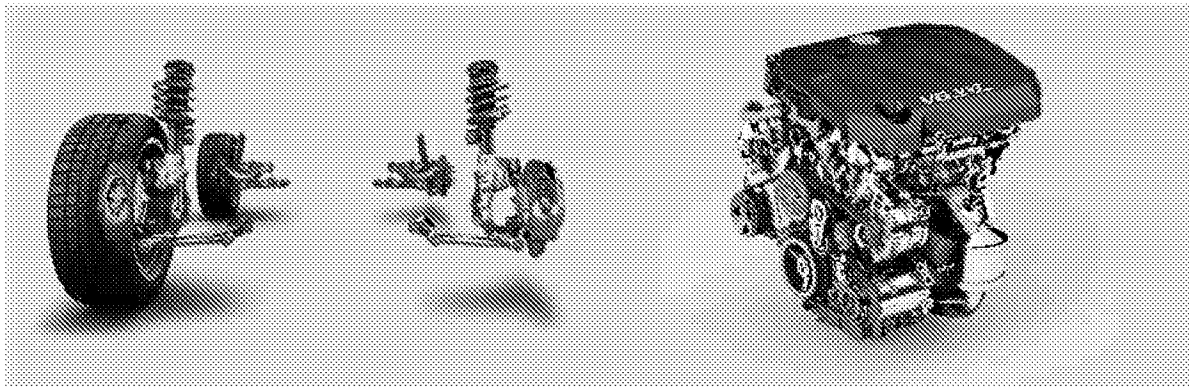
## PERFORMANCE

### ADVANCED SUSPENSION TECHNOLOGY

Our revolutionary dual-mode Magnetic Ride Control works in tandem with cutting-edge HiPer Strut technology to adjust seamlessly to the road and help keep the tires keyed to the surface. The result is a flawless ride—however refined or athletic you desire.

### 3.6L V6 ENGINE

Powerful yet remarkably efficient, the all-new XTS delivers an exhilarating driving experience with a refined 304 HP 3.6L direct-injection V6 engine. When you call for power, the XTS answers immediately.



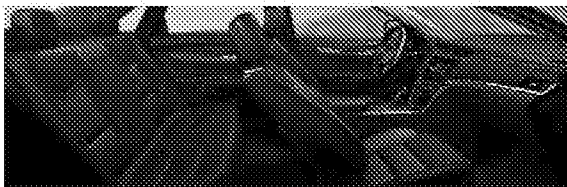
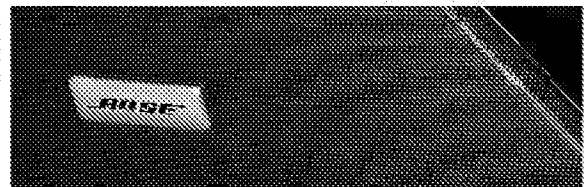
## INTERIOR

### PASSENGER COMFORT

The cabin in the all-new XTS rewards each passenger individually. Pressure-mapping technology was used extensively to optimize front-seat comfort, and rear passengers enjoy separate control of the available tri-zone climate system.

### BOSE STUDIO SURROUND SOUND SYSTEM

Welcome to your personal concert hall. Indulge your auditory senses with the available 14-speaker Bose® Studio Surround® Sound system designed exclusively for the XTS. Complete with two Personal® speakers on the top of each front seat, the sound not only surrounds, it immerses.

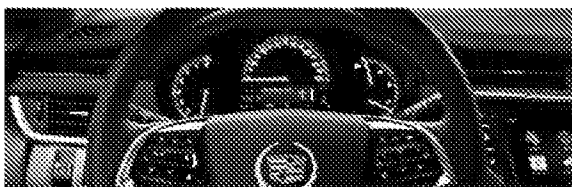


### HEATED STEERING WHEEL

The welcome warmth of an available heated steering wheel is the perfect antidote for a cold winter morning.

### INTELLIGENTLY DESIGNED STORAGE

From the smartly placed mobile device holder to the center control panel that ingeniously glides open, every millimeter of the XTS reveals yet another brilliantly engineered space.



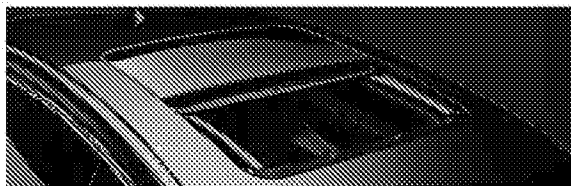
### PLATINUM COLLECTION INTERIOR GALLERY

To understand just how far we've gone, look no further than the XTS Platinum Collection. Perforated Opus full-leather seats are renowned for their supple feel, while highly polished premium wood trim is so deeply grained it takes on extra dimension. A luxurious microfiber sueded headliner frames the expansive UltraView sunroof, a standard feature in the Platinum Collection.

## EXTERIOR

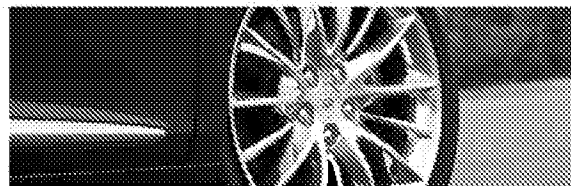
### ULTRAVIEW SUNROOF

The same approximate size as a 45-inch flat-panel television, the available UltraView sunroof spans both rows of seats and offers a view that exceeds high-definition.



### WHEEL DESIGN

Stunning 20-inch wheels are standard on the Platinum Collection and available on the Premium Collection<sup>1</sup>, while an artful 19-inch design completes the Luxury Collection. Proof that the finishing touches keep on going.



### PLATINUM COLLECTION EXTERIOR GALLERY

The Platinum Collection takes the design of the XTS to an even higher level. Exterior touches like its unique grille and dynamic 20-inch wheels are clear signals to those in the know that it is something very special.

## NEXT STEPS FOR YOUR XTS

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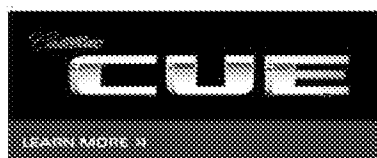
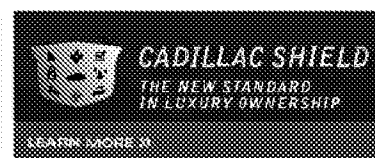
### OTHER CADILLAC SEDANS:



CTS SPORT SEDAN



CTS-V SEDAN



<sup>1</sup> The Manufacturer's Suggested Retail Price excludes destination freight charge, tax, title, license, dealer fees and optional equipment. [Click here to see all Cadillac vehicles' destination freight charges.](#)

<sup>2</sup> EPA-estimated mpg 17 city / 26 highway, FWD. EPA-estimated mpg 17 city / 26 highway, AWD.

<sup>3</sup> With available navigation system.

<sup>4</sup> Late availability.

5. Always use safety belts and the correct restraint for your child's age and size. Even in vehicles equipped with the Passenger Sensing System, children are safer when properly secured in a rear seat in the appropriate infant, child or booster seat. Never place a rear-facing infant restraint in the front seat of any vehicle equipped with a passenger air bag. See the Owner's Manual and child safety seat instructions for more safety information.

7. Full functionality requires compatible Bluetooth and smartphone. Some devices require USB connectivity.

.....

CNET Reviews

# Cadillac revamps the instrument panel with CUE

New CUE (Cadillac User Experience) instrument panel utilizes a number of technologies popularized by smartphones and tablets. It has a large touch screen in the middle that uses multitouch gestures and a proximity sensor so that it knows when your hand is approaching.

by **Nicole Lee** | October 11, 2011 9:00 PM PDT



SAN DIEGO--Cadillac has introduced a new central instrument panel that features touch-screen technology popularized by smartphones and tablets. The fully capacitive faceplate has an 8-inch touch screen that utilizes multitouch gestures to interact with it. Cadillac says this sets it apart from other **car** [<http://reviews.cnet.com/car-tech/>] in-dash units that have an overabundance of buttons and controls.



CUE stands for Cadillac User Experience.

(Credit: Cadillac)

The instrument panel is called CUE and it stands for Cadillac User Experience. In addition to a touch screen that lets you tap, swipe, and pinch in and out, it also has a proximity sensor so that when your hand approaches the screen, certain shortcut icons will appear. You can also enable haptic feedback, so that the screen pulses when you select something. Aside from the touch screen, the overall interface features fewer buttons, large icons, and natural voice recognition. You can pair up to 10 Bluetooth devices to it, and it's also compatible with USB keys, SD cards, and, of course, the **iPod** <http://www.cnet.com/ipod/1> or iPhone. The entire faceplate opens up to reveal a 1.8L storage area as well.



Cadillac's CUE playing a song. Note the app tray at the top and the scrolling ticker of favorite functions along the bottom row.

(Credit: Cadillac)

The main home screen of the CUE display features the five most frequently used functions along the top of the screen in an app tray. These buttons can be customized with any function or shortcut the driver wants. Drivers can also select up to 60 favorite points of interest, music files, addresses, maps, directions, phone numbers, and system commands to scroll along the bottom row of the screen. If you want to keep your hands on the wheel, the steering wheel has several physical controls to help you navigate



through the cluster display, cruise control functions, volume, and more. You still get access to OnStar's suite of services if you decide to sign up for it.

CUE runs on a version of Linux and uses an ARM 11 3-core processor, which Cadillac says offers 3.5 times more processing power than its competitors. The open nature of the platform lets developers write applications for CUE in the future.

Other features of CUE include weather maps with Doppler radar, 3D turn-by-turn navigation maps, a customizable gauge cluster, AM/FM/HD and XM radio, two USB ports, an SD card slot, Bluetooth with A2DP streaming, Pandora and Stitcher support, and more.

[\[http://www.cnet.com/profile/Nicole+Lee/\]](http://www.cnet.com/profile/Nicole+Lee/)



[\[http://www.cnet.com/profile/Nicole+Lee/\]](http://www.cnet.com/profile/Nicole+Lee/)

or associate editor for CNET, covering cell phones, Bluetooth  
ngs mobile. She's also a fan of comic books, video games, and of  
course, shiny gadgets.



[\[http://plus.google.com/116927391465690022495/\]](http://plus.google.com/116927391465690022495/)

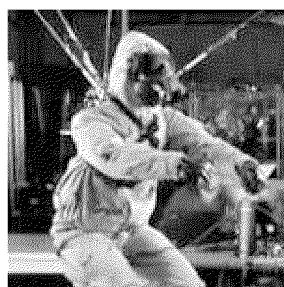
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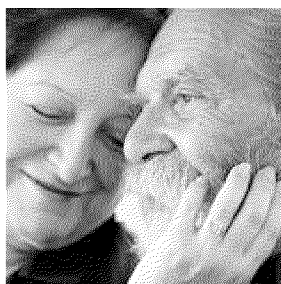


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### Petman robot rocks gas mask, chemical suit

CNET

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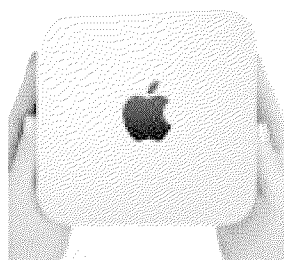


[suit/1](#)

### 4 Bodily Signs a Heart Attack is Near

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[\[http://www.newsmax.com/MKTNews/things-feel-before-heart-attack/2012/10/15/id/464302?](http://www.newsmax.com/MKTNews/things-feel-before-heart-attack/2012/10/15/id/464302?)



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## Our Perspective: Blog

### General Motors Takes a CUE from Customers

by Larry Marturano

November 8th, 2011

It's always exciting for us to see what we call [practical innovation in action](#)—companies leveraging existing and emerging technologies with their own unique skills and capabilities and doing the “next right thing” for their customers. And when it's all the product of a well-executed customer-centered design strategy—especially one we've been able to influence—it's particularly satisfying.

So it was exciting to see General Motors announce their next generation driver experience this month. The “Cadillac User Experience,” or CUE for short, will appear on flagship Cadillac brand products beginning in 2012. With CUE, Cadillac integrates the car's infotainment systems with a truly modern user interface. Combining touch and haptic feedback, natural language voice interaction, proximity sensing and judicious use of buttons and controls, CUE enriches in-car information, communication, navigation, and entertainment, while at the same time simplifying the interaction and tailoring it to the driving experience.

CUE is revolutionary in the automobile industry, introducing a number of capabilities for the first time. The 8-inch capacitive touchscreen center stack display features multi-touch and haptic feedback. The display shows a simplified set of icons and information to minimize distraction during normal driving, but when the integrated proximity sensor detects a finger approaching it, richer information and controls are automatically shown. The 12-inch LCD cluster display is easily reconfigurable to match your driving style. Media from up to 10 connected devices and drives are aggregated and can be navigated and accessed as one library. The speech interface allows your emails and texts to be read to you—and for you to respond, without ever having to take your eyes off the road.

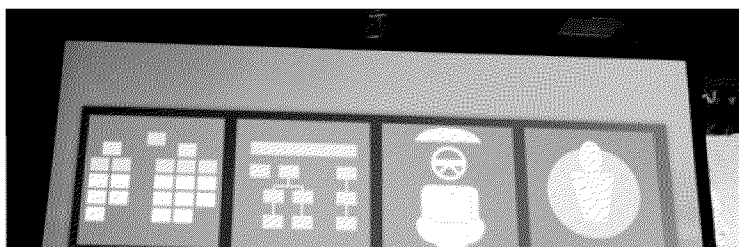
It is quite unlike anything yet seen in automotive interfaces—more akin to the iPad than a car. No doubt to underscore this break from the past, GM chose to announce CUE not at an automotive event, but at CTIA, the main wireless telecommunication industry conference.

Early reviews based on pre-production units has been overwhelmingly positive: “*CUE has the potential to be a real game changer*” (*Motor Trend*), “*Smartphone and tablet manufacturers should take note—this car manufacturer just showed you how to do car mode*” (*Android Central*), “*...it could prove to be a huge improvement over the convoluted control knobs on German and Japanese luxury cars.*” (*Forbes*).

The design of CUE started with a joint InContext/GM exploration of the attitudes, values and behaviors of 32 drivers in four North American cities, with a focus on information, navigation, entertainment and communication. It's been particularly gratifying for us to see how much value GM places on the customer-centered philosophy that underlies CUE's design—even in the press release that accompanied the announcement:

*“CUE development began in 2008 when Cadillac designers rode with 32 consumers for six months to study driver habits. Engineers and designers then used the data to develop CUE.”*

They even explicitly called out the Contextual Design models they used in their CTIA presentation:



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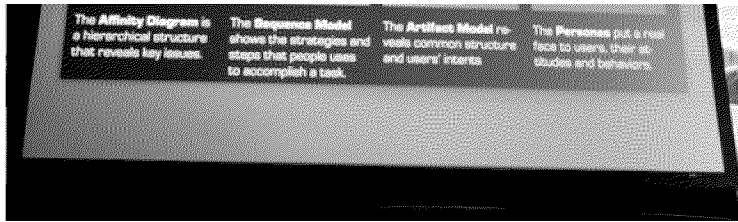
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In addition to generating the core design concepts, the study also generated the ideas for some of the underlying technology as well—in a published paper describing the user research, GM notes:

*"The Contextual Design effort described here provided significantly more innovation to our infotainment and telematics systems design than GM's previous user-centered design methods of relying on the collective experience and wisdom of the designers/engineers and conducting usability tests to incrementally improve a design. This project alone resulted in over 180 new design ideas, from which 33 patent submissions were presented for approval, 8 were approved for patent filing, and 3 had defensive publications written."*

Of course, the initial customer data gathering and concept creation were only a small part of the huge effort that went into executing CUE. Still, driving innovation of this kind is what gets us all up in the morning and it's very satisfying to see front end research, ideation and requirements definition executed so well as part of a long term experience strategy.

From a new product development point of view, there is a larger and very important point that is illustrated with CUE: significant innovation can and does result from a well-executed, integrated development effort incorporating customer-centered design. A common criticism of user-centered design is that "asking people what they want" simply results in incremental innovation. And I think that is probably true—except that user-centered design isn't about asking people what they want. It's about understanding the intents, behaviors and attitudes of the people who will use your product, and then using your own design and domain expertise to create solutions that support their lives, even if it means restructuring and improving what they do and how they do it. It's about redesigning products and—in the most elegant and profound designs—redesigning lives.

CUE is an innovative, bold step. It represents a practical combination of best-in-class interaction design and technology from computing and telecom and combines it with GM's particular expertise in automotive engineering and design. Time will tell, but I believe it truly is the right next step for them. Kudos to the GM product planners, engineers, designers and management for trusting customer-centered design and for making such a courageous break with the status quo.

Tags:



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No comments yet

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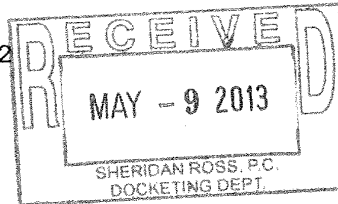
## PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

TADD F. WILSON  
SHERIDAN ROSS P.C.  
1560 BROADWAY  
SUITE 1200  
DENVER, CO 80202



NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT AND  
THE WRITTEN OPINION OF THE INTERNATIONAL  
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

|                                                       |                                                                             |
|-------------------------------------------------------|-----------------------------------------------------------------------------|
| Applicant's or agent's file reference<br>6583-244-PCT | Date of mailing<br>(day/month/year) <b>06 MAY 2013</b>                      |
| International application No.<br>PCT/US 12/65510      | International filing date<br>(day/month/year) 16 November 2012 (16.11.2012) |
| Applicant FLEXTRONICS AP, LLC                         |                                                                             |

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

**Filing of amendments and statement under Article 19:**

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

**When?** The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

**Where?** Directly to the International Bureau of WIPO, 34 chemin des Colombettes  
1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

**For more detailed instructions,** see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

**4. Reminders**

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

For details about the applicable time limits, Office by Office, see [www.wipo.int/pct/en/texts/time\\_limits.html](http://www.wipo.int/pct/en/texts/time_limits.html) and the *PCT Applicant's Guide*, National Chapters.

|                                                                                                                                                                                 |                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Name and mailing address of the ISA/<br>Mail Stop PCT, Attn: ISA/US<br>Commissioner for Patents<br>P.O. Box 1450, Alexandria, Virginia 22313-1450<br>Facsimile No. 571-273-3201 | Authorized officer<br><br>Lee W. Young<br><br>PCT Helpdesk: 571-272-4300<br>Telephone No. PCT OSP: 571-272-7774 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|                                                       |                                                                                      |                                                                                     |
|-------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Applicant's or agent's file reference<br>6583-244-PCT | <b>FOR FURTHER<br/>ACTION</b>                                                        | see Form PCT/ISA/220<br>as well as, where applicable, item 5 below.                 |
| International application No.<br>PCT/US 12/65510      | International filing date ( <i>day/month/year</i> )<br>16 November 2012 (16.11.2012) | (Earliest) Priority Date ( <i>day/month/year</i> )<br>16 November 2011 (16.11.2011) |
| Applicant<br>FLEXTRONICS AP, LLC                      |                                                                                      |                                                                                     |

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☒ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 1

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/65510

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:  
See extra sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
Claims 1-30, 41-70, 81-90, and 101-110

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/65510

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G01M 17/00 (2013.01); G06F 7/00 (2013.01)

USPC - 701/31.5

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

USPC: 701/31.5; IPC(8): G01M 17/00 (2013.01); G06F 7/00 (2013.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
USPC: 701/1, 31.4, 31.5, 468, 484-487; 342/450; IPC(8): G01M 17/00 (2013.01); G06F 7/00 (2013.01)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Google Scholar; Google Web; Google Patents; PatBase.

Search Terms: vehicle, car, signal, communicate, reject, deny, ignore, connect, bus, hotspot, transceiver, BLUETOOTH, antenna, wireless, local area network, weight, originate, inside, within, character, feature, location, person, user, passenger, driver, move, sense

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                    | Relevant to claim No.         |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Y         | US 2010/0097239 A1 (Campbell et al.) 22 April 2010 (22.04.2010), entire document, especially para [0007], [0040]-[0041], [0045], [0053], [0055], [0059], [0061], [0064]-[0065], [0068]-[0070], [0075], [0083], [0087]-[0088], [0090], [0099], [0108]-[0109], [0116]-[0117], [0120], [0125], [0131]-[0132], [0135], [0137], [0139], [0141] 1-30, 41-70, 81-90, 101-110 | 1-30, 41-70, 81-90, 101-110   |
| Y         | US 2010/0090817 A1 (Yamaguchi et al.) 15 April 2010 (15.04.2010), entire document, especially para [0008]                                                                                                                                                                                                                                                             | 1-30, 41-70, 81-90, 101-110   |
| Y         | US 2010/0144284 A1 (Chutorash et al.) 10 June 2010 (10.06.2010), entire document, especially para [0027], [0033], [0045], [0053], [0062]                                                                                                                                                                                                                              | 2-15, 17-20, 48, 51-55, 57-60 |
| Y         | US 2011/0105097 A1 (Tadayon et al.) 05 May 2011 (05.05.2011), entire document, especially para [0069]                                                                                                                                                                                                                                                                 | 10, 20                        |
| Y         | US 2009/0278750 A1 (Man et al.) 12 November 2009 (12.11.2009), entire document, especially para [0019]                                                                                                                                                                                                                                                                | 21-30, 61-70                  |
| A         | US 2008/0148374 A1 (Spaur et al.) 19 June 2008 (19.06.2008), entire document                                                                                                                                                                                                                                                                                          | 1-30, 41-70, 81-90, 101-110   |
| A         | US 2011/0112969 A1 (Zald et al.) 12 May 2011 (12.05.2011), entire document                                                                                                                                                                                                                                                                                            | 1-30, 41-70, 81-90, 101-110   |

☐ Further documents are listed in the continuation of Box C.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

29 March 2013 (29.03.2013)

Date of mailing of the international search report

06 MAY 2013

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents  
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300

PCT 571-272-7774

Ford Ex. 1002 Page 170 of 1178

Continuation of Box No. III: Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

Reasons for Lack of Unity of Invention:

This application contains the following inventions or groups of inventions that are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group 1: Claims 1-30, 41-70, 81-90, and 101-110 directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising receiving a signal at a vehicle communication system from a device, automatically determining if the signal originates from inside the vehicle and if the signal does not originate from inside the vehicle, rejecting the signal, but if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device.

Group 2: Claims 31-40, 71-80, 91-100 and 111-120 directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising a vehicle communication system to receive a request for a function/application, determine one or more of available resources, available devices and available sources, determine load/cloud service/multimedia service, select/command a device or source to provide/activate the function/application/cloud service/multimedia service.

The inventions listed as Groups 1 - 2 do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical feature of the Group 1 invention is directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising receiving a signal at a vehicle communication system from a device, automatically determining if the signal originates from inside the vehicle and if the signal does not originate from inside the vehicle, rejecting the signal, but if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device.

The special technical feature of the Group 2 invention is directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising a vehicle communication system to receive a request for a function/application, determine one or more of available resources, available devices and available sources, determine load/cloud service/multimedia service, select/command a device or source to provide/activate the function/application/cloud service/multimedia service.

The only common technical feature shared by the above groups is a vehicle communication system.

However, this shared technical feature does not represent a contribution over prior art, because the shared technical feature is anticipated/made obvious by reference US 7,548,815 B2 to Watkins et al. (Published on 16 June 2009) that discloses a vehicle communication system in Abstract, col 8, ln 10-18 (Vehicle system module 290 contains one or more processors, one or more memory devices, and one or more connection ports. In one embodiment, VSM 290 includes a software switch for scanning received information such as, for example, real-time traffic updates and location information to identify that data has been received. VSM 290 is coupled to a vehicle communication network 212, and therefore to any other device that is also coupled to vehicle communication network 212).

As the above technical feature of vehicle communication system as taught by Watkins et al was known, this cannot be considered a special technical feature that would otherwise unify the groups.

Therefore, the inventions of Groups 1-2 lack unity of invention under PCT Rule 13 because they do not share a same or corresponding special technical feature.

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To: TADD F. WILSON  
SHERIDAN ROSS P.C.  
1560 BROADWAY  
SUITE 1200  
DENVER, CO 80202

# PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year)

**06 MAY 2013**

Applicant's or agent's file reference  
**6583-244-PCT**

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.  
**PCT/US 12/65510**

International filing date (day/month/year)  
**16 November 2012 (16.11.2012)**

Priority date (day/month/year)  
**16 November 2011 (16.11.2011)**

International Patent Classification (IPC) or both national classification and IPC  
**IPC(8) - G01M 17/00 (2013.01); G06F 7/00 (2013.01)**  
**USPC - 701/31.5**

Applicant **FLEXTRONICS AP, LLC**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US  
Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450, Alexandria, Virginia 22313-1450  
Facsimile No. 571-273-3201

Date of completion of this opinion  
**29 March 2013 (29.03.2013)**

Authorized officer:  
**Lee W. Young**

PCT Helpdesk: 571-272-4300  
PCT OSP: 571-272-7774

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US 12/65510

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
  - ☒ the international application in the language in which it was filed.
  - ☐ a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
  - a. (means)
    - ☐ on paper
    - ☐ in electronic form
  - b. (time)
    - ☐ in the international application as filed
    - ☐ together with the international application in electronic form
    - ☐ subsequently to this Authority for the purposes of search
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 12/65510

**Box No. IV Lack of unity of invention**

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
- ☐ paid additional fees
  - ☐ paid additional fees under protest and, where applicable, the protest fee
  - ☐ paid additional fees under protest but the applicable protest fee was not paid
  - ☒ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

☐ complied with

☒ not complied with for the following reasons:

Reasons for Lack of Unity of Invention:

This application contains the following inventions or groups of inventions that are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group 1: Claims 1-30, 41-70, 81-90, and 101-110 directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising receiving a signal at a vehicle communication system from a device, automatically determining if the signal originates from inside the vehicle and if the signal does not originate from inside the vehicle, rejecting the signal, but if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device.

Group 2: Claims 31-40, 71-80, 91-100 and 111-120 directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising a vehicle communication system to receive a request for a function/application, determine one or more of available resources, available devices and available sources, determine load/cloud service/multimedia service, select/command a device or source to provide/activate the function/application/cloud service/multimedia service.

The inventions listed as Groups 1 - 2 do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical feature of the Group 1 invention is directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising receiving a signal at a vehicle communication system from a device, automatically determining if the signal originates from inside the vehicle and if the signal does not originate from inside the vehicle, rejecting the signal, but if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device.

The special technical feature of the Group 2 invention is directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising a vehicle communication system to receive a request for a function/application, determine one or more of available resources, available devices and available sources, determine load/cloud service/multimedia service, select/command a device or source to provide/activate the function/application/cloud service/multimedia service.

The only common technical feature shared by the above groups is a vehicle communication system.

However, this shared technical feature does not represent a contribution over prior art, because the shared technical feature is anticipated/made obvious by reference US 7,548,815 B2 to Watkins et al. (Published on 16 June 2009) that discloses a vehicle communication system in Abstract, col 8, ln 10-18 (Vehicle system module 290 contains one or more processors, one or more memory devices, and one or more connection ports. In one embodiment, VSM 290 includes a software switch for scanning received information such as, for example, real-time traffic updates and location information to identify that data has been received. VSM 290 is coupled to a vehicle communication network 212, and therefore to any other device that is also coupled to vehicle communication network 212).

As the above technical feature of vehicle communication system as taught by Watkins et al was known, this cannot be considered a special technical feature that would otherwise unify the groups.

4. Consequently, this opinion has been established in respect of the following parts of the international application:

☐ all parts

☒ the parts relating to claims Nos. Claims 1-30, 41-70, 81-90, and 101-110

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 12/65510

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

|                               |        |                             |     |
|-------------------------------|--------|-----------------------------|-----|
| Novelty (N)                   | Claims | 1-30, 41-70, 81-90, 101-110 | YES |
|                               | Claims | None                        | NO  |
| Inventive step (IS)           | Claims | None                        | YES |
|                               | Claims | 1-30, 41-70, 81-90, 101-110 | NO  |
| Industrial applicability (IA) | Claims | 1-30, 41-70, 81-90, 101-110 | YES |
|                               | Claims | None                        | NO  |

**2. Citations and explanations:**

Claims 1, 16, 41-47, 49, 50, 56, 81-90, and 101-110 lack an inventive step under PCT Article 33(3) as being obvious over US 2010/0097239 A1 to Campbell et al. (hereinafter Campbell) in view of US 2010/0090817 A1 to Yamaguchi et al. (hereinafter Yamaguchi).

Regarding claim 1, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); and providing access to a vehicle bus (para [0069]). Campbell does not expressly disclose that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

Regarding claim 16, Campbell discloses a computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method for providing a universal bus, the computer-executable instructions comprising: instructions to receive a signal at a vehicle communication system from a device (para [0069]); instructions to automatically determine if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); and instructions to provide access to a vehicle bus (para [0069]). Campbell does not expressly disclose that said computer-executable instructions comprise if the signal originates from inside the vehicle, instructions to communicatively connect the vehicle communication system to the device, and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

--Please See Continuation Sheet--

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US 12/65510

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V. 2. Citations and explanations:

Regarding claim 41, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); and receiving a message from a first device (para [0070]); and providing the message to a second device (para [0070]). Campbell does not expressly disclose that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device and verifying that the message originated from inside the vehicle and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

Regarding claim 42, in the combination of Campbell and Yamaguchi, Campbell further discloses that the message is directed to the second device (para [0070]).

Regarding claim 43, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising accessing signal data in a signal data database to retrieve address information from the second device (para [0141]).

Regarding claim 44, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising accessing signal data in a signal data database to retrieve address information for the first device (para [0141]).

Regarding claim 45, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising comparing an address for the first device in the message with the retrieved address information (para [0070]).

Regarding claim 46, in the combination of Campbell and Yamaguchi, Campbell further discloses that if the address for the first device in the message is the same as the retrieved address information, the message is verified (para [0070]).

Regarding claim 47, in the combination of Campbell and Yamaguchi, Campbell further discloses that the message is sent through the vehicle communication system to the second device (para [0070]).

Regarding claim 49, in the combination of Campbell and Yamaguchi, Campbell further discloses that the vehicle communication system includes at least one wireless LAN component (para [0064]).

Regarding claim 50, in the combination of Campbell and Yamaguchi, Campbell further discloses that the first device communicates to the second device through the at least one wireless LAN component (para [0064]).

Regarding claim 56, Campbell discloses a computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method for providing a universal bus, the computer-executable instructions comprising: instructions to receive a message from a first device (para [0070]); and instructions to provide the message to a second device (para [0070]). Campbell does not expressly disclose that said computer-executable instructions comprise instructions to verify that the message originated from inside the vehicle. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

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WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US 12/65510

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V. 2. Citations and explanations:

Regarding claim 81, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); and providing access to a vehicle bus (para [0069]). determining one or more of available resources, available devices, and available sources (para [0137]); determining cloud services connected to the available resources, available devices, and available sources (para [0083]); receiving input on a user interface of the vehicle, wherein the input requests a cloud service (para [0131]); routing the input to a device (para [0131]); receiving, from the device, data from the cloud service (para [0083]); and providing the data on the display of the vehicle (para [0132]). Campbell does not expressly disclose that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicatable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

Regarding claim 82, in the combination of Campbell and Yamaguchi, Campbell further discloses that a vehicle communication system sends signal data to a processor to determine the available resources, available devices, and available sources and the cloud services (para [0053]).

Regarding claim 83, in the combination of Campbell and Yamaguchi, Campbell further discloses that the vehicle communication system determines which cloud sources are available through the device (para [0083]).

Regarding claim 84, in the combination of Campbell and Yamaguchi, Campbell further discloses that the processor determines which cloud sources are available through a server (para [0083]).

Regarding claim 85, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising presenting the cloud services information on a touch sensitive display (para [0041]).

Regarding claim 86, in the combination of Campbell and Yamaguchi, Campbell further discloses that the device is a computing system (para [0116]).

Regarding claim 87, in the combination of Campbell and Yamaguchi, Campbell further discloses that the cloud service is for the provision of data or for the execution of an application (para [0083]).

Regarding claim 88, in the combination of Campbell and Yamaguchi, Campbell further discloses that the input is received on the touch sensitive display (para [0041]).

Regarding claim 89, in the combination of Campbell and Yamaguchi, Campbell further discloses that the input is analyzed to determine a correct source for the cloud service (para [0083]).

Regarding claim 90, in the combination of Campbell and Yamaguchi, Campbell further discloses that based on the analysis, the vehicle communication system routes the input to the correct device (para [0083]).

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65510

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V. 2. Citations and explanations:

Regarding claim 101, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); determining one or more of available resources, available devices, and available sources (para [0137]); determining multimedia sources associated with the available resources, available devices, and available sources (para [0055]); receiving input on a user interface of the vehicle, wherein the input multimedia (para [0055]); routing the input to an available resource, available device, and available source (para [0087]); receiving a multimedia stream from an available resource, available device, and available source (para [0088]); and presenting the multimedia stream on an output of the vehicle (para [0070]). Campbell does not expressly disclose that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

Regarding claim 102, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising caching the multimedia stream (para [0061]).

Regarding claim 103, in the combination of Campbell and Yamaguchi, Campbell further discloses that two or more multimedia streams are received from two or more sources (para [0064]).

Regarding claim 104, in the combination of Campbell and Yamaguchi, Campbell further discloses that all of the two or more multimedia streams are cached (para [0061]).

Regarding claim 105, in the combination of Campbell and Yamaguchi, Campbell further discloses that determining multimedia sources associated with the available resources, available devices, and available sources comprises canvassing the available resources, available devices, and available sources for multimedia available at those available resources, available devices, and available sources (para [0137]).

Regarding claim 106, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising: consolidating the multimedia (para [0117]); and presenting the multimedia on a vehicle touch sensitive display (para [0132]).

Regarding claim 107, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising determining if safety parameters are met for presentation of the multimedia stream (para [0099]).

Regarding claim 108, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising if safety parameters are met for presentation of the multimedia stream, presenting the multimedia stream (para [0099]).

Regarding claim 109, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising if safety parameters are not met for presentation of the multimedia stream, recording the multimedia stream (para [0099]).

Regarding claim 110, in the combination of Campbell and Yamaguchi, Campbell further discloses that the multimedia stream is recorded in local storage (para [0116]).

Claims 2-9, 11-15, 17-19, 48, 51-55, and 57-60 lack an inventive step under PCT Article 33(3) as being obvious over Campbell in view of Yamaguchi, and further in view of US 2010/0144284 A1 to Chutorash et al. (hereinafter Chutorash).

Regarding claim 2, Campbell and Yamaguchi disclose the method of claim 1. Campbell and Yamaguchi do not expressly disclose that the vehicle communication system include a communication system in communication with two or more transceivers. However, Chutorash discloses that the vehicle communication system include a communication system in communication with two or more transceivers (para [0053]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that the vehicle communication system include a communication system in communication with two or more transceivers, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the vehicle communication system include a communication system in communication with two or more transceivers, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

--Please See Continuation Sheet--

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US 12/65510

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V. 2. Citations and explanations:

Regarding claim 3, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that two or more of the transceivers are BLUETOOTH transceivers (para [0045]).

Regarding claim 4, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that two or more antennas for the vehicle communication system are separated but positioned within the vehicle (para [0033]).

Regarding claim 5, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the communication system analyzes the signal (para [0075]).

Regarding claim 6, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that the analysis includes one or more of:  
determining signal characteristics (para [0027]);  
determining location information;  
determining person information;  
determining movement information (para [0062]); and  
determining sensor information.

Regarding claim 7, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that the communication system resolves the analysis to determine if the signal originated inside the vehicle (para [0060]).

Regarding claim 8, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the vehicle communication system includes at least one wireless LAN component (para [0064]).

Regarding claim 9, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the device communicates with the at least one wireless LAN component (para [0064]).

Regarding claim 11, Campbell discloses a vehicle communication system (para [0007]), comprising: a communication system (para [0040]) comprising: two or more communication modules (para [0065]); a signal processor (para [0053]); wherein the signal processor is operable to: receive a signal at the vehicle communication system from a device (para [0069]); automatically determine if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); and provide access to a vehicle bus (para [0069]). Campbell does not expressly disclose that said signal processor is operable to if the signal originates from inside the vehicle, communicatively connect the vehicle communication system to the device and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicable area formed inside the vehicle or an exterior wireless communicable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]). The combination of Campbell and Yamaguchi discloses the foregoing, but does not expressly disclose that said vehicle communication system comprises two or more BLUETOOTH transceivers. However, Chutorash discloses that said vehicle communication system comprises: two or more BLUETOOTH transceivers (para [0045], [0053]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that said vehicle communication system comprises two or more BLUETOOTH transceivers, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said vehicle communication system comprises two or more BLUETOOTH transceivers, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

Regarding claim 12, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the vehicle communication system includes at least one wireless LAN component (para [0064]), and wherein at least one device connects through the wireless LAN component (para [0064]).

Regarding claim 13, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the communication system further comprises a signal data database (para [0141]).

Regarding claim 14, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the communication system further comprises a translator (para [0120]).

--Please See Continuation Sheet--

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US 12/65510

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V. 2. Citations and explanations:

Regarding claim 15, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that the signal processor is further operable to: determine signal characteristics (para [0027]); determine location information; determine person information; determine movement information (para [0062]); determine sensor information; and resolve the signal characteristics, location information, person information, movement information, and sensor information to determine if the signal originated inside the vehicle (para [0060]).

Regarding claim 17, in the combination of Campbell and Yamaguchi, Campbell further discloses that the vehicle communication system includes: at least one wireless LAN component (para [0064]), and wherein at least one device connects through the wireless LAN component (para [0064]); a communication system (para [0040]) comprising: two or more communication modules (para [0065]); a signal processor (para [0053]). Campbell and Yamaguchi do not expressly disclose that the vehicle communication system includes two or more BLUETOOTH transceivers. However, Chutorash discloses that the vehicle communication system includes: two or more BLUETOOTH transceivers (para [0045], [0053]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that the vehicle communication system includes two or more BLUETOOTH transceivers, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the vehicle communication system includes two or more BLUETOOTH transceivers, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

Regarding claim 18, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the communication system further comprises: a signal data database (para [0141]); and a translator (para [0120]).

Regarding claim 19, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that the signal processor executes instructions to: determine signal characteristics (para [0027]); determine location information; determine person information; determine movement information (para [0062]); determine sensor information; and resolve the signal characteristics, location information, person information, movement information, and sensor information to determine if the signal originated inside the vehicle (para [0060]).

Regarding claim 48, Campbell and Yamaguchi disclose the method of claim 41. Campbell and Yamaguchi do not expressly disclose that verifying the message comprises determining signal characteristics; determining location information; determining person information; determining movement information; determining sensor information; and resolving the signal characteristics, location information, person information, movement information, and sensor information to determine if the message originated inside the vehicle. However, Chutorash discloses that verifying the message comprises: determining signal characteristics (para [0027]); determining location information; determining person information; determining movement information (para [0062]); determining sensor information; and resolving the signal characteristics, location information, person information, movement information, and sensor information to determine if the message originated inside the vehicle (para [0060]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that verifying the message comprises determining signal characteristics; determining location information; determining person information; determining movement information; determining sensor information; and resolving the signal characteristics, location information, person information, movement information, and sensor information to determine if the message originated inside the vehicle, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from verifying the message comprises determining signal characteristics; determining location information; determining person information; determining movement information; determining sensor information; and resolving the signal characteristics, location information, person information, movement information, and sensor information to determine if the message originated inside the vehicle, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

Regarding claim 51, Campbell discloses a vehicle communication system (para [0007]), comprising: a communication system (para [0040]) comprising: two or more communication modules (para [0065]); a signal processor (para [0053]); wherein the signal processor is operable to: receiving a message from a first device (para [0070]); and providing the message to a second device (para [0070]). Campbell does not expressly disclose that the signal processor is operable to verifying that the message originated from inside the vehicle. However, Yamaguchi discloses that the signal processor is operable to: verifying that the message originated from inside the vehicle ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that the signal processor is operable to verifying that the message originated from inside the vehicle, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the signal processor is operable to verifying that the message originated from inside the vehicle, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]). The combination of Campbell and Yamaguchi discloses the foregoing, but does not expressly disclose that said vehicle communication system comprises two or more BLUETOOTH transceivers. However, Chutorash discloses that said vehicle communication system comprises: two or more BLUETOOTH transceivers (para [0045], [0053]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that said vehicle communication system comprises two or more BLUETOOTH transceivers, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said vehicle communication system comprises two or more BLUETOOTH transceivers, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

Regarding claim 52, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the message is directed to the second device (para [0070]).

Regarding claim 53, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses further comprising: accessing signal data in a signal data database to retrieve address information from the second device (para [0141]), and accessing signal data in a signal data database to retrieve address information for the first device (para [0141]).

--Please See Continuation Sheet--

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US 12/65510

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V. 2. Citations and explanations:

Regarding claim 54, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses further comprising comparing an address for the first device in the message with the retrieved address information (para [0070]), wherein if the address for the first device in the message is the same as the retrieved address information, the message is verified (para [0070]).

Regarding claim 55, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the message is sent through the vehicle communication system to the second device (para [0070]).

Regarding claim 57, in the combination of Campbell and Yamaguchi, Campbell further discloses that the vehicle communication system includes: at least one wireless LAN component (para [0064]), and wherein at least one device connects through the wireless LAN component (para [0064]); a communication system (para [0040]) comprising: two or more communication modules (para [0065]); a signal processor (para [0053]). Campbell and Yamaguchi do not expressly disclose that the vehicle communication system includes two or more BLUETOOTH transceivers. However, Chutorash discloses that the vehicle communication system includes: two or more BLUETOOTH transceivers (para [0045], [0053]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that the vehicle communication system includes two or more BLUETOOTH transceivers, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the vehicle communication system includes two or more BLUETOOTH transceivers, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

Regarding claim 58, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the communication system further comprises: a signal data database (para [0141]); and a translator (para [0120]).

Regarding claim 59, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses further comprising: instructions to access signal data in a signal data database to retrieve address information from the second device (para [0141]), instructions to access signal data in a signal data database to retrieve address information for the first device (para [0141]); and instructions to compare an address for the first device in the message with the retrieved address information (para [0070]), wherein if the address for the first device in the message is the same as the retrieved address information, the message is verified (para [0070]).

Regarding claim 60, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the vehicle communication system includes at least one wireless LAN component (para [0064]), and wherein the first device communicates to the second device through the at least one wireless LAN component (para [0064]).

Claims 21-30 and 61-70 lack an inventive step under PCT Article 33(3) as being obvious over Campbell in view of Yamaguchi and US 2009/0278750 A1 to Man et al. (hereinafter Man).

Regarding claim 21, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); receiving a request for a function (para [0090]); determining one or more of available resources, available devices, and available sources (para [0137]); selecting a device or source to provide the function (para [0068]); commanding the device or source to provide the function (para [0108]); and receiving the function (para [0109]). Campbell does not expressly disclose that the method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: If the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]). The combination of Campbell and Yamaguchi discloses the foregoing, but does not expressly disclose that said method comprises determining load. However, Man discloses that said method comprises: determining load (para [0019]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that said method comprises determining load, as disclosed by Man, because Campbell, Yamaguchi, and Man are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises determining load, because such systems and methods provide relatively high performance multi-band antennas for operation in EDGE, CDMA and/or WCDMA systems (Man para [0008]).

Regarding claim 22, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the vehicle communication system includes a communication system in communication with one or more devices (para [0040]).

--Please See Continuation Sheet--

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US 12/65510

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V. 2. Citations and explanations:

Regarding claim 23, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the device is a computing system (para [0116]).

Regarding claim 24, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the function is one of playing of multimedia data (para [0055]), provisioning of access to the Internet (para [0059]), or providing access to e-mail (para [0070]).

Regarding claim 25, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that determining the load comprises one of: determining a number of input/output messages sent between a device and vehicle communication system (para [0045]); or analyzing information sent to the vehicle communication system by the device (para [0070]).

Regarding claim 26, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the selection of the device or source is based both on availability and load (para [0137]).

Regarding claim 27, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that a first device requests the function (para [0090]).

Regarding claim 28, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that a second device provides the function (para [0108]).

Regarding claim 29, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the request for the function is received by the vehicle communication system (para [0090]).

Regarding claim 30, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that a device provides the function for the vehicle communication system (para [0090]).

Regarding claim 61, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); receiving a request for an application (para [0083]); determining one or more of available resources, available devices, and available sources (para [0137]); activating function on a device or source to execute the application (para [0139]); receiving, from the device, application user interface information or data at the vehicle to be displayed on a display associated with the vehicle (para [0131]); and displaying the application on the display (para [0132]). Campbell does not expressly disclose that the method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]). The combination of Campbell and Yamaguchi discloses the foregoing, but does not expressly disclose that said method comprises determining load. However, Man discloses that said method comprises: determining load (para [0019]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that said method comprises determining load, as disclosed by Man, because Campbell, Yamaguchi, and Man are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises determining load, because such systems and methods provide relatively high performance multi-band antennas for operation in EDGE, CDMA and/or WCDMA systems (Man para [0008]).

Regarding claim 62, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses further comprising: commanding the vehicle communication system to perform functions for the application (para [0135]).

Regarding claim 63, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses further comprising receiving input on the display (para [0125]).

Regarding claim 64, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses further comprising based on the input received on the display, executing an application function on the device (para [0139]).

Regarding claim 65, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the vehicle communication system includes a communication system in communication with one or more devices (para [0040]).

Regarding claim 66, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the device is a computing system (para [0116]).

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65510

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V. 2. Citations and explanations:

Regarding claim 67, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that determining the load comprises one of: determining a number of input/output messages sent between a device and vehicle communication system (para [0045]); or analyzing information sent to the vehicle communication system by the device (para [0070]).

Regarding claim 68, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the selection of the device or source is based both on availability and load (para [0137]).

Regarding claim 69, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the request for the application is received by the vehicle communication system (para [0083]).

Regarding claim 70, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that a device provides the application for the vehicle communication system (para [0139]).

Claims 10 and 20 lack an inventive step under PCT Article 33(3) as being obvious over Campbell in view of Yamaguchi and Chutorash, and further in view of US 2011/0105097 A1 to Tadayon et al. (hereinafter Tadayon).

Regarding claim 10, Campbell, Yamaguchi, and Chutorash disclose the method of claim 9.

Campbell, Yamaguchi, and Chutorash do not expressly disclose that the analysis is weighted to resolve the determination of if the signal originated inside the vehicle. However, Tadayon discloses that the analysis is weighted to resolve the determination of if the signal originated inside the vehicle (para [0069]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell, Yamaguchi, and Chutorash so as that the analysis is weighted to resolve the determination of if the signal originated inside the vehicle, as disclosed by Tadayon, because Campbell, Yamaguchi, Chutorash, and Tadayon are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the analysis is weighted to resolve the determination of if the signal originated inside the vehicle, because such systems and methods limit/disable the use of some of mobile device features which could cause distraction to the user when the user is engaged in another activity (Tadayon para [0010]).

Regarding claim 20, Campbell, Yamaguchi, and Chutorash disclose the computer readable medium of claim 19.

Campbell, Yamaguchi, and Chutorash do not expressly disclose that the signal characteristics, location information, person information, movement information, and sensor information is weighted to resolve the determination of if the signal originated inside the vehicle. However, Tadayon discloses that the signal characteristics, location information, person information, movement information, and sensor information is weighted to resolve the determination of if the signal originated inside the vehicle (para [0069]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell, Yamaguchi, and Chutorash so as that the signal characteristics, location information, person information, movement information, and sensor information is weighted to resolve the determination of if the signal originated inside the vehicle, as disclosed by Tadayon, because Campbell, Yamaguchi, Chutorash, and Tadayon are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the signal characteristics, location information, person information, movement information, and sensor information is weighted to resolve the determination of if the signal originated inside the vehicle, because such systems and methods limit/disable the use of some of mobile device features which could cause distraction to the user when the user is engaged in another activity (Tadayon para [0010]).

Claims 1-30, 41-70, 81-90, and 101-110 have industrial applicability as defined by PCT Article 33(4), because the subject matter can be made or used in industry.



SAC

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

## PCT

To:

DOUGLAS W. SWARTZ  
SHERIDAN ROSS P.C.  
1560 BROADWAY  
SUITE 1200  
DENVER, CO 80202

FEB 20 2013

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT AND  
THE WRITTEN OPINION OF THE INTERNATIONAL  
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing  
(day/month/year)

15 FEB 2013

Applicant's or agent's file reference

6583-247-PCT

**FOR FURTHER ACTION** See paragraphs 1 and 4 below

International application No.

PCT/US 12/65613

International filing date  
(day/month/year)

16 November 2012 (16.11.2012)

Applicant FLEXTRONICS AP, LLC

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

**Filing of amendments and statement under Article 19:**

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

**When?** The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

**Where?** Directly to the International Bureau of WIPO, 34 chemin des Colombettes  
1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

**For more detailed instructions,** see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

For details about the applicable time limits, Office by Office, see [www.wipo.int/pct/en/texts/time\\_limits.html](http://www.wipo.int/pct/en/texts/time_limits.html) and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the ISA/

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450, Alexandria, Virginia 22313-1450  
Facsimile No. 571-273-3201

Authorized officer

Lee W. Young

PCT Helpdesk: 571-272-4300

Telephone No. PCT OSP: 571-272-7774

Form PCT/ISA/220 (July 2010)



# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|                                                       |                                                                                                                                                                                                  |                                                                            |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Applicant's or agent's file reference<br>6583-247-PCT | <b>FOR FURTHER ACTION</b> <div style="display: inline-block; width: 45%; text-align: right;">         see Form PCT/ISA/220<br/>         as well as, where applicable, item 5 below.       </div> |                                                                            |
| International application No.<br>PCT/US 12/65613      | International filing date (day/month/year)<br>16 November 2012 (16.11.2012)                                                                                                                      | (Earliest) Priority Date (day/month/year)<br>16 November 2011 (16.11.2011) |
| Applicant<br>FLEXTRONICS AP, LLC                      |                                                                                                                                                                                                  |                                                                            |

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 15

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (July 2009)

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/65613

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B60T 8/172 (2013.01)

USPC - 701/1

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

USPC: 701/1

IPC(8): B60T 8/172 (2013.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

USPC: USPC: 701/1,2,36,29.1; 709/207,230,235,226-227 (Keyword limited; terms below)

IPC(8): B60T 8/172 (2013.01) (Keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase; Google (Scholar, Patents, Web)

Terms used: vehicle processing module standby primary control hand-off arbitration check health display object filter network diagnostic media "remote control" security "social network"

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                             | Relevant to claim No. |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Y         | US 2006/0042846 A1 (Kojori et al.), 02 March 2006 (02.03.2006), entire document, especially Abstract, para [0027]-[0030]                                                                                                                       | 1-20                  |
| Y         | US 6,484,082 B1 (Millsap et al.), 19 November 2002 (19.11.2002), entire document, especially Abstract; col 5, ln 34 to col 6, ln 10; col 8, ln 53 to col 9, ln 29; col 11, ln 33 to col 12, ln 3; col 12, ln 4-41                              | 1-20                  |
| Y         | US 2011/0106375 A1 (Gurusamy Sundaram et al.), 05 May 2011 (05.05.2011), entire document, especially Abstract, para [0003], [0013], [0019], [0020]-[0022], [0027], [0029], [0032]-[0033], [0036], [0039], [0069]-[0071], [0157]-[0159], [0176] | 1-20                  |
| Y         | US 7,891,004 B1 (Gelvin et al.), 15 February 2011 (15.02.2011), entire document, especially Abstract; Claim 32; col 2, ln 32-39; col 27, ln 19-35                                                                                              | 14-16                 |
| Y         | US 2008/0140278 A1 (Breed), 12 June 2008 (12.06.2008), entire document, especially Abstract, para [0538]                                                                                                                                       | 17                    |

☐ Further documents are listed in the continuation of Box C.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

18 January 2013 (18.01.2013)

Date of mailing of the international search report

15 FEB 2013

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents

P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To: DOUGLAS W. SWARTZ  
SHERIDAN ROSS P.C.  
1560 BROADWAY  
SUITE 1200  
DENVER, CO 80202

# PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

|                                                                                                                                                  |                                                                                    |                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Date of mailing<br>(day/month/year) <b>15 FEB 2013</b>                                                                                           |                                                                                    |                                                                        |
| Applicant's or agent's file reference<br><b>6583-247-PCT</b>                                                                                     | <b>FOR FURTHER ACTION</b><br>See paragraph 2 below                                 |                                                                        |
| International application No.<br><b>PCT/US 12/65613</b>                                                                                          | International filing date (day/month/year)<br><b>16 November 2012 (16.11.2012)</b> | Priority date (day/month/year)<br><b>16 November 2011 (16.11.2011)</b> |
| International Patent Classification (IPC) or both national classification and IPC<br><b>IPC(8) - B60T 8/172 (2013.01)</b><br><b>USPC - 701/1</b> |                                                                                    |                                                                        |
| Applicant <b>FLEXTRONICS AP, LLC</b>                                                                                                             |                                                                                    |                                                                        |

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

|                                                                                                                                                                                   |                                                                               |                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US<br>Commissioner for Patents<br>P.O. Box 1450, Alexandria, Virginia 22313-1450<br>Facsimile No. 571-273-3201 | Date of completion of this opinion<br><br><b>19 January 2013 (19.01.2013)</b> | Authorized officer:<br><br><b>Lee W. Young</b><br><br><small>PCT Helpdesk: 571-272-4300<br/>PCT OSP: 571-272-7774</small> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|

Form PCT/ISA/237 (cover sheet) (July 2011)

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US 12/65613

Box No. I      Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
  - ☒ the international application in the language in which it was filed.
  - ☐ a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account **therectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
  - a. (means)
    - ☐ on paper
    - ☐ in electronic form
  - b. (time)
    - ☐ in the international application as filed
    - ☐ together with the international application in electronic form
    - ☐ subsequently to this Authority for the purposes of search
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US 12/65613

**Box No. V** Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

|                               |        |             |     |
|-------------------------------|--------|-------------|-----|
| Novelty (N)                   | Claims | <u>1-20</u> | YES |
|                               | Claims | <u>None</u> | NO  |
| Inventive step (IS)           | Claims | <u>None</u> | YES |
|                               | Claims | <u>1-20</u> | NO  |
| Industrial applicability (IA) | Claims | <u>1-20</u> | YES |
|                               | Claims | <u>None</u> | NO  |

2. Citations and explanations:  
(PLEASE SEE SUPPLEMENTAL BOX)

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 12/65613

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V.2 - Citations and explanations:

Claims 1-13, 18-20 lack an inventive step under PCT Article 33(3) as being obvious over US 2006/0042846 A1 to Kojori et al. (hereinafter 'Kojori') in view of US 6,484,082 B1 to Millsap et al. (hereinafter 'Millsap') and US 2011/0106375 A1 to Gurusamy Sundaram et al. (hereinafter 'Gurusamy')

As to claim 1, Kojori teaches a vehicle, comprising at least one of: (a) a plurality of processing modules, a first processing module being in an active mode whereby the first processing module is in primary control of at least most vehicle functions and a second processing module being in a standby mode whereby the second processing module is ready to assume primary control of at least most vehicle functions ("one computer unit could be operational while the other is on standby if the arbitration method employed could meet the criticality requirements established for the vehicle computer system," para [0027]); (b) an arbitration module to arbitrate hand-off conflicts between duplicated first and second processing modules (para [0027]); (c) a health check module to determine a corresponding state of health of each of the duplicated first and second processing modules to perform at least one of critical and non-critical tasks, functions, and operations ("system health," para [0029]). Kojori fails to explicitly teach such a vehicle further comprising: (d) a displayed object movement module to move displayed objects from a source input/output system to a target input/output system, the source and target input/output systems corresponding to different vehicle occupants; (e) a media filter to apply a selected rule to filter third party sourced signals received by a vehicle processing module for presentation to a vehicle occupant via a corresponding input/output system; (f) a network selector to select one of plural communication networks local to the vehicle for transmitting a selected signal; (g) a diagnostic module to receive a warning and/or error signal from a vehicle component and select a destination for the signal, the possible destinations including a vehicle input/output system to present the warning and/or error to a vehicle occupant, an emergency service provider, an emergency responder, and a remotely located diagnostic service to diagnose a cause of the warning and/or error signal; (l) a media controller to receive a media stream from a remote node, identify which of a plurality of vehicle input/output systems are disabled due to operator command and/or as a result of a rule, and, when enabled, provide the media stream to an input/output system associated with an associated vehicle occupant; (k) a computational module selector to select a computational module to perform a selected task, operation, and/or function. However, Millsap teaches (d) a displayed object movement module to move displayed objects from a source input/output system to a target input/output system, the source and target input/output systems corresponding to different vehicle occupants (col 11, ln 33 to col 12, ln 3); (e) a media filter to apply a selected rule to filter third party sourced signals received by a vehicle processing module for presentation to a vehicle occupant via a corresponding input/output system (col 11, ln 33 to col 12, 3); (f) a network selector to select one of plural communication networks local to the vehicle for transmitting a selected signal (col 5, ln 56 to col 6, ln 10); (g) a diagnostic module to receive a warning and/or error signal from a vehicle component and select a destination for the signal, the possible destinations including a vehicle input/output system to present the warning and/or error to a vehicle occupant, an emergency service provider, an emergency responder, and a remotely located diagnostic service to diagnose a cause of the warning and/or error signal ("diagnostics virtual network," col 8, ln 53 to col 9, ln 29); (i) a media controller to receive a media stream from a remote node, identify which of a plurality of vehicle input/output systems are disabled due to operator command and/or as a result of a rule, and, when enabled, provide the media stream to an input/output system associated with an associated vehicle occupant (col 11, ln 33 to col 12, ln 3); (k) a computational module selector to select a computational module to perform a selected task, operation, and/or function ("The activation of a virtual network to perform a particular control task," col 5, ln 34-55). Kojori and Millsap fail to explicitly teach such a vehicle further comprising: (h) a remote control module to receive a request from a remote source to command a vehicle function, authenticate the requestor, and, when successfully authenticated and when privileged to request the performance of the vehicle function, execute or cause execution of the request; (j) an installation supervisor to determine, for a newly installed software and/or hardware and/or other component, whether the newly installed component satisfies defined functional and/or source or reuse requirements and/or restrictions for the component and/or license restrictions, and, when satisfied, create data structures in the component and/or a memory in the vehicle to bind the component to the current vehicle and thereby prevent the component from communicating with a processing module in a different vehicle; (1) a network security module to isolate a component encountering a security breach and/or isolate a primary processing module from one or more other components in a local vehicle network; (m) a media controller to detect movement of a computational device from an authorized station to an unauthorized station and restrict, relative to wireless connection to the authorized station, an operation and/or function of the computational device when wirelessly connected to the unauthorized station; (n) a network controller to cache automatically streaming media in response to a vehicle state change, function, and/or operation; (o) a unified communications presence reporting module to determine whether a vehicle occupant is present and/or by what communication channel to contact the occupant based on a requirement of a law applicable to a current location of the vehicle; and (p) a social networking module to enable processing modules of different vehicles to wirelessly connect to exchange vehicle information. However, Gurusamy teaches such a vehicle further comprising: (h) a remote control module to receive a request from a remote source to command a vehicle function, authenticate the requestor, and, when successfully authenticated and when privileged to request the performance of the vehicle function, execute or cause execution of the request ("user authentication," para [0032], [0039]); (j) an installation supervisor to determine, for a newly installed software and/or hardware and/or other component, whether the newly installed component satisfies defined functional and/or source or reuse requirements and/or restrictions for the component and/or license restrictions, and, when satisfied, create data structures in the component and/or a memory in the vehicle to bind the component to the current vehicle and thereby prevent the component from communicating with a processing module in a different vehicle (software stack also handles application security, rights management, copy protection, security against virus attacks etc. The application programs stored in the secured layers have controlled access," para [0029]); (1) a network security module to isolate a component encountering a security breach and/or isolate a primary processing module from one or more other components in a local vehicle network (para [0029]); (m) a media controller to detect movement of a computational device from an authorized station to an unauthorized station and restrict, relative to wireless connection to the authorized station, an operation and/or function of the computational device when wirelessly connected to the unauthorized station ("rights management," para [0029]); (n) a network controller to cache automatically streaming media in response to a vehicle state change, function, and/or operation (para [0003], [0021]); (o) a unified communications presence reporting module to determine whether a vehicle occupant is present and/or by what communication channel to contact the occupant based on a requirement of a law applicable to a current location of the vehicle ("determine that a user is not present in the vehicle," para [0069]-[0071]); and (p) a social networking module to enable processing modules of different vehicles to wirelessly connect to exchange vehicle information (para [0021]). It would have been obvious to one of ordinary skill in the art to combine the vehicle computer system of Kojori with the support for networking, media streaming, and diagnostics of Millsap and Gurusamy, because Kojori, Millsap and Gurusamy are directed to systems and methods for in-vehicle computers.

(PLEASE SEE NEXT SUPPLEMENTAL BOX)

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US 12/65613

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V.2 - Citations and explanations:

As to claim 2, the vehicle of claim 1 is discussed above. Further, Kojori teaches such a vehicle wherein the vehicle comprises (a), wherein the first and second processing modules are in wireless communication with one another, and wherein a state of the second processing module is maintained substantially in synchronicity with a state of the first processing module to enable a stateful failover from the first processing module to the second processing module (para [0027]-[0028]).

As to claim 3, the vehicle of claim 1 is discussed above. Further, Kojori teaches such a vehicle wherein the vehicle comprises (b) and wherein the arbitration module selects one of the first and second processing modules to currently possess and/or own a token, the token indicating which processing module is an active processing module and/or which processing module is a standby processing module ("Depending upon the failure arbitration method employed, one computer unit could be operational while the other is on standby if the arbitration method employed could meet the criticality requirements established for the vehicle computer system," para [0027]).

As to claim 4, the vehicle of claim 1 is discussed above. Further, Kojori teaches such a vehicle wherein the vehicle comprises (c) and wherein the health check module performs a check and/or test, in response to an internally generated interrupt and/or request to determine a selected processing module's ability to perform critical and/or non-critical vehicle tasks, functions, and/or operations, assign a score to the selected processing module based on the check and/or test results, and compare the score to one or more thresholds and/or to a score of a different processing module to determine a state of health to determine a state of health of the selected processing module ("vehicle computer can also perform trend or prognostic health monitoring algorithms of parameters collected by the EEMC for preventative maintenance activities," para [0030]).

As to claim 5, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (d) and wherein the displayed object movement module selects the target input/output system from among plural input/output systems on board the vehicle based on input from a user of the source input/output system ("Audio subsystem 220 is capable of handling several sources of input and output, decoding digital audio, multichannel sound, etc. Further, audio subsystem 220 enables in-vehicle computer 104 to recognize the user and his/her commands for providing personalized features and services to the user," para [0036]).

As to claim 6, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (e) and wherein the selected rule is one or more of a white list, blacklist, user preference, sensed occupant context, and/or governing federal, state, provincial, and/or local law and/or regulation applicable to a current sensed spatial location of the vehicle ("The vehicle's response may include one or more of the following: (a) preventing the user from going outside the bounds (e.g., preventing the user from exceeding a specified speed limit); (b) alerting the user that he is attempting to go (or is going) outside the bounds (e.g., with an alarm or a computer voice alert); (c) alert a third party about the user's actions (e.g., alert a parent of the user; e.g., alert authorities)," para [0019]).

As to claim 7, the vehicle of claim 1 is discussed above. Further, Millsap teaches such a vehicle wherein the vehicle comprises (f) and wherein the network selector selects one of plural communication networks local to the vehicle for transmitting a selected signal based on one or more of network/node status, signal/noise ratio, type of signal, available and/or unavailable bandwidth, network performance parameter(s), and quality of service (col 12, ln 4-41).

As to claim 8, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (g) and wherein the diagnostic module provides the warning and/or error signal to the vehicle occupant and interactively communicates a likely cause of the warning and/or error signal to the occupant and receives a command from the occupant to contact one or more of an emergency service provider, an emergency responder, and a remotely located diagnostic service ("these inputs may also be transmitted in real-time to various monitoring agencies which may then provide assistance, control, information or services to the user and external agencies such as road transport authorities etc.," para [0022]).

As to claim 9, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (h) and wherein the remote control module is associated with one or more of the vehicle owner, a law enforcement authority, a lender associated with a loan having the vehicle as collateral, and a vehicle manufacturer and wherein the requested vehicle function, is executed or caused to be executed notwithstanding a contrary command from the vehicle operator ("alert a third party about the user's actions (e.g., alert a parent of the user; e.g., alert authorities)," para [0019]; para [0157]-[0159]).

As to claim 10, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (i) and wherein the media controller, in a dependent mode, provides common content synchronously to each of the input/output systems and, in an independent mode, provides different content to different ones of the input/output systems ("In some embodiments, the same speaker system can simultaneously output two different audio tracks to two different people," para [0176]).

As to claim 11, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (j) and wherein the newly installed software and/or hardware and/or other component is one or more of an on-board sensor, a processing module or component thereof, a software application, a circuit board, an expansion module or component thereof, a critical or non-critical device, and a cellular upgrade module ("program module," para [0013], [0020], [0027]).

As to claim 12, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (k), wherein the computational module is selected from among plural computational modules, and wherein the plural computational modules comprise one or more vehicle processing devices and one or more occupant computational devices, the one or more occupant computational devices comprising one or more of a mobile phone, personal digital assistant, tablet computer, and laptop computer (para [0013], [0033]).

(PLEASE SEE NEXT SUPPLEMENTAL BOX)

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65613

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V.2 - Citations and explanations:

As to claim 13, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (k), wherein the computational module is selected from among plural computational modules, and wherein the plural computational modules comprise multiple software applications corresponding to different versions, releases, and/or vendors of a common type of software application ("the software might be in the form of a collection of separate programs, a program module with a larger program or a portion of a program module," para [0013]).

As to claim 18, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (p) (para [0021]).

As to claim 19, Kojori, Millsap and Gurusamy teach a non-transient, tangible computer readable medium comprising processor executable instructions to perform one or more of operations (a)-(p) referenced in claim 1.

As to claim 20, Kojori, Millsap and Gurusamy teach a method comprising steps to perform one or more of the operations (a)-(p) referenced in claim 1.

Claims 14-16 lack an inventive step under PCT Article 33(3) as being obvious over Kojori, Millsap and Gurusamy in view of US 7,891,004 B1 to Gelvin et al. (hereinafter 'Gelvin').

As to claim 14, Kojori, Millsap and Gurusamy teach the vehicle of claim 1, but fail to explicitly teach such a vehicle wherein the vehicle comprises (1) and wherein the network security module filters and/or prohibits communications between the isolated one of the component and/or processing module with other network components. However, Gelvin teaches such a vehicle wherein the vehicle comprises (1) and wherein the network security module filters and/or prohibits communications between the isolated one of the component and/or processing module with other network components ("isolation must be provided between essential vehicle systems and any unauthorized local or remote access attempts," col 2, in 32-39). It would have been obvious to one of ordinary skill in the art to combine the vehicle computer systems of Kojori, Millsap, and Gurusamy with the support for isolating specific modules of Gelvin, because Kojori, Millsap, Gurusamy and Gelvin are directed to systems and methods for modular in-vehicle computer systems.

As to claim 15, Kojori, Millsap and Gurusamy teach the vehicle of claim 1, but fail to explicitly teach such a vehicle wherein the vehicle comprises (m) and wherein the media controller permits a first function and/or operation to be performed by the computational device when wirelessly connected to the authorized station but not when wirelessly connected to the unauthorized station ("blocking coupling with unauthorized devices," Claim 32). It would have been obvious to one of ordinary skill in the art to combine the vehicle computer systems of Kojori, Millsap, and Gurusamy with the support for authorized of Gelvin, because Kojori, Millsap, Gurusamy and Gelvin are directed to systems and methods for wireless vehicle communication.

As to claim 16, Kojori, Millsap and Gurusamy teach the vehicle of claim 1, but fail to explicitly teach such a vehicle wherein the vehicle comprises (n) and wherein the network controller caches automatically streaming media in response to the vehicle state changing from a parked state to an unparked state ("when connectivity is established with another transmitter the record download begins again where it left off," col 27, in 19-35). It would have been obvious to one of ordinary skill in the art to combine the vehicle computer systems of Kojori, Millsap, and Gurusamy with the support for caching and resumming data streams of Gelvin, because Kojori, Millsap, Gurusamy and Gelvin are directed to systems and methods for in-vehicle computers used for network communication.

Claim 17 lacks an inventive step under PCT Article 33(3) as being obvious over Kojori, Millsap and Gurusamy in view of US 2008/0140278 A1 to Breed.

As to claim 17, Kojori, Millsap and Gurusamy teach the vehicle of claim 1, but fail to explicitly teach such a vehicle wherein the vehicle comprises (o) and wherein the unified communications presence reporting module determines that the vehicle occupant is the operator of the vehicle and that the vehicle operator is not present by a selected communication channel when the vehicle is in motion. However, Breed teaches such a vehicle wherein the vehicle comprises (o) and wherein the unified communications presence reporting module determines that the vehicle occupant is the operator of the vehicle and that the vehicle operator is not present by a selected communication channel when the vehicle is in motion ("obtaining information from various sensors about the occupant(s) in the passenger compartment of the vehicle, e.g., the number of occupants, their type and their motion, if any," para [0538]). It would have been obvious to one of ordinary skill in the art to combine the vehicle computer systems of Kojori, Millsap, and Gurusamy with the support for occupant sensing of Breed, because Kojori, Millsap, Gurusamy and Breed are directed to systems and methods for in-vehicle computer systems with attributes tailored to specific detected occupants.

Claims 1-20 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.





# UNITED STATES PATENT AND TRADEMARK OFFICE

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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.          | CONFIRMATION NO. |
|-----------------------------------------------------------------------|-------------|----------------------|------------------------------|------------------|
| 13/679,441                                                            | 11/16/2012  | Christopher P. Ricci | 6583-244                     | 8362             |
| 111285                                                                | 7590        | 09/05/2013           |                              |                  |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>CAMBY, RICHARD M |                  |
|                                                                       |             |                      | ART UNIT                     | PAPER NUMBER     |
|                                                                       |             |                      | 3661                         |                  |
|                                                                       |             |                      | NOTIFICATION DATE            | DELIVERY MODE    |
|                                                                       |             |                      | 09/05/2013                   | ELECTRONIC       |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com

|                              |                                      |                                              |                                                  |
|------------------------------|--------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/679,441 | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                              | <b>Examiner</b><br>RICHARD CAMBY     | <b>Art Unit</b><br>3661                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_\_.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_.; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 5) ☒ Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-20 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 4) ☐ Other: \_\_\_\_\_.

The present application is being examined under the pre-AIA first to invent provisions.

### **DETAILED ACTION**

The following is a quotation of 35 U.S.C. 112(b):

(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-10 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 1 recites "automatically identifying the person" while claims 2 and 3 determine if the person can be identified. It is therefore not possible that claim 1 automatically identified the person based on claims 2 and 3.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-20 are rejected under pre-AIA 35 U.S.C. 102b as being anticipated by Jones et al. '668.

The PG Pub to Jones et al. discloses a device that identifies a person by speech recognition as recited in paragraph 53. It is possible that the person's speech is not recognized. In paragraphs 41-52 gestures are recognized. In paragraphs 35- 40 humans are detected in the vehicle.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RICHARD CAMBY whose telephone number is (571)272-6958. The examiner can normally be reached on Tues-Fri 9:00 a.m.-7:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas G. Black can be reached on (571) 272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number: 13/679,441  
Art Unit: 3661

Page 4

/Richard M. Camby/  
Primary Examiner, Art Unit 3661

|                                   |                                       |  |                                                                  |             |
|-----------------------------------|---------------------------------------|--|------------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/679,441 |  | Applicant(s)/Patent Under Reexamination<br>RICCI, CHRISTOPHER P. |             |
|                                   | Examiner<br>RICHARD CAMBY             |  | Art Unit<br>3661                                                 | Page 1 of 1 |

#### U.S. PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name               | Classification |
|---|---|--------------------------------------------------|-----------------|--------------------|----------------|
| * | A | US-2010/0295676                                  | 11-2010         | Khachaturov et al. | 340/540        |
| * | B | US-2009/0180668                                  | 07-2009         | Jones et al.       | 382/103        |
| * | C | US-2008/0253613                                  | 10-2008         | Jones et al.       | 382/103        |
| * | D | US-6,724,920                                     | 04-2004         | Berenz et al.      | 382/118        |
| * | E | US-RE41,449                                      | 07-2010         | Krahnstoeve et al. | 701/1          |
|   | F | US-                                              |                 |                    |                |
|   | G | US-                                              |                 |                    |                |
|   | H | US-                                              |                 |                    |                |
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|   | M | US-                                              |                 |                    |                |

#### FOREIGN PATENT DOCUMENTS

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#### NON-PATENT DOCUMENTS

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
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|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.              | CONFIRMATION NO.            |
|-----------------------------------------------------------------------|-------------|----------------------|----------------------------------|-----------------------------|
| 13/678,773                                                            | 11/16/2012  | Christopher P. Ricci | 6583-315                         | 5713                        |
| 111285                                                                | 7590        | 07/09/2013           |                                  |                             |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>BUTLER, RODNEY ALLEN |                             |
|                                                                       |             |                      | ART UNIT<br>3667                 | PAPER NUMBER                |
|                                                                       |             |                      | NOTIFICATION DATE<br>07/09/2013  | DELIVERY MODE<br>ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com

|                              |                                      |                                     |                                                  |
|------------------------------|--------------------------------------|-------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/678,773 | <b>Applicant(s)</b><br>RICCI ET AL. |                                                  |
|                              | <b>Examiner</b><br>RODNEY BUTLER     | <b>Art Unit</b><br>3667             | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 November 2012.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 5) ☒ Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-20 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 16 November 2012 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                                            |                                                                                         |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 3) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 4) <input type="checkbox"/> Other: _____                                                |



## **DETAILED ACTION**

### ***Status of the Claims***

1. This action is in response to the applicant's filing on November 16, 2013. Claims 1-20 are pending and examined below.

### ***Specification***

2. The disclosure is objected to because of the following informalities:

In the "**Cross Reference To Related Applications**" section, the applicant did not include the latest changes made to the Application Data Sheet (ADS). In other words, the applicant did not add the priority information for Provisional Application No. 61/715,699, filed on October 18, 2012 to the cross reference section of the application.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 101***

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 11-20 are rejected under 35 U.S.C. §101 because the claimed invention is directed to non-statutory subject matter. The claimed invention is not directed to patent eligible subject matter. Based upon consideration of all of the relevant factors with respect to the claim as a whole, claims 11-20 are determined to be directed to an abstract idea. The rationale for this determination is explained below:

The applicant fails to recite how a machine or apparatus implements the claimed method/software steps. As a result, the aforementioned claims are directed to a judicial exception under 35 U.S.C. §101, i.e., an abstract idea.

Integral use of a machine or apparatus to achieve performance of the method/software steps weighs toward eligibility, as compared to where the machine or apparatus is merely an object on which the method/software operate, which weighs against eligibility. See MPEP §2106(II)(B)(1).

***Specification***

5. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

The stand-alone computing device is capable of **remotely** disabling one or more features of the vehicle, as recited in claim 6.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1, 3, 9-11, 13, 19, and 20 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2011/0117933 A1 to Andersson (herein after “Andersson publication”) in view of U.S. Patent Application Publication No. 2006/0125631 A1 to Sharony (herein after “Sharony publication”).

**As to claim 1, 3, 9-11, 13, 19, and 20,**

The Andersson publication discloses **a system to associate a stand-alone computing device (100) and a vehicle (192) comprising:**

**a location module (262b/262c) adapted to initiate a locator routine** (see ¶41, lines 7-8 and 13-15); and

**one or more of an additional console display (110) or a communications device that provide stand-alone computing device location information** (see ¶27-¶28 and ¶36).

The Andersson publication, however, does not disclose **a tracking module adapted to determine stand-alone computing device identifier for the stand-alone computing device (100) to be associated with the vehicle (192)**.

The Sharony publication, on the other hand, teaches the idea of using **a tracking system (100) adapted to determine stand-alone computing device identifier/tag (30) for the stand-alone computing device (20)**. (See ¶2 and ¶10.) One of the major benefits of such an RF tracking system is that the RF tags are capable of surviving harsh and hostile environments.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify and provide the system of the Andersson publication with a tracking system with RF tags adapted to determine stand-alone computing device identifier/tag for the stand-alone computing device, such as taught by the Sharony publication, in order to survive harsh and hostile environments.

8. Claims 2, 7, 8, 12, 17, and 18 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over the Andersson publication in view of the Sharony publication, and further in view of U.S. Patent No. 5,794,164 to Beckert et al. (herein after "Beckert et al. patent").

**As to claims 2, 7, 8, 12, 17, and 18,**

The modified Andersson publication discloses the invention substantially as claimed, except for **the stand-alone computing device includes a key to authorize use of the vehicle, the driver being reminded to associate the stand-alone computing device with the vehicle prior to movement, and the stand-alone computing device being dockable and integrally functionable with the vehicle.**

The Beckert et al. patent, on the other hand, teaches the idea of **a key used to authorize use of the vehicle** (see Column 9, lines 42-51), **the driver being reminded to associate the stand-alone computing device (22, 48, 64) with the vehicle prior to movement** (see Column 9, lines 51-53, where the Beckert et al. patent discloses asking the driver for a pin number as added security. This added security can be interpreted as a reminder to the driver before using the car.), **and the stand-alone computing device (22, 48, 64) being dockable and integrally functionable with the vehicle.** (See Column 4, lines 51-55, Column 11, line 66 through Column 12, line 5.)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify and provide the system of the Andersson publication with a key used to authorize use of the vehicle, as taught by the Beckert et al. patent, in order to increase security of the vehicle, thereby preventing theft.

It also would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the system of the Andersson publication by reminding the driver to associate the stand-alone computing device with the vehicle

Art Unit: 3667

**prior to movement** of the vehicle, as suggest by the Beckert et al. patent, in order to increase security and functionality of the vehicle.

It would have been further obvious to one having ordinary skill in the art at the time the invention was made to further modify the system of the Andersson publication so that the stand-alone computing device is dockable and integrally functionable with the vehicle, as taught by the Beckert et al. patent, in order to increase functionality of the vehicle.

9. Claims 5, 6, 15, and 16 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over the Andersson publication in view of the Sharony publication, and further in view of U.S. Patent Application Publication No. 2010/0222939 A1 to Namburu et al. (herein after “Namburu et al. patent”).

**As to claims 5, 6, 15, and 16,**

The modified Andersson publication discloses the invention substantially as claimed, except for **the stand-alone computing device being capable of disabling or remotely disabling one or more features of the vehicle.**

The Namburu et al. patent, on the other hand, teaches the idea of **a stand-alone computing device (110) capable of disabling or remotely disabling one or more features of the vehicle (130).** (See ¶46.)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the Andersson publication by allowing the stand-alone computing device to disable or remotely disable one or more features of the vehicle, as suggested by the Namburu et al. patent, in order to allow the user to

Art Unit: 3667

manage the operation of the vehicle and/or various diagnostic information regarding various systems of the vehicle.

10. Claims 4 and 14 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over the Andersson publication in view of the Sharony publication, and further in view of U.S. Patent Application Publication No. 2011/0053506 A1 to Lemke et al. (herein after "Lemke et al. publication").

The modified Andersson publication discloses the invention substantially as claimed, except for **a proximity module that determines whether the stand-alone computing device is near, but not associated with, the vehicle.**

The Lemke et al. publication, on the other hand, teaches the idea of using a proximity module (278) that determines whether the stand-alone computing device is near, but not associated with, the vehicle. (See ¶26, lines 1-3.)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify and provide the Andersson publication with a proximity module that determines whether the stand-alone computing device is near, but not associated with, the vehicle, as taught by the Lemke et al. publication, in order to in order to increase security of the vehicle, thereby preventing theft.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RODNEY BUTLER whose telephone number is (313)446-6513. The examiner can normally be reached on Monday - Friday, 6:30 am - 3:00 pm EST.

Art Unit: 3667

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James P. Trammell can be reached on (571) 272-6712. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. B./

Examiner, Art Unit 3667

/Mary Cheung/

Primary Examiner, Art Unit 3667

|                                   |                                       |  |                                                         |             |
|-----------------------------------|---------------------------------------|--|---------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/678,773 |  | Applicant(s)/Patent Under Reexamination<br>RICCI ET AL. |             |
|                                   | Examiner<br>RODNEY BUTLER             |  | Art Unit<br>3667                                        | Page 1 of 1 |

#### U.S. PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name                 | Classification |
|---|---|--------------------------------------------------|-----------------|----------------------|----------------|
| * | A | US-2011/0117933                                  | 05-2011         | Andersson, Henrik Bo | 455/456.2      |
| * | B | US-2006/0125631                                  | 06-2006         | Sharony, Jacob       | 340/539.13     |
| * | C | US-5,794,164                                     | 08-1998         | Beckert et al.       | 455/3.06       |
| * | D | US-2010/0222939                                  | 09-2010         | Namburu et al.       | 701/2          |
| * | E | US-2006/0250272                                  | 11-2006         | Puamau, Soane R.     | 340/825.69     |
| * | F | US-2011/0053506                                  | 03-2011         | Lemke et al.         | 455/41.2       |
| * | G | US-7,606,660                                     | 10-2009         | Diaz et al.          | 701/431        |
| * | H | US-2005/0149752                                  | 07-2005         | Johnson et al.       | 713/201        |
| * | I | US-2008/0212215                                  | 09-2008         | Schofield et al.     | 359/844        |
| * | J | US-6,681,176                                     | 01-2004         | Funk et al.          | 701/433        |
| * | K | US-7,295,921                                     | 11-2007         | Spencer et al.       | 701/472        |
|   | L | US-                                              |                 |                      |                |
|   | M | US-                                              |                 |                      |                |

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#### NON-PATENT DOCUMENTS

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
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## Time-triggered CAN

The TTCAN (time-triggered CAN) protocol (standardized in ISO 11898-4) is a higher layer protocol on top of the CAN (Controller Area Network) data link layer as specified in ISO 11898-1. It may use standardized CAN physical layers such as specified in ISO 11898-2 (high-speed transceiver) or in ISO 11898-3 (fault-tolerant low-speed transceiver). Time-triggered communication means that activities are triggered by the elapsing of time segments. In a time-triggered communication system all points of time of message transmission are defined during the development of a system. A time-triggered communication system is ideal for applications in which the data traffic is of a periodic nature.

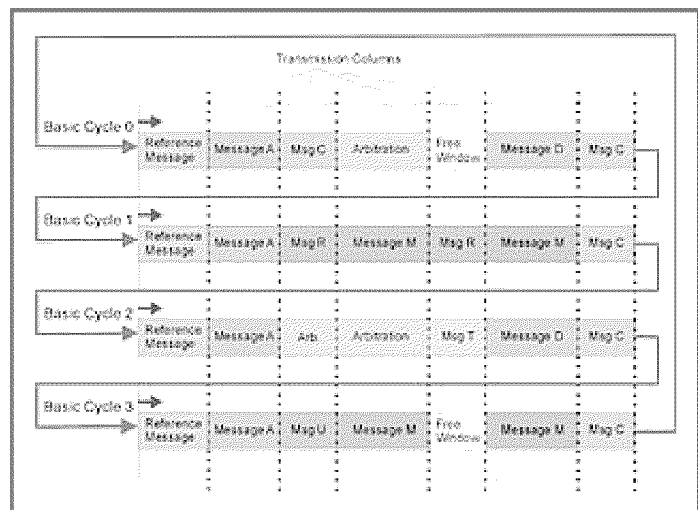
### TTCAN benefits

TTCAN provides mechanisms to schedule CAN messages in a time-triggered way as well as in an event-triggered way. This allows using CAN-based networks for closed-loop control. Also the real-time performance in CAN-based in-vehicle networks increases with the use of TTCAN.

In vehicles data traffic must usually be both event-triggered (e.g. a temperature change in the cooling mechanism) and time-triggered (e.g. the status of the brakes). In order not to have to develop two different network systems the ISO defined the TTCAN protocol.

### Basic TTCAN functionality

The TTCAN protocol is realized in software in a higher layer on top of CAN. This is why in a TTCAN network messages can be transmitted both event-triggered as well as time-triggered. The transmitted frames do not need any additional overhead in the CAN frame. The time-triggered control and thus the synchronization of the involved control units within the network are done via a reference message. All participants of the TTCAN network identify the reference message by its identifier. As soon as the first bit of the frame (Start of Frame: SOF) is recognized, the local time unit is synchronized. The accuracy of the local time units depend only on the physical signal propagation of the bus line and is thus neglectable. The individual TTCAN participants are configured to know when to send their frames after having received the reference frame. The time between two reference frames is called the



always identical in order to be able to transmit messages at different periodic frequencies. The system matrix comprises several basic cycles and is repeated indefinitely until the vehicle is turned off.

For some applications it is necessary that the reference frame is sent corresponding to an event. For these cases a bit is inserted in the basic cycle, which discontinues the periodic transmission of messages until the event has taken place. This is done e.g. to synchronize communication and motor rotation.

Within a basic cycle there are exclusive windows, during which only one node may send a frame. Apart from that there are free windows and arbitrating windows, for which the nodes compete for bus access just as in the regular CAN communication. Several arbitrating windows can be merged (merged windows). The end of an arbitrating window is always predictable. Thus the advantages of event-triggered communication can be combined with those of time-triggered communication.

This is especially interesting for off-highway vehicles such as forestry vehicles or forklifts.

These vehicles often use the higher-layer protocol CANopen. Therefore there are intentions of implementing TTCAN-specific objects in the CANopen standard. Also a specific TTCAN transmit mode for process data objects (PDO) is planned. CANopen networks are also used for separate vehicle add-ons such as fire fighting equipment, cranes and add-on devices for municipal vehicles.

The sending of CAN frames in TTCAN (level 1) between two reference frames is triggered by the local time units. Since there may be minimum time differences despite the initial synchronization, a system designer may implement a level 2 TTCAN network. In level 2 TTCAN a reference frame includes a time-stamp (Master\_Ref\_Mark). This means that after at least two times receiving of the reference frame the nodes can resynchronize according to the time-stamp. Thus a synchronization accuracy of 1  $\mu$ s is achievable. This should suffice even for high requirements of vehicle builders.

Should the sender of the reference frame fail, another node automatically takes over the task of sending it. Up to eight potential time givers are installable. In case a higher-ranking time master has been replaced by a lower-ranking time master but returns to the network, it automatically tries to become time master again. The TTCAN specifications provide the procedure of the return/take over of a time master.

If the time stamp is provided by an external clock (e.g. GPS), the time is given as part of a second. An internal time base in regular operation depends of the bit rate of the CAN network. With an external time base even several TTCAN networks of other systems may be synchronized with a TTCAN network.

The TTCAN protocol also defines an error level state machine as well as several error modes. The ISO 11898-4 also defines all "visible" interfaces. Scheduling tables are locally implemented in every node and must be configured before system start-up.

## *TTCAN implementations*

After the ISO had submitted their TTCAN standard proposal for international standardization the first few manufacturers started implementing the TTCAN protocol. Bosch had already implemented it in an FPGA successfully and presented it at a TTCAN workshop of the CAN in Automation (CiA) international users and manufacturers group. Due to market responses Bosch has by now implemented the TTCAN module in a chip. The TTCAN stand-alone chip with integrated TTCAN level 1 and level 2 (with time correction) is pin-compatible to the company's CAN controller CC170 and Intel's 82527. It is available for the evaluation of TTCAN interfaces and for the development of TTCAN-compatible control units and software tools (e.g. bus analyzers and configurators). The controller provides different interfaces to host controllers by Intel and Motorola. Samples have been available since July 2003.

Basically all CAN controllers that support single-shot mode or are able to support the cancellation of a transmission request are able to support level 1 of TTCAN in software. For level 2 they additionally require the ability to time-stamp the Start of Frame-bit and send the time-stamp within the very same frame. For reasons of performance enhancement it makes sense to realize the protocol functions in hardware. First CAN controllers with partial TTCAN support have been announced by Atmel. The 8-bit T89C51CC01/2 provides 15 message objects that are adjustable via filter masks. The message objects may optionally be transformed to a FIFO, which prevents the erasure of received but not yet processed data.

The NEC CAN microcontroller family has provided the hardware requirements for TTCAN since the mid-nineties with the patented SOF-synchronization, which is necessary to implement TTCAN. The company is still working on a hardware version of a standalone TTCAN module.

Hitachi has implemented the protocol in a chip, which is being tested by an independent institute for conformity to the standard.

CiA members are currently working on extending the CANopen standard in order to enable the usage of TTCAN hardware within CANopen networks. This entails the definition of a further transmission mode for PDOs and a new communication object (TREF). The CANopen extensions are due for publication with the official release of the TTCAN standard.

## *Further literature on TTCAN*

- Thomas Fuehrer and others: [Time-triggered communication on CAN](#)
- Florian Hartwich and others: [CAN network with time-triggered communication](#)
- Dr. Bernd Mueller and others: [Fault-tolerant TTCAN networks](#)
- Florian Hartwich and others: [Timing in the TTCAN network](#)
- José Fonseca and others: [Scheduling for a TTCAN network with a stochastic optimization algorithm](#)



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## Controller Area Network (CAN) schedulability analysis: Refuted, revisited and revised

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**Abstract** Controller Area Network (CAN) is used extensively in automotive applications, with in excess of 400 million CAN enabled microcontrollers manufactured each year. In 1994 schedulability analysis was developed for CAN, showing how worst-case response times of CAN messages could be calculated and hence guarantees provided that message response times would not exceed their deadlines. This seminal research has been cited in over 200 subsequent papers and transferred to industry in the form of commercial CAN schedulability analysis tools. These tools have been used by a large number of major automotive manufacturers in the design of in-vehicle networks for a wide range of cars, millions of which have been manufactured during the last decade.

This paper shows that the original schedulability analysis given for CAN messages is flawed. It may provide guarantees for messages that will in fact miss their deadlines in the worst-case. This paper provides revised analysis resolving the problems with the original approach. Further, it highlights that the priority assignment policy, previously claimed to be optimal for CAN, is not in fact optimal and cites a method of obtaining an optimal priority ordering that is applicable to CAN. The paper discusses the possible impact on commercial CAN systems designed and developed using flawed schedulability analysis and makes recommendations for the revision of CAN schedulability analysis tools.

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**Keywords** Controller Area Network (CAN) · Fixed priority scheduling · Non-pre-emptive scheduling · Schedulability analysis · Response time analysis · Priority assignment policies

## 1 Introduction

### 1.1 Background

Controller Area Network (CAN) is a serial communications bus designed to provide simple, efficient and robust communications for in-vehicle networks. CAN was developed by Robert Bosch GmbH, beginning in 1983, and presented to a wider audience at the Society of Automotive Engineers (SAE) Congress in 1986—effectively the “birth of CAN”. In 1987, the first CAN controller chips were released by Intel (82526) and Philips (82C200). In the early 1990s, Bosch submitted the CAN specification (Bosch, 1991) for standardisation, leading to publication of the first ISO standard for CAN (11898) in 1993 (ISO, 1993).

Mercedes was the first automotive manufacturer to deploy CAN in a production car, the 1991 S-class. By the mid 1990s, the complexity of automotive electronics was increasing rapidly. The number of networked Electronic Control Units (ECUs) in Mercedes, BMW, Audi and VW cars went from 5 or less at the beginning of the 1990s to around 40 at the turn of the millennium. With this explosion in complexity traditional point-to-point wiring became increasingly expensive to manufacture, install, and maintain due to the hundreds of separate connections and tens of kilograms of copper wire required. As a result CAN was rapidly adopted by the cost-conscious automotive industry, providing an effective solution to the problems posed by increasing vehicle electronics content. Following on from Mercedes, other manufacturers including Volvo, Saab, BMW, Volkswagen, Ford, Renault, PSA, Fiat and others all adopted CAN technology.

As a result of the wholesale adoption of CAN by the automotive industry, sales of CAN nodes (8, 16 and 32-bit microcontrollers with on-chip CAN peripherals) grew from just under 50 million in 1999 to over 340 million in 2003<sup>1</sup>—see Fig. 1.

By 2004, there were at least 15 silicon vendors manufacturing, in total, over 50 different microprocessor families with on-chip CAN capability.

Today almost all of the cars manufactured in Europe are equipped with at least one CAN bus. In the United States, the Environmental Protection Agency has mandated the use of CAN, for On Board Diagnostics, in all cars and light trucks sold in the US from model year 2008 onwards.

### 1.2 Automotive applications

In automotive applications, CAN is typically used to provide high speed networks (500 Kbits/s) connecting chassis and power-train ECUs, for example engine management and transmission control. It is also used for low speed networks (100 or 125 Kbits/s)

<sup>1</sup> Figures from the CAN in Automation (CiA) website [www.can-cia.org](http://www.can-cia.org)

**Fig. 1** Sales of microcontrollers with onchip CAN peripherals

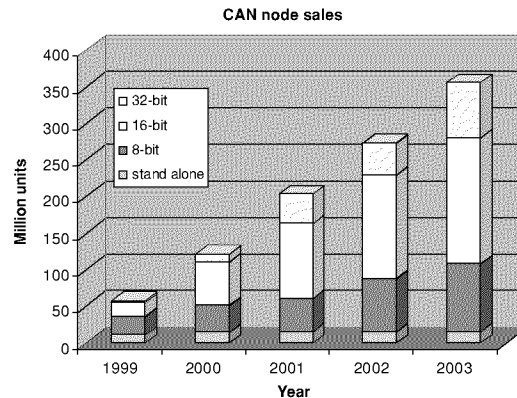
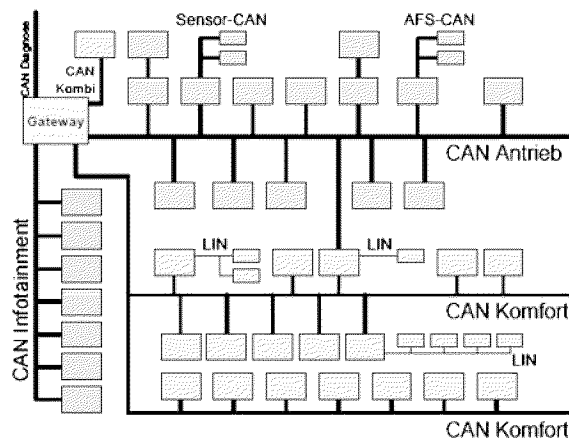


**Fig. 2** VW Passat network architecture



connecting body and comfort electronics, for example door modules, seat modules and climate control. Data required by ECUs on different networks is typically gatewayed between the different CAN buses by a powerful ECU connected to both.

The network architecture of the VW Passat (Leohold, 2005) shown in Fig. 2, reproduced with permission from Nolte (2006), illustrates how a number of CAN buses are used to connect around 45 ECUs in that vehicle. Also shown in Fig. 2 are three Local Interconnect Networks (LIN). LIN is a complementary technology to CAN, and is used to provide inexpensive, low speed (20 Kbits/s) connectivity (LIN Consortium, 2003).

Table 1 summarises the requirements placed on in-vehicle networks for the BMW 7 Series. This is typical of automotive applications, where individual CAN buses are used to connect between 2 and 32 ECUs at bandwidths ranging from 100 to 500 Kbits/s (Frischkorn, 2005).

In automotive applications the *messages* sent on CAN are used to communicate state information, referred to as *signals*, between different ECUs. Examples of signals include: wheel speeds, oil and water temperature, engine rpm, gear selection, accelerator position, dashboard switch positions, climate control settings, window switch positions, fault codes, diagnostic information and so on. In a high-end vehicle, such as

**Table 1** BMW 7 Series network requirements

|             | No. of ECUs | Bandwidth   | No. of Messages | Cycle times |
|-------------|-------------|-------------|-----------------|-------------|
| Body        | 14–30       | 100 Kbits/s | 300             | 50 ms–2 s   |
| Chassis     | 6–10        | 500 Kbits/s | 180             | 10 ms–1 s   |
| Power-train | 3–6         | 500 Kbits/s | 36              | 10 ms–10 s  |

the VW Phaeton, there can be more than 2500 distinct signals (Leohold, 2004), each effectively replacing what would, in a traditional point-to-point wiring loom, have been a separate wire.

Many of these signals have real-time constraints associated with them. For example, an ECU reads the position of a switch attached to the brake pedal. This ECU must send a message over the CAN network, carrying information (a signal) that the brakes have been applied. The ECU responsible for the rear light clusters receives the message, recognises the change in the value of the signal, and switches the brake lights on. All within a few tens of milliseconds of the brake pedal being pressed. Engine, transmission, and stability control systems typically place even tighter time constraints on signals, which may need to be sent as frequently as once every 5 milliseconds to meet their time constraints (Society of Automotive Engineers, 1993).

### 1.3 Research and real-time analysis

CAN is a serial data bus that supports priority based message arbitration and non-pre-emptive message transmission. In the early 1990s, a common misconception about CAN was that although the protocol was very good at transmitting the highest priority message with low latency, it was not possible to guarantee that less urgent signals, carried in lower priority messages, would meet their deadlines.

Tindell and Burns (1994) and Tindell et al. (1994b, 1995) showed how research into fixed priority pre-emptive scheduling for single processor systems could be adapted and applied to the scheduling of messages on CAN. This analysis provided a method of calculating the worst-case response times of all CAN messages. Using this analysis it became possible to engineer CAN based systems for timing correctness, providing guarantees that all messages, and the signals that they carry, would meet their deadlines.

Tindell's seminal research heavily influenced the design of on-chip CAN peripherals such as Motorola msCAN (Motorola, 1998) and has led to a large body of work into schedulability theory and error models for CAN (Punnekkat et al., 2000; Nolte et al., 2002, 2003; Broster et al., 2002, 2005; Hansson et al., 2002; Broster and Burns, 2003), including at least two PhD theses (Broster, 2003; Nolte, 2006). Overall, this research into CAN scheduling has been cited in over 200<sup>2</sup> subsequent papers.

In 1995, Tindell's research was recognised by Volvo Car Corporation and successfully used in the configuration and analysis of the CAN buses for the forthcoming

<sup>2</sup> As of August 2006, reference (Tindell and Burns, 1994) has 78 citations, reference (Tindell et al., 1995) 199 citations and reference (Tindell et al., 1994b) 110 citations (Google Scholar).



**Table 2** CAN messages highlighting flawed analysis

| Message | Priority | Period | Deadline | TX time |
|---------|----------|--------|----------|---------|
| A       | 1        | 2.5 ms | 2.5 ms   | 1 ms    |
| B       | 2        | 3.5 ms | 3.25 ms  | 1 ms    |
| C       | 3        | 3.5 ms | 3.25 ms  | 1 ms    |

Volvo S80 (P23) (Casparsson et al., 1998). Following the success of this project, Volcano Communications Technologies AB<sup>3</sup> used Tindell's analysis as the basis of a commercial CAN schedulability analysis tool, called Volcano Network Architect.

Since 1998, these tools and the Volcano concept (Casparsson et al., 1998) have been used in the design and development of CAN networks and electronics systems for the Volvo XC90, S80, S/V/XC70, S60, V50 and S40 as well as many other cars from different manufacturers.

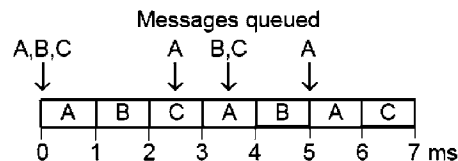
Prior to Tindell's work, low levels of bus utilization, up to 30 or 40%, were typical in automotive applications, with extensive testing required to obtain confidence that CAN messages would meet their deadlines. With the advent of a systematic approach based on schedulability analysis, CAN bus utilization could be increased to around 80% (DeMeis, 2005) whilst still guaranteeing that deadlines would be met.

#### 1.4 Motivation

The design and development of many in vehicle Controller Area Networks relies on the schedulability analysis of CAN given by Tindell and Burns (1994) and Tindell et al. (1994b, 1995). In this section we show that this analysis is flawed. It may result in computed worst-case response times for messages that are optimistic, i.e. less than the response times that may actually occur. The set of CAN messages listed in Table 2 serve to highlight the problem with the existing schedulability analysis of CAN. As a simple example, we have assumed a 125 Kbit/s network with 3 messages, each of which carries 7 bytes of signal data. Assuming 11-bit identifiers and worst-case bit-stuffing, the maximum length of each message is 125 bits. The maximum transmission time of each message is therefore 1 ms.

The analysis method given by Tindell and Burns (1994) and Tindell et al. (1994b, 1995) calculates the worst-case response times of messages A, B and C as 2 ms, 3 ms and 3 ms respectively. Hence the system is deemed to be schedulable—the analysis supposedly guarantees that all of the messages will meet their deadlines in the worst case, despite the high bus utilisation of 97%.

Figure 3 illustrates the worst-case scenario for transmission of message C. We note that the first instance of this message is delayed by higher priority messages A and

**Fig. 3** Worst-case scenario for message C

<sup>3</sup> Volcano Communications Technologies AB was acquired by Mentor Graphics in May 2005.

B, leading to a response time of 3 ms—this is the “worst-case response time” calculated using existing CAN schedulability analysis methods. However, as message transmission is non-pre-emptive, the first transmission of message C has a knock on effect, delaying subsequent transmissions of higher priority messages A and B. Some of this higher priority interference is *pushed through* into the next period of message C leading to a longer response time for the second instance of message C.

At time  $t = 7$  ms, the second instance of message C completes transmission with a response time of 3.5 ms. (Note at time  $t = 7$  ms, there are no higher priority messages awaiting transmission and so there is no further push through interference that could delay subsequent instances of message C).

The actual worst-case response time for message C is 3.5 ms, which is greater than its deadline of 3.25 ms. The system is therefore unschedulable; contrary to the guarantees given by Tindell and Burns (1994) and Tindell et al. (1994b, 1995).

In fact, if the periods of messages B and C are shortened from 3.5 ms to 3.25 ms then the existing analysis results in unchanged worst-case response times, implying that the messages will still meet their deadlines. However, with these shorter periods the overall bus utilisation exceeds 100% and so the system cannot possibly be schedulable!

### 1.5 Related work

The schedulability analysis for CAN builds on previous research into fixed priority scheduling of tasks on single processor systems.

Lehoczky (1990) introduced the concept of a busy period and showed that if tasks have deadlines greater than their periods, referred to as *arbitrary deadlines*, then it is necessary to examine the response times of all invocations of a task falling within a busy period in order to determine the worst-case response time. Harbour et al. (1991) showed that if deadlines are less than or equal to periods, but priorities vary during execution, then again multiple invocations must be inspected to determine the worst-case response time. We note that non-pre-emptive scheduling is effectively a special case of pre-emptive scheduling with varying execution priority—as soon as a task starts to execute its priority is raised to the highest level. Tindell et al. (1994a) improved upon the work of Lehoczky (1990) providing a formulation for arbitrary deadline analysis based on a recurrence relation.

Building upon these earlier results, George et al. (1996) provided comprehensive schedulability analysis of non-pre-emptive fixed priority scheduling of single processor systems.

Bril (2006) refuted the analysis of fixed priority systems with deferred pre-emption given by Burns (1994), showing that this analysis may result in computed worst-case response times that are optimistic. The schedulability analysis for CAN given by Tindell and Burns (1994) and Tindell et al. (1994b, 1995) builds upon Burns (1994) and suffers from essentially the same flaw. A similar issue with work on pre-emption thresholds (Wang and Saxena, 1999) was first identified and corrected by Regehr (2002).

The revised schedulability analysis presented in this paper aims to provide an evolutionary improvement upon the analysis of CAN given by Tindell and Burns (1994) and Tindell et al. (1994b, 1995). To do so, it draws upon the analysis of Tindell

et al. (1994a) for fixed priority pre-emptive scheduling of systems with arbitrary deadlines and the analysis of George et al. (1996) for fixed priority non-pre-emptive systems.

A technical report (Bril et al., 2006a) and a workshop paper (Bril et al., 2006b) highlighted the problem for CAN but did not provide a specific in-depth solution. That is the purpose of this paper. A further technical report (Bril et al., 2006c) complements this paper, providing formal proofs of the worst-case response time of tasks under fixed priority scheduling with deferred pre-emption.

## 1.6 Organisation

The remainder of this paper is organised as follows: Section 2 describes the CAN protocol and terminology before outlining a suitable scheduling model and notation on which to base revised schedulability analysis. Section 3 provides new schedulability analysis for CAN, correcting the flaws in the existing approach. Section 4 discusses the system and message parameters needed for the flaws in the existing analysis to result in incorrect worst-case response times and hence misleading guarantees. Section 5 discusses the issue of optimal priority assignment for CAN messages. Section 6 summarises the implications of flaws in the existing analysis for commercial CAN applications. Finally, Section 7 concludes with a summary of the main contributions of this paper and recommendations for further research.

## 2 Controller area network

This section describes elements of the CAN protocol and characteristics of a system model that are needed to formulate a schedulability test. For a complete description of the CAN protocol, see the CAN specification version 2.0 (Bosch, 1991)

### 2.1 CAN protocol and terminology

CAN is an asynchronous multi-master serial data bus that uses Carrier Sense Multiple Access/Collision Resolution (CSMA/CR) to determine access.

CAN was designed as a simple and robust broadcast bus capable of operating at speeds of up to 1 Mbit/s. Message transfer over CAN is controlled by 4 different types of *frame*: Data frames, Remote Transmit Request (RTR) frames, Overload frames and Error frames.

The layout of a standard format data frame is shown in Fig. 4. Each CAN data frame is required to have a unique identifier. Identifiers may be 11-bit (standard format) or

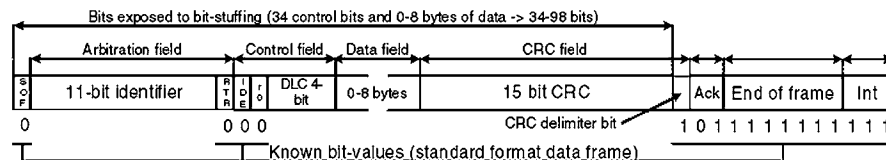


**Fig. 4** Standard format data frame

29-bit (extended format). The identifier serves two purposes beyond simply identifying the message. First, the identifier is used as a priority to determine which message, among those contending for the bus, will be transmitted next. Second, the identifier may be used by receivers to filter out messages they are not interested in, and so reduce the load on the receiver's host microprocessor.

In this paper we are interested in the schedulability of data frames, with error frames also considered in Section 3.5. The schedulability analysis can however easily be extended to include RTR frames using the approach given by Tindell et al. (1995).

### 2.1.1 Priority based arbitration

The CAN physical layer supports two states termed *dominant* ('0') and *recessive* ('1'). If two or more CAN controllers are transmitting at the same time and at least one of them transmits a '0' then the value on the bus will be a '0'. This mechanism is used to control access to the bus and also to signal errors.

The CAN protocol calls for nodes to wait until a *bus idle period*<sup>4</sup> is detected before attempting to transmit. If two or more nodes start to transmit at the same time, then by monitoring each bit on the bus, each node can determine if it is transmitting the highest priority message (with a numerically lower identifier) and should continue or if it should stop transmitting and wait for the next bus idle period before trying again. As the message identifiers are unique, a node transmitting the last bit of the identifier field, without detecting a '0' bit that it did not transmit, must be transmitting the highest priority message that was ready for transmission at the start of arbitration. This node then continues to transmit the remainder of its message, all other nodes having backed off.

The requirement for a node to be able to overwrite a recessive bit, and the transmitting node detect this change, limits the combination of physical length and speed of a CAN bus. The duration of each bit must be sufficient for the signal to propagate the length of the network. This limits the maximum data rate to 1 Mbit/s for a network up to 40 m in length or to 125 Kbit/s for a 500 m long network.

The arbitration mechanism employed by CAN means that messages are sent as if all the nodes on the network shared a single global priority based queue. In effect messages are sent on the bus according to fixed priority non-pre-emptive scheduling.

The above high level description is a somewhat simplified view of the timing behaviour of CAN. CAN does not have a global concept of time, rather each CAN controller typically has its own clock which, within a tolerance specified by the protocol, may drift with respect to the clocks of other nodes. The CAN protocol therefore requires that nodes re-synchronise on each message transmission. Specifically, every node must synchronise to the leading edge of the *start of frame* bit caused by whichever node starts to transmit first.

Normally, CAN nodes are only allowed to start transmitting when the bus is idle. Thus, when the bus is idle beyond the 3-bit *inter-frame space* and a node starts to transmit a message beginning with the dominant start of frame bit ('0'), then all the other nodes synchronise on the leading edge of this bit and become *receivers*—i.e.

<sup>4</sup> A *bus idle period* is an interval of arbitrary length comprising only recessive bits and beginning with the last bit of the *inter-frame space*—the final 3-bit field shown in Fig. 4.

they are not permitted to transmit until the bus next becomes idle. In this case any message that becomes ready for transmission after the leading edge of the start of frame bit has to wait for the next bus idle period before it can enter into arbitration.

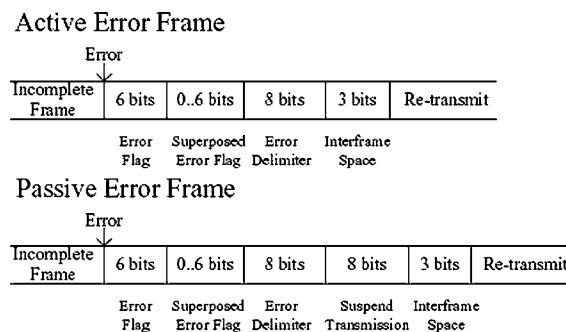
However, to avoid problems due to clock drift, the CAN protocol also specifies that, if a CAN node has a message ready for transmission and detects a dominant bit at the 3rd bit of the inter-frame space, it will interpret this as a start of frame bit, and with the next bit, start transmitting its own message with the first bit of the identifier without first transmitting a start of frame bit and without becoming a receiver.<sup>5</sup> Again the leading edge of the start of frame bit causes a synchronisation. This behaviour ensures that any messages that become ready for transmission, whilst another message is being sent on the bus, are entered into the next round of arbitration, irrespective of any within tolerance clock drift.

### 2.1.2 Error detection

CAN was designed as a robust and reliable form of communication for short messages. Each data frame carries between 0 and 8 bytes of payload data and has a 15-bit Cyclic Redundancy Check (CRC). The CRC is used by receiving nodes to check for errors in the transmitted message. If a node detects an error in the transmitted message, which may be a bit-stuffing error (see Section 2.1.3), a CRC error, a form error in the fixed part of the message, or an acknowledgement error, then it transmits an error flag. The error flag consists of 6 bits of the same polarity: ‘000000’ if the node is in the error active state and ‘111111’ if it is error passive. Transmission of an error flag typically causes other nodes to also detect an error, leading to transmission of further error flags.

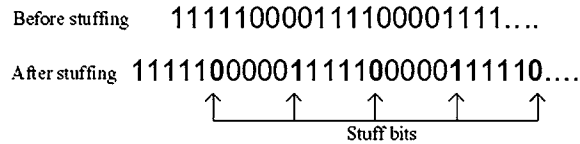
Figure 5 illustrates CAN error frames, for further details see (Bosch, 1991; Punnekkat et al., 2000). The length of an error frame is between 17 and 31 bits. Hence each message transmission that is signalled as an error can lead to a maximum of 31 additional bits<sup>6</sup> of error recovery overhead plus re-transmission of the message itself.

**Fig. 5** CAN error frames



<sup>5</sup> See page 54 of the CAN Specification version 2.0 (Bosch, 1991).

<sup>6</sup> The analysis given by Tindell and Burns (1994) and Tindell et al. (1994b, 1995) uses 29 bits as the error recovery overhead as specified on page 8 of part A of the CAN specification 2.0 (Bosch, 1991) for standard identifiers only. We use 31 bits as specified on page 40 of the CAN specification 2.0 Part B (Bosch, 1991) for both standard and extended identifiers.

**Fig. 6** Worst-case bit stuffing

### 2.1.3 Bit stuffing

As the bit patterns ‘000000’ and ‘111111’ are used to signal errors, it is essential that these bit patterns are avoided in the variable part of a transmitted message—see Fig. 4. The CAN protocol therefore requires that a bit of the opposite polarity is inserted by the transmitter whenever 5 bits of the same polarity are transmitted. This process is referred to as *bit-stuffing*, and is reversed by the receiver.

The worst-case scenario for bit-stuffing is shown in Fig. 6. Note that each stuff bit begins a sequence of 5 bits that is itself subject to bit stuffing.

Stuff bits increase the maximum transmission time of CAN messages. Including stuff bits and the inter-frame space, the maximum transmission time  $C_m$ , of a CAN message  $m$  containing  $s_m$  data bytes is given by:<sup>7</sup>

$$C_m = \left( g + 8s_m + 13 + \left\lfloor \frac{g + 8s_m - 1}{4} \right\rfloor \right) \tau_{\text{bit}} \quad (1)$$

where  $g$  is 34 for standard format (11-bit identifiers) or 54 for extended format (29-bit identifiers),  $\lfloor a/b \rfloor$  is notation for the *floor* function, which returns the largest integer less than or equal to  $a/b$ , and  $\tau_{\text{bit}}$  is the transmission time for a single bit.

The formula given in Eq. (1) simplifies to:

$$C_m = (55 + 10s_m) \tau_{\text{bit}} \quad (2)$$

for 11-bit identifiers and

$$C_m = (80 + 10s_m) \tau_{\text{bit}} \quad (3)$$

for 29-bit identifiers.

## 2.2 Scheduling model

In this section we describe an appropriate system model and notation that can be used to analyse worst-case response times of messages on CAN and hence determine system schedulability.

The system is assumed to comprise a number of nodes (microprocessors) connected via CAN. Each node is assumed to be capable of ensuring that, at any given time when arbitration starts, the highest priority message queued at that node is entered into arbitration.

<sup>7</sup> This formula corrects a similar one by Tindell and Burns (1994) and Tindell et al. (1994b, 1995) which does not account for the fact that stuff bits are themselves also subject to bit stuffing.

The system is assumed to contain a static set of hard real-time messages, each statically assigned to a node on the network. Each message  $m$  has a fixed identifier and hence a unique priority. As priority uniquely identifies each message, in the remainder of this paper we will overload  $m$  to mean either message  $m$  or priority  $m$  as appropriate. Each message has a maximum number of data bytes  $s_m$ , and a maximum transmission time  $C_m$ , given by Eq. (1).

Each message is assumed to be queued by a software task, process or interrupt handler executing on the host microprocessor. This task is either invoked by, or polls for, the event and takes a bounded amount of time, between 0 and  $J_m$ , to queue the message ready for transmission.  $J_m$  is referred to as the *queuing jitter* of the message and is inherited from the overall response time of the task, including any polling delay.

The event that triggers queuing of the message is assumed to occur with a minimum inter-arrival time of  $T_m$ , referred to as the *message period*. This model supports events that occur strictly periodically with a period of  $T_m$ , events that occur sporadically with a minimum separation of  $T_m$ , and events that occur only once before the system is reset, in which case  $T_m$  is infinite.

Each message has a hard deadline  $D_m$ , corresponding to the maximum permitted time from occurrence of the initiating event to the end of successful transmission of the message, at which time the message data is assumed to be available on the receiving nodes that require it. Tasks on the receiving nodes may place different timing requirements on the data, however in such cases we assume that  $D_m$  is the tightest such time constraint.

The *worst-case response time*  $R_m$ , of a message is defined as the longest time from the initiating event occurring to the message being received by the nodes that require it.

A message is said to be *schedulable* if and only if its worst-case response time is less than or equal to its deadline ( $R_m \leq D_m$ ). The system is schedulable if and only if all of the messages in the system are schedulable.

### 2.3 Practical implications of the model

Engineers wanting to use the analysis given in Section 3 to analyse CAN based systems must be careful to ensure that all of the assumptions of the above model hold for their system.

In particular, it is important that each CAN controller and device driver is capable of ensuring that, at any given time when arbitration starts, the highest priority message queued at that node is entered into arbitration. This behaviour is essential if message transmission is to take place as if there were a single global priority queue and for the analysis given in Section 3 to be applicable. As noted by Tindell and Burns (1994), the Philips 82C500 CAN controller cannot in general support this behaviour. Also the Intel 82527 CAN controller has a feature where messages are entered into arbitration in slot order rather than identifier order. In this case it is important that messages are allocated to slots in identifier order to preserve the correct priority based behaviour.

Many on-chip CAN controllers have multiple slots that can be allocated to either transmit or receive a specific message. For example some Motorola, National Semiconductor, Fujitsu and Hitachi on-chip CAN peripherals have 14, 15 or 16 such slots.

These slots typically have only a single buffer and therefore it is necessary to ensure that the previous instance of a message has been transmitted before any new data is written into the buffer, otherwise the previous message will be overwritten and lost. This behaviour provides an additional constraint on message transmission: the deadline of each message must be less than or equal to its period ( $D_m \leq T_m$ ).

Recall that the worst-case response time of a message is from the occurrence of the initiating event to the end of successful message reception at the receiving nodes. As noted by Broster (2003), receiving nodes can access the message following the end of frame marker and before the 3-bit inter-frame space—see Fig. 4. The analysis given in the remainder of this paper is slightly pessimistic in that it includes the 3-bit inter-frame space in the computed worst-case response times. To remove this small degree of pessimism, it is valid to simply subtract  $3\tau_{\text{bit}}$  from the computed response time values.

The time constraint of interest to engineers is the overall end-to-end response time from an initiating event occurring, such as the brake pedal switch closing, to the corresponding output response, for example the brake lights illuminating. The worst-case response time of a message represents only part of this overall end-to-end response time. There is an additional delay to consider, corresponding to the worst-case time between the message becoming available at the receiving node and the output being made. Processing of the signal information contained in a message is typically done either by a task that polls for the message or by an interrupt handler that is triggered by message reception. The worst-case response time of the receiving task or interrupt handler, including any polling delay, needs to be added to the worst-case response time of the message to determine the overall end-to-end response time.

The scheduling model assumed in this paper uses only one time domain, whilst CAN typically has a separate clock source for each node on the network. To ensure that the schedulability analysis for a real network does not produce optimistic results, it is necessary to take clock tolerances into account. This can be achieved by converting to real-time as follows: for message jitters and bit times on the bus the conversion to real-time should assume that the node clocks run as slowly as their tolerance allows. Similarly, message periods and deadlines derived from node clocks should be converted to real-time assuming that the node clocks run as quickly as their tolerance allows.

### 3 Response time analysis

Response time analysis for CAN aims to provide a method of calculating the worst-case response time of each message. These values can then be compared to the message deadlines to determine if the system is schedulable. Initially we provide analysis assuming no errors on the CAN bus. This analysis is then extended, in Section 3.5, to account for errors on the bus.

For systems complying with the scheduling model given in Section 2.2, CAN effectively implements fixed priority non-pre-emptive scheduling of messages. Following the analysis given by Tindell and Burns (1994) and Tindell et al. (1994b, 1995) the worst-case response time of a message can be viewed as being made up of three elements:

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- (i) The queuing jitter  $J_m$ , corresponding to the longest time between the initiating event and the message being queued, ready to be transmitted on the bus.
- (ii) The queuing delay  $w_m$ , corresponding to the longest time that the message can remain in the CAN controller slot or device driver queue, before commencing successful transmission on the bus.
- (iii) The transmission time  $C_m$ , corresponding to the longest time that the message can take to be transmitted.

The worst-case response time of message  $m$  is given by:

$$R_m = J_m + w_m + C_m \quad (4)$$

The queuing delay  $w_m$ , comprises two elements:

- (i) *blocking*  $B_m$ , due to lower priority messages which may be in the process of being transmitted when message  $m$  is queued, and
- (ii) *interference* due to higher priority messages which may win arbitration and be transmitted in preference to message  $m$ .

Given the behaviour of CAN described in the final two paragraphs of Section 2.1.1, the maximum amount of blocking occurs when a lower priority message starts transmission immediately before message  $m$  is queued and hence ready to be transmitted on the bus. Message  $m$  must wait until the bus is idle before it can be entered into arbitration. The maximum blocking time  $B_m$ , is given by:

$$B_m = \max_{k \in lp(m)} (C_k) \quad (5)$$

where  $lp(m)$  is the set of messages with lower priority than  $m$ .

The concept of a *busy period*, introduced by Lehoczky (1990), is fundamental in analysing worst-case response times. Modifying the definition of a busy period given by Harbour et al. (1991) to apply to CAN messages, a priority level- $m$  busy period is defined as follows:

- (i) It starts at some time  $t^s$  when a message of priority  $m$  or higher is queued ready for transmission and there are no messages of priority  $m$  or higher waiting to be transmitted that were queued strictly before time  $t^s$ .
- (ii) It is a contiguous interval of time during which any message of priority lower than  $m$  is unable to start transmission and win arbitration.
- (iii) It ends at the earliest time  $t^e$  when the bus becomes idle, ready for the next round of transmission and arbitration, yet there are no messages of priority  $m$  or higher waiting to be transmitted that were queued strictly before time  $t^e$ .

The key characteristic of a busy period is that all messages of priority  $m$  or higher, queued strictly before the end of the busy period, are transmitted during the busy period. These messages cannot therefore cause any interference on a subsequent instance of message  $m$  queued at or after the end of the busy period.

In mathematical terminology, busy periods can be viewed as right half-open intervals:  $[t^s, t^e)$  where  $t^s$  is the start of the busy period and  $t^e$  the end of the busy period. Thus the end of one busy period may correspond to the start of another separate busy

period. This is in contrast to the simpler definition given by Lehoczky (1990), which unifies two adjacent busy periods, as we have defined them, and therefore sometimes results in analysis of more message instances than is strictly necessary.

The worst-case queuing delay for message  $m$  occurs for some instance of message  $m$  queued within a priority level- $m$  busy period that starts immediately after the longest lower priority message begins transmission. This *maximal* busy period begins with a so-called *critical instant* (Liu and Layland, 1973) where message  $m$  is queued simultaneously with all higher priority messages and then each of these higher priority messages is subsequently queued again after the shortest possible time interval. In the remainder of this paper whenever we refer to a busy period we mean this maximum length busy period.

If more than one instance of message  $m$  is transmitted during a priority level- $m$  busy period, then it is necessary to determine the response time of each instance, in order to find the overall worst-case response time of the message.

### 3.1 Basic analysis and stopping condition

Tindell and Burns (1994) and Tindell et al. (1994b, 1995) give the following equation for the worst-case queuing delay:

$$w_m = B_m + \sum_{\forall k \in hp(m)} \left\lceil \frac{w_m + J_k + \tau_{\text{bit}}}{T_k} \right\rceil C_k \quad (6)$$

where  $hp(m)$  is the set of messages with priorities higher than  $m$ , and  $\lceil a/b \rceil$  is notation for the *ceiling* function which returns the smallest integer greater than or equal to  $a/b$ .

Although  $w_m$  appears on both sides of Eq. (6), as the right hand side is a monotonic non-decreasing function of  $w_m$ , the equation may be solved using the recurrence relation given below.

$$w_m^{n+1} = B_m + \sum_{\forall k \in hp(m)} \left\lceil \frac{w_m^n + J_k + \tau_{\text{bit}}}{T_k} \right\rceil C_k \quad (7)$$

A suitable starting value is  $w_m^0 = B_m$ . The recurrence relation iterates until, either  $J_m + w_m^{n+1} + C_m > D_m$  in which case the message is not schedulable, or  $w_m^{n+1} = w_m^n$  in which case the worst-case response time of the *first instance of the message in the busy period* is given by:  $J_m + w_m^{n+1} + C_m$ .

The flaw in the above analysis is that, given the constraint  $D_m \leq T_m$ , it implicitly assumes that if message  $m$  is schedulable, then the priority level- $m$  busy period will end at or before  $T_m$ . We observe that with fixed priority pre-emptive scheduling this would always be the case, as on completion of transmission of message  $m$  no higher priority message could be awaiting transmission. However, with fixed priority non-pre-emptive scheduling, a higher priority message can be awaiting transmission when message  $m$  completes transmission, and thus the busy period can extend beyond  $T_m$ , as shown by the example in Section 1.4.

The length  $t_m$ , of the priority level- $m$  busy period is given by the following recurrence relation, starting with an initial value of  $t_m^0 = C_m$ , and finishing when  $t_m^{n+1} = t_m^n$ :

$$t_m^{n+1} = B_m + \sum_{\forall k \in \text{hep}(m)} \left\lceil \frac{t_m^n + J_k}{T_k} \right\rceil C_k \quad (8)$$

where  $\text{hep}$  is the set of messages with priority higher than or equal to  $m$ . As the right hand side is a monotonic non-decreasing function of  $t_m$ , then the recurrence relation is guaranteed to converge provided that the bus utilisation  $U_m$ , for messages of priority  $m$  and higher, is less than 1:

$$U_m = \sum_{\forall k \in \text{hep}(m)} \frac{C_k}{T_k} \quad (9)$$

If  $t_m \leq T_m - J_m$ , then the busy period ends at or before the second instance of message  $m$  is queued. This means that only the first instance of the message is transmitted during the busy period. The existing analysis calculates the worst-case queuing time for this instance, via Eq. (7), and hence provides the correct worst-case response time in this case.

If  $t_m > T_m - J_m$ , then the existing analysis may give an optimistic worst-case response time, depending on whether the first, or a subsequent instance of message  $m$  has the longest response time.

We observe that the analysis presented in appendix A.2 of George et al. (1996) suggests that  $t_m$  is the smallest value that is a solution to Eq. (8), however this is not strictly correct. For the lowest priority message  $B_m = 0$ , and so  $t_m = 0$  is trivially the smallest solution when all of the messages have zero jitter. We avoid this problem by using an initial value of  $t_m^0 = C_m$ .

### 3.2 Checking multiple instances

The number of instances  $Q_m$ , of message  $m$  that become ready for transmission before the end of the busy period is given by:

$$Q_m = \left\lceil \frac{t_m + J_m}{T_m} \right\rceil \quad (10)$$

To determine the worst-case response time of message  $m$ , it is necessary to calculate the response time of each of the  $Q_m$  instances. The maximum of these values then gives the worst-case response time.

In the following analysis, we use the index variable  $q$  to represent an instance of message  $m$ . The first instance in the busy period corresponds to  $q = 0$ , and the final instance to  $q = Q_m - 1$ . The longest time from the start of the busy period to instance  $q$  beginning successful transmission is given by:

$$w_m^{n+1}(q) = B_m + qC_m + \sum_{\forall k \in \text{hep}(m)} \left\lceil \frac{w_m^n + J_k + \tau_{\text{bit}}}{T_k} \right\rceil C_k \quad (11)$$

**Table 3** CAN messages

| Message | Priority | Period | Deadline | TX time |
|---------|----------|--------|----------|---------|
| A       | 1        | 2.5 ms | 2.5 ms   | 1 ms    |
| B       | 2        | 3.5 ms | 3.25 ms  | 1 ms    |
| C       | 3        | 3.5 ms | 3.25 ms  | 1 ms    |

The recurrence relation starts with a value of  $w_m^0(q) = B_m + qC_m$ , and ends when  $w_m^{n+1}(q) = w_m^n(q)$ , or when  $J_m + w_m^{n+1}(q) - qT_m + C_m > D_m$  in which case the message is unschedulable. For values of  $q > 0$  an efficient starting value is given by  $w_m^0(q) = w_m(q-1) + C_m$ .

The event initiating instance  $q$  of the message occurs at time  $qT_m - J_m$  relative to the start of the busy period, so the response time of instance  $q$  is given by:

$$R_m(q) = J_m + w_m(q) - qT_m + C_m \quad (12)$$

The worst-case response time of message  $m$  is therefore:

$$R_m = \max_{q=0..Q_m-1} (R_m(q)) \quad (13)$$

We note that the analysis presented above is also applicable when messages have deadlines that are greater than their periods, so called arbitrary deadlines. However, if such timing characteristics are specified then the software device drivers or CAN controller hardware may need to be capable of buffering more than one instance of a message.  $N_m$ , the number of instances of each message that need to be buffered is bounded by:

$$N_m = \left\lceil \frac{R_m}{T_m} \right\rceil \quad (14)$$

We observe that the analysis presented by George et al. (1996) effectively uses  $Q_m = \lfloor t_m/T_m \rfloor + 1$  rather than  $Q_m = \lceil t_m/T_m \rceil$ . This yields a value which is one too large when the length of the busy period plus jitter is an integer multiple of the message period. Although this does not give rise to problems, we prefer the more efficient formulation given by Eq. (10).

### 3.3 Example

In Section 1.4 we showed, with the aid of a simple example, how the existing analysis can provide optimistic worst-case response times and hence flawed guarantees that messages will meet their deadlines. We return to this example to illustrate how the analysis presented in this paper computes the correct worst-case response times. For ease of reference, the table of message parameters is repeated below.

Using the new analysis, the worst-case response time of message C ( $m = 3$ ) is calculated as follows: As there are no lower priority messages,  $B_3 = 0$ . Starting with

a value of  $t_3^0 = C_3 = 1$ , the recurrence relation given by Eq. (8) iterates as follows:  $t_3^1 = 3$ ,  $t_3^2 = 4$ ,  $t_3^3 = 6$ ,  $t_3^4 = 7$ , converging as  $t_3^5 = t_3^4 = 7$ . The length of the busy period is therefore 7.0 ms, and the number of instances of message  $C$  that need to be examined is given by Eq. (10):

$$Q_3 = \left\lceil \frac{7.0}{3.5} \right\rceil = 2$$

This tells us that there is the possibility that the existing analysis will calculate an optimistic worst-case response time. The value could, however, still be correct if the first instance of the message has the longest response time.

Calculation of the response time of the first instance proceeds using Eq. (11):  $w_3^0(0) = 0$ ,  $w_3^1(0) = 2$ , converging as  $w_3^2(0) = w_3^1(0) = 2$ . Using Eq. (12), we have  $R_3(0) = 3$ , the same response time calculated by the existing analysis.

Moving on to the second instance,  $w_3^0(1) = w_3(0) + C_m = 3$ ,  $w_3^1(1) = 4$ ,  $w_3^2(1) = 5$ ,  $w_3^3(1) = 6$ . At this point computation would normally stop as the response time, given by  $J_3 + w_3(q) - qT_3 + C_3$ , has reached 3.5 ms which is greater than the message deadline. However, if we continue iterating, assuming a longer deadline, then the recurrence relation converges on  $w_3^4(1) = w_3^3(1) = 6$  and hence  $R_3(1) = 3.5$  ms. The worst-case response time of message  $C$  is in fact 3.5 ms, as previously illustrated by Fig. 3 in Section 1.4.

### 3.4 Sufficient schedulability tests

The analysis given in Sections 3.1 and 3.2 corrects a significant flaw in the existing schedulability analysis for CAN. However, the schedulability test presented is more complex, potentially requiring the computation of multiple response times.

In this section we present two simpler but more pessimistic schedulability tests. These tests are “sufficient but not necessary”. By “sufficient” we mean that all systems deemed to be schedulable by the tests are in fact schedulable, and by “not necessary” we mean that not all systems deemed to be unschedulable by the tests are in fact unschedulable.

The schedulability tests given in this section are only applicable given the constraint that message deadlines do not exceed their periods.

The response time of the first instance of a message in the busy period is given by Eq. (7). Assuming that this first instance completes transmission before its deadline and hence before the end of its period, then we have two possibilities to consider.

- (i) If the busy period ends before the next instance of message  $m$  is queued, then Eq. (7) gives the correct worst-case response time.
- (ii) Alternatively, if the busy period continues beyond the time at which the next instance of message  $m$  is queued, then we must also consider the response time of the second and any subsequent instances of message  $m$ , queued before the end of the busy period.

First, we derive an upper bound on the maximum length of the interval  $[s_{m,q}, s_{m,q+1})$ , between the times,  $s_{m,q}$  and  $s_{m,q+1}$ , at which two arbitrary but consecutive instances,

$q$  and  $q + 1$ , of message  $m$  start transmission. We then show that this upper bound is also an upper bound on the queuing delay for instance  $q + 1$ , and can therefore be used as the basis for a sufficient schedulability test.

We assume that:

- (i) all  $q + 1$  instances fall within the same busy period,
- (ii) the first  $q$  instances are schedulable—we will return to this point later.

We observe that at time  $s_{m,q}$ , when instance  $q$  starts transmission, there can be no other messages currently being transmitted, and no messages of higher priority than  $m$  awaiting transmission. Thus, an upper bound on the length of the time interval  $[s_{m,q}, s_{m,q+1})$  can be found by making the potentially pessimistic assumption that all higher priority messages are queued just as instance  $q$  starts transmission. The smallest solution to Eq. (15) provides an upper bound on the length of this interval.

$$w_m^{n+1} = C_m + \sum_{\forall k \in hp(m)} \left\lceil \frac{w_m^n + J_k + \tau_{\text{bit}}}{T_k} \right\rceil C_k \quad (15)$$

Here,  $C_m$  is the transmission time of the  $q$ th instance of message  $m$ , which is transmitted first in the interval. The summation term represents the interference from higher priority messages, released during the interval, and sent before the  $(q + 1)$ th instance of message  $m$  can start to be transmitted.

Given the assumption that the first  $q$  instances in the busy period are schedulable, and the constraint that  $D_m \leq T_m$ , then the start (and end) of transmission of the  $q$ th instance must happen before the end of its period, and hence before the  $(q + 1)$ th instance is queued. This means that the queuing delay for the  $(q + 1)$ th instance, as measured from the time at which it is queued to the start of its transmission, is less than the length of the interval  $[s_{m,q}, s_{m,q+1})$ . The queuing delay for the  $(q + 1)$ th instance is therefore also bounded<sup>8</sup> by the solution to Eq. (15).

We now return to the assumption that the first  $q$  instances are schedulable. Schedulability of the  $q = 0$  instance can be determined using Eq. (7); whilst the schedulability of the second and all subsequent instances within the busy period can be determined, by induction, using Eq. (15).

To determine an upper bound on the queuing delay, a suitable starting value, for use in using Eq. (15), is  $w_m^0 = C_m$ . The recurrence relation iterates until, either  $J_m + w_m^{n+1} + C_m > D_m$  in which case message  $m$  is deemed unschedulable, or  $w_m^{n+1} = w_m^n$  in which case the second and subsequent instances of message  $m$  are schedulable, with an upper bound on their response times of  $J_m + w_m^{n+1} + C_m$ .

Intuitively, we might say that the second and subsequent instances of message  $m$  in the busy period are subject to blocking, of at most  $C_m$ , due to the previous instance of the same message.

<sup>8</sup> We observe that the queuing delay of the  $(q + 1)$ th instance is in fact at least  $C_m$  less than the bound given by Eq. (15). This is because, to be schedulable, instance  $q$  must start transmission at least  $C_m$  before the end of its period. As accurate analysis is available, presented in Section 3.2, we do not pursue this potential improvement in the sufficient analysis further.

This result suggests a simple sufficient but not necessary schedulability test, formed by combining Eqs. (7) and (15) into a single equation—Eq. (16).

$$w_m^{n+1} = \max(B_m, C_m) + \sum_{\forall k \in hp(m)} \left\lceil \frac{w_m^n + J_k + \tau_{\text{bit}}}{T_k} \right\rceil C_k \quad (16)$$

We observe that the schedulability analysis embodied in Eq. (16) equates to assuming that an instance of message  $m$  can be subject to blocking; either of  $B_m$ , due to non-pre-emptive transmission of lower priority messages; or of  $C_m$ , due to the non-pre-emptive transmission of the previous instance of message  $m$  itself.

A further simplification is to assume that the blocking factor always takes its maximum possible value. This leads to a further sufficient but not necessary schedulability test:

$$w_m^{n+1} = B^{\text{MAX}} + \sum_{\forall k \in hp(m)} \left\lceil \frac{w_m^n + J_k + \tau_{\text{bit}}}{T_k} \right\rceil C_k \quad (17)$$

where  $B^{\text{MAX}}$  corresponds to the transmission time of the longest possible CAN message (8 data bytes), irrespective of the characteristics and priorities of the messages in the system.<sup>9</sup>

### 3.5 Error model

So far we have assumed that no errors occur on the CAN bus; however, as originally shown by Tindell and Burns (1994) and Tindell et al. (1994b, 1995), schedulability analysis of CAN may be extended to include an appropriate error model.

In this paper we consider only a very simple and general error model. We assume that the maximum number of errors present on the bus in some time interval  $t$  is given by the function  $F(t)$ . We assume no specific details about this function; save that it is a monotonic non-decreasing function of  $t$ . For a more detailed discussion of appropriate error models for CAN, see Punnekkat et al. (2000) and Broster et al. (2002, 2005).

We now modify the schedulability equations to account for the error recovery overhead. The worst-case impact of a single bit error is to cause transmission of an additional 31 bits of error recovery overhead plus re-transmission of the affected message. Only errors affecting message  $m$  or higher priority messages can delay message  $m$  from being successfully transmitted. The maximum additional delay caused by the error recovery mechanism is therefore given by:

$$E_m(t) = \left( 31\tau_{\text{bit}} + \max_{k \in hp(m)} (C_k) \right) F(t) \quad (18)$$

<sup>9</sup> Tindell et al. (1995) state that the *blocking time on CAN* is defined as the longest time that a message can take to be physically transmitted on “the bus”. This simplified view provides a sufficient but not necessary schedulability test that corresponds to Eq. (17). However, later in Tindell et al. (1995), the blocking term is described as “the longest time that any lower priority message can occupy the bus”. This description, also in Tindell and Burns (1994) and Tindell et al. (1994b), results in a flawed schedulability test.

Revising Eq. (8) to compute the length of the busy period we have:

$$t_m^{n+1} = E_m(t_m^n) + B_m + \sum_{\forall k \in \text{hep}(m)} \left\lceil \frac{t_m^n + J_k}{T_k} \right\rceil C_k \quad (19)$$

Again an appropriate initial value is  $t_m^0 = C_m$ . Eq. (19) is guaranteed to converge on a solution provided that the utilisation  $U_m$ , including error recovery overhead, is less than 1.

As before, Eq. (10) can be used to compute the number of message instances that need to be examined to find the worst-case response time.

$$w_m^{n+1}(q) = E_m(w_m^n + C_m) + B_m + qC_m + \sum_{\forall k \in \text{hp}(m)} \left\lceil \frac{w_m^n + J_k + \tau_{\text{bit}}}{T_k} \right\rceil C_k \quad (20)$$

Eq. (20) extends Eq. (11) to account for the error recovery overhead. Note that as errors can impact the transmission of message  $m$  itself, the time interval considered in calculating the error recovery overhead includes the transmission time of message  $m$  as well as its queuing delay. Eqs. (20), (12) and (13) can be used together to compute the response time of each message instance  $q$ , and hence find the worst-case response time of each message  $m$  in the presence of errors at the maximum rate specified by the error model.

The sufficient schedulability tests given in Section 3.4 can be similarly modified via the addition of the term  $E_m(w_m^n + C_m)$  to account for the error recovery overhead.

## 4 Discussion

In this section we consider various characteristics of CAN systems and discuss whether flaws in the existing analysis can result in erroneous guarantees under specific circumstances that are relevant to real-world systems.

We seek to answer the following questions.

1. Can the existing analysis give faulty guarantees to messages of any priority?
2. If the bus utilization is low, can the existing analysis still result in optimistic response times?
3. Do error models give sufficient engineering margin for error to account for the flaw in the analysis?
4. Does the omission of diagnostic messages during normal operation reduce interference/blocking enough to ensure that the deadlines of the remaining messages will be met?
5. Which message guarantees can we be sure are not at risk?

### 4.1 Priorities of messages at risk

We have found that the existing analysis gives the correct worst-case response times for the highest priority and the 2nd highest priority message. However; it can compute



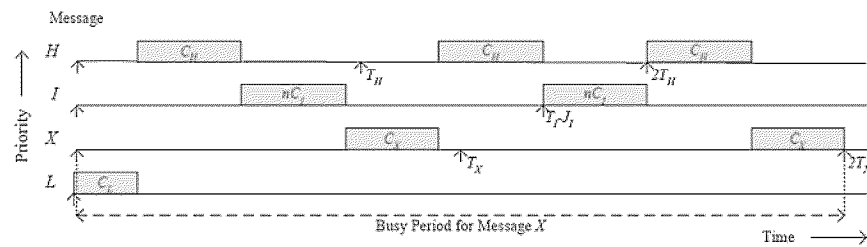


**Fig. 7** Busy period for message  $X$

incorrect worst-case response times for messages from the 3rd highest priority to the lowest priority.

This is illustrated by the example message set constructed below and depicted in Fig. 7. The example message set consists of;

- (i) a high priority message  $H$ ;
- (ii) a group of  $n$  (where  $n \geq 1$ ) intermediate priority messages, represented by  $I$ , which all have the same periods and transmission times;
- (iii) a message  $X$  with a priority below those messages in group  $I$ , which highlights the flaw in the analysis and
- (iv) a group of  $k$  (where  $k \geq 0$ ) low priority messages represented by  $L$ , which all have the same transmission times.

The transmission times of the messages are  $C_H$ ,  $C_I$ ,  $C_X$  and  $C_L$  respectively, with the constraint that  $C_X > C_L$ .

The low priority messages  $L$ , are assumed to have very large periods and no jitter. These messages contribute only blocking to the response time of message  $X$ . (Note that if there are no lower priority messages, i.e.  $k = 0$ , then the example still holds with  $C_L = 0$ ).

The period of message  $H$  is:

$$T_H = (C_L + 2C_H + 2nC_I + C_X)/2$$

The period of message  $X$  is:

$$T_X = (C_L + 3C_H + 2nC_I + 2C_X)/2$$

The period of the intermediate messages  $I$ , is assumed to be large ( $T_I \gg 2T_X$ ); however the period less jitter for each intermediate message is:

$$T_I - J_I = C_L + 2C_H + nC_I + C_X$$

By contrast, messages  $H$  and  $X$  are assumed to have no jitter.

The busy period for message  $X$  is shown in Fig. 7. For simplicity, there is only one intermediate priority message shown in the diagram; however, the transmission time of this message is given as  $nC_I$ , representing the arbitrary number of intermediate messages that are considered.

We now show that under certain conditions message  $X$  exhibits the problem with the existing analysis. The length of the busy period for message  $X$ , given by Eq. (8), is:

$$t_X = C_L + 3C_H + 2nC_I + 2C_X = 2T_X$$

Hence, according to Eq. (10), there are two instances of message  $X$  in the busy period. We now compute the response times of these two instances. According to Eq. (11), and as  $C_X > C_L$ , the queuing delay of the first instance of message  $X$  is:

$$w_X(0) = C_L + C_H + nC_I$$

Similarly for the second instance:

$$w_X(1) = C_L + 3C_H + 2nC_I + C_X$$

According to Eq. (12), the response times of the two instances are:

$$R_X(0) = C_L + C_H + nC_I + C_X$$

and

$$R_X(1) = (C_L + 3C_H + 2nC_I + 2C_X)/2$$

Comparing the formulas for  $R_X(0)$  and  $R_X(1)$ , then, provided that  $C_H > C_L$ , the response time of the second instance is greater than that of the first. Meaning that message  $X$  exposes the flaw in the existing analysis. (In fact, assuming that  $D_X = T_X$ , the second instance of message  $X$  is only just schedulable with  $R_X = T_X$ ).

As we can choose an arbitrary number ( $n \geq 1$ ) of intermediate priority messages, and similarly an arbitrary number ( $k \geq 0$ ) of lower priority messages, message  $X$  may lie anywhere from the 3rd highest to the lowest priority in a set of messages with cardinality greater than or equal to 3. We conclude that any message from the lowest priority to the 3rd highest priority in a set of 3 or more messages can be given an optimistic response time and therefore a faulty guarantee by the existing analysis.

## 4.2 Breakdown utilisation

The example in Section 1.4 has a bus utilisation of 97%. It is interesting to ask if the existing analysis can yield optimistic worst-case response times for systems with much lower utilisation.

Returning to the example message set, constructed in Section 4.1, we now consider how low the utilisation of that message set can be.

To achieve the lowest possible utilisation, we need only consider the contribution from messages  $H$  and  $X$ ; as the utilisation of both the intermediate messages  $I$ , and the low priority messages  $L$ , tends to zero when their periods are increased to an

**Table 4** Utilisation of message sets breaking the existing analysis

| Number of messages | Utilisation |
|--------------------|-------------|
| 3                  | 45.5%       |
| 5                  | 21.4%       |
| 10                 | 9.2%        |
| 25                 | 3.4%        |
| 100                | 0.82%       |

arbitrarily large value. We therefore have:

$$U = \frac{2C_X}{C_L + 3C_H + 2nC_I + 2C_X} + \frac{2C_H}{C_L + 2C_H + 2nC_I + C_X}$$

with the constraints that  $C_H > C_L$  and  $C_X > C_L$ .

The overall utilisation is minimised by choosing values of  $C_H$  and  $C_X$  as small as possible, and a value of  $C_I$  as large as possible. Given the constraints on CAN message sizes, the minimum occurs when we choose messages  $H$  and  $X$  to have zero data bytes, so  $C_H = C_X = 55\tau_{\text{bit}}$ , the intermediate messages to have 8 data bytes, so  $C_I = 135\tau_{\text{bit}}$ , and no lower priority messages, so  $C_L = 0$ .

We note that this message set is somewhat pathological, as all the intermediate priority messages have arbitrarily large periods/deadlines and correspondingly large queuing jitter. However, it does illustrate that in general the existing analysis breaks down at very low utilisation levels.

Table 4 provides an upper bound on this breakdown utilisation: the existing analysis is known to breakdown at these levels of utilisation, it may breakdown at still lower levels.

Whilst it is unlikely that real-world applications will have message configurations that replicate the pathological case discussed above, such systems may include messages with large amounts of queuing jitter. Typically these are ‘gatewayed’ messages that have inherited a large jitter from variability in the response time of a source message sent on another network. We conclude that, for applications characterised by non-zero queuing jitter, it is prudent to assume that there could be problems with the existing analysis, irrespective of overall bus utilisation.

In fact, for real-world CAN systems, characterised by messages with non-zero queuing jitter and consequently deadlines less than periods, overall bus utilisation is a poor indicator of system schedulability.

### 4.3 Margin for error

In Section 3.5 we saw how a generalised error model could be included in the revised schedulability analysis. Bit error rates on CAN are typically very low:  $10^{-11}$  up to  $10^{-6}$  depending on environmental conditions (Ferreira et al., 2004). However, errors do occur and it is therefore appropriate that any commercial application of CAN schedulability analysis should include at least a simple error model to account for sporadic errors on the bus. These errors are typically caused by external sources of Electromagnetic Interference (EMI) such as mobile phones, radar, radio transmitters, and lightning as well as other possible causes such as switch contacts, and shielding or wiring faults. As such errors are typically completely uncorrelated with message

transmission, it is reasonable to assume that any useful error model allows for the possibility of an error occurring at any given time, and hence the error function  $F(t) \geq 1$  for a time interval of any length  $t$ .

Let us now consider the situation where the schedulability analysis given by Tindell and Burns (1994) and Tindell et al. (1994b, 1995) has been used along with an error model with  $F(t) = 1$  to determine the schedulability of a system. The recurrence relation used by the existing analysis is given below:

$$w_m^{n+1} = B_m + E_m(w_m^n + C_m) + \sum_{\forall k \in hp(m)} \left\lceil \frac{w_m^n + J_k + \tau_{\text{bit}}}{T_k} \right\rceil C_k \quad (21)$$

Given that  $F(t) \geq 1$ , then from Eq. (18), the maximum additional delay to message  $m$  due to the error recovery mechanism is always longer than the transmission time of message  $m$ , i.e.  $E_m(t) > C_m$ . Substituting  $C_m$  for  $E_m(t)$  in Eq. (21) gives:

$$w_m^{n+1} = B_m + C_m + \sum_{\forall k \in hp(m)} \left\lceil \frac{w_m^n + J_k + \tau_{\text{bit}}}{T_k} \right\rceil C_k \quad (22)$$

We note that as  $E_m(t) > C_m$ , the solution to Eq. (22) cannot be larger than the solution to Eq. (21).

Recall that Eq. (16) provides a correct sufficient but not necessary schedulability test for the case where there are no errors on the CAN bus. Comparing Eqs. (22) and (16), we observe that, as  $\max(B_m, C_m) \leq B_m + C_m$ , the solution to Eq. (16) cannot be larger than the solution to Eq. (22) and hence cannot be larger than the solution to Eq. (21). This means that if message  $m$  is deemed to be schedulable given the queuing delay computed by Eq. (21) for the case where there are errors on the bus, then it must also be schedulable given the queuing delay computed via Eq. (16) for the case where there are no errors on the bus.

This is an important result. It means that if the existing analysis showed that every message was schedulable in the presence of any reasonable error model, with  $F(t) \geq 1$ , then, despite the flaw in the existing analysis, every message is actually guaranteed to be schedulable when no errors are present. Put another way, the engineering margin for error provided by the error model is sufficient to account for the error in the analysis.

We observe however, that the robustness of systems analysed using the schedulability analysis given by Tindell and Burns (1994), and Tindell et al. (1994b, 1995) may not be all that was expected. Flaws in the existing analysis could lead to message configurations that will miss their deadlines in the presence of errors at a rate within the parameters of the specified error model, even though we can be sure that they will not miss their deadlines when no errors are present on the bus.

#### 4.4 Message omission

Many CAN applications allow for 8 data byte diagnostic messages that are not transmitted during the normal mode of operation. These messages are transmitted only when the system is in diagnostic mode<sup>10</sup> and linked to service equipment. In this section we consider whether the omission of diagnostic messages provides sufficient

<sup>10</sup> Typically, all normal mode messages continue to be transmitted during diagnostic mode.

reduction in interference/blocking to ensure that messages do not miss their deadlines during normal operation, despite being given potentially optimistic worst-case response times by the existing analysis.

To answer this question, we consider a system that is deemed to be schedulable by the existing analysis. We assume that this system includes an 8 data byte diagnostics message  $Y$ , which is only transmitted when the system is in diagnostic mode. We note that as message  $Y$  has the maximum number of data bytes, its transmission time is equivalent to the largest possible blocking factor, so  $C_Y = B^{\text{MAX}}$ . The blocking factor for each message  $m$  of higher priority than  $Y$ , is therefore given by  $B_m = B^{\text{MAX}}$ , which means that the existing analysis based on Eq. (7) computes exactly the same worst-case response time for each higher priority message  $m$ , as the correct sufficient but not necessary schedulability analysis test based on Eq. (17). The existing analysis cannot therefore result in optimistic worst-case response times for messages of higher priority than  $Y$ .

For each message of lower priority than  $Y$ , the interference due to message  $Y$  is at least  $B^{\text{MAX}}$ . Comparing Eq. (7) and (17), we observe that the solution to Eq. (7), with diagnostic message  $Y$  included in the set of higher priority messages, is at least as large as the solution to Eq. (17) when message  $Y$  is excluded. This means that if a lower priority message  $m$  is deemed to be schedulable by the existing analysis when message  $Y$  is present, then it must also be schedulable according to the correct sufficient but not necessary schedulability analysis when message  $Y$  is omitted.

We conclude that the omission of a single maximum length message of arbitrary priority provides sufficient reduction in interference/blocking to ensure that the flaw in the existing analysis cannot lead to any of the remaining messages missing their deadlines.

#### 4.5 Message guarantees not at risk

In this section we consider the circumstances under which the first instance of a message in the busy period is guaranteed to have the longest response time. Under these circumstances, despite its flaws, the existing analysis gives correct results.

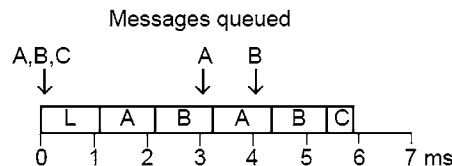
Assuming that message deadlines do not exceed their periods, then Eq. (16) in Section 3.4 provides an upper bound on the queuing delay for the second and subsequent instances of message  $m$  in the busy period. Comparing Eqs. (7) and (16), we observe that if  $B_m \geq C_m$ , then the first instance of message  $m$  is guaranteed to have a response time at least as long as subsequent ones. From the definition of  $B_m$  given in Eq. (5), we conclude the following important result: the existing analysis gives the correct response time for any message where there exists at least one lower priority message with equal or longer transmission time/message length.

### 5 Priority assignment policies

The analysis presented in Section 3 is applicable irrespective of the priority ordering of CAN messages. However, choosing an appropriate priority ordering is important in obtaining a schedulable system, and in maximising robustness to errors.

**Table 5** CAN messages highlighting non-optimal priority assignment

| Message | Period | Deadline | Number of bits | TX time |
|---------|--------|----------|----------------|---------|
| A       | 3.0 ms | 3.0 ms   | 135            | 1.08 ms |
| B       | 4.0 ms | 4.0 ms   | 135            | 1.08 ms |
| C       | 4.5 ms | 4.5 ms   | 65             | 0.52 ms |

**Fig. 8** Message response times with “optimal” priority assignment

Priority ordering is determined by a priority assignment policy. A priority assignment policy  $P$  is referred to as *optimal* if there are no systems that are schedulable using any other priority assignment policy that are not also schedulable using policy  $P$ .

Tindell and Burns (1994) and Tindell et al. (1995) claimed that *deadline monotonic* priority assignment (Leung and Whitehead, 1982) and “deadline minus jitter” or (*D-J-monotonic*) priority assignment (Zuhily, 2006) was optimal for CAN; however, whilst these policies are optimal for fixed priority pre-emptive scheduling, assuming deadlines no greater than periods, they are not optimal for fixed priority non-pre-emptive scheduling (George et al., 1996), and are therefore not optimal for CAN. This is illustrated by the following example using the set of messages given in Table 5.

This example assumes a 125 Kbit/s network and 11-bit identifiers. Messages A and B contain 8 data bytes and message C contains 1 data byte, giving transmission times of 1.08, 1.08 and 0.52 ms respectively, assuming worst-case bit stuffing. In addition, there are a number of lower priority messages, each containing 8 data bytes, which are also sent on the network; their transmission times are also 1.08 ms.

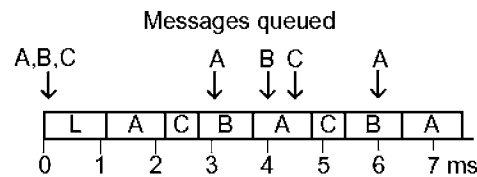
Setting message priorities in the order A—highest, then B, then C results in an unschedulable system. The worst-case response times of messages A and B are 2.16 ms and 3.24 ms respectively; however, in the worst case, message C does not even begin transmission before its deadline.

Figure 8 illustrates the long delays that message C is subject to before transmission. Messages A, B and C are assumed to be queued just too late to enter into arbitration at time  $t = 0$  and hence the low priority message L is transmitted first.

The priority ordering A, B, C corresponds to both deadline monotonic and also (*D-J*)-monotonic priority ordering—as all the messages have zero queuing jitter. If these priority assignment policies are optimal then we should not be able to find another priority ordering which results in all of the deadlines being met; however, if we use the priority ordering A, C, B then the worst-case response times of the messages are:  $R_A = 2.16$  ms,  $R_C = 2.68$  ms and  $R_B = 3.76$  ms, as illustrated in Fig. 9. With this priority ordering, all of the messages meet their deadlines.

The reason that the revised priority ordering results in a schedulable system is that giving the shortest message a higher priority enables all three messages to start transmission within 3 ms of being queued; hence none of them are subject to interference from a second instance of message A and subsequently a second instance of message

**Fig. 9** Message response times with an alternative priority assignment



B. This example shows that the priority assignment policies assumed by Tindell and Burns (1994) and Tindell et al. (1995) to be optimal are not.

George et al. (1996) claimed that deadline monotonic priority assignment is optimal for non-pre-emptive systems with no jitter, provided that deadlines and execution times are in the same order i.e.  $D_i < D_j$  implies  $C_i \leq C_j$ . The proof, given by George et al. (1996), assumes that “as  $\forall i, D_i \leq T_i$  the worst-case response time of any task is found in its first instance”; however, this assumption is false, as we have seen with the simple example in Section 1.4, and so the proof is undermined. The theorem may or may not still be true.

George et al. (1996) also showed that the optimal priority assignment algorithm devised by Audsley (1991) is applicable to non-pre-emptive systems. In general, Audsley’s algorithm is applicable provided that the worst-case response time of a message:

- (i) does not depend upon the specific priority ordering of higher priority messages and,
- (ii) does not get longer if the message is given a higher priority.

Inspection of the various equations presented in this paper shows that both of the above conditions hold. Neither the length of the queuing delay, nor the length of the busy period depends upon the specific priority order of higher priority messages. Similarly, although the blocking term can get larger with increased priority this is always counteracted by a decrease in interference that is at least as large; hence the length of the busy period and the length of the queuing delay cannot increase with increasing message priority. The optimal priority ordering of CAN messages can therefore be determined using Audsley’s priority assignment algorithm, given below.

```

Optimal Priority Assignment Algorithm

for each priority level, lowest first
{
  for each unassigned message  $m$ 
  {
    if  $m$  is schedulable at this priority
    {
      assign  $m$  this priority
      break (continue outer loop)
    }
  }
  return unschedulable
}
return schedulable

```

For  $n$  messages, Audsley's algorithm performs at most  $n(n - 1)/2$  schedulability tests and is guaranteed to find a schedulable priority assignment if one exists. It does not however specify an order in which messages should be tried at each priority level. This order heavily influences the priority assignment chosen if there is more than one ordering that is schedulable. In fact, a poor choice of initial ordering can result in a priority assignment that leaves the system only just schedulable. We therefore suggest that, as a useful heuristic, messages are tried at each priority level in (D-J) order, largest value of (D-J) first, with ties broken according to message length, longest first.

## 6 Implications and recommendations

In this section we discuss the implications of flaws in existing CAN schedulability analysis on commercial CAN schedulability analysis tools and deployed CAN applications.

### 6.1 CAN schedulability analysis tools

CAN schedulability analysis tools need to take account of the findings presented in this paper. This will involve checking, and if necessary updating, the analysis they employ; ensuring that it cannot provide optimistic worst-case response times and false guarantees.

The sufficient but not necessary schedulability tests given in Section 3.4 provide a “quick-fix” solution with minimal changes required to the existing analysis. These tests are however pessimistic and implementing the revised analysis given in Section 3 would potentially lead to a better technical solution.

Whilst “deadline minus jitter” or (D-J)-monotonic priority ordering is still a good heuristic to use, it is not necessarily the optimal priority assignment policy for CAN. Implementing priority ordering based upon Audsley's optimal priority assignment algorithm would ensure that a schedulable priority ordering is found whenever one exists.

### 6.2 Commercial CAN applications

System Designers configuring commercial CAN applications often take the engineering approach that all messages in the system should remain schedulable given the addition of any number of low priority messages that can be used for development and test purposes. Such analysis based on Tindell and Burns (1994) and Tindell et al. (1994b, 1995) would assume that every message is subject to the maximum blocking factor, as per the sufficient schedulability test given by Eq. (17). This schedulability test computes a correct upper bound on the actual response time of each message, and so provides a correct guarantee that the configured messages will meet their deadlines.

Given the flaws in the existing schedulability analysis, it would however be prudent for System Designers to check the precise details of the analysis used to compute worst-case response times for their systems. If the analysis used has the potential to compute



erroneous worst-case response times, then the feasibility of all the CAN configurations designed, developed and deployed using that analysis should be checked to ensure that they are in fact schedulable, and robust to errors at the rate specified by the prescribed error model.

### 6.3 Faults in deployed systems

Many deployed CAN systems, for example those in automotive applications, will have been analysed using the pragmatic engineering approach described in the previous section. The flaws in the existing analysis cannot lead to a problem with a deployed system in this case.

Many CAN applications allow for maximum length (8 data byte) diagnostic messages that are not transmitted during normal operation. Assuming that the existing analysis deemed the deployed system to be schedulable with these diagnostic messages present, then Section 4.4 showed that the omission of a single diagnostic message provides sufficient reduction in interference/blocking to ensure that the flaws in the existing analysis cannot lead to other messages missing their deadlines during normal operation.

In Section 4.5 we saw that the existing analysis gives the correct response time for any message where there is at least one lower priority message with equal or longer transmission time/message length. Many CAN applications use exclusively 8 data byte messages as a means of addressing the high ratio of overhead to useful data on CAN. In this case, the existing analysis is guaranteed to compute correct response times for all but the lowest priority message.

Even if a message has the potential to be given an erroneous worst-case response time by the existing analysis, then, unless that message is close to being unschedulable, the computed worst-case response time is still likely to be the true value. Even if an optimistic value is computed, then the true value may still be less than the message deadline. Finally, for a deadline miss to actually happen in a deployed system requires that the worst-case message phasing occurs, and at that point a number of messages take close to their maximum transmission times. This requires worst-case or near worst-case bit stuffing to occur which is, in itself, highly unlikely (Nolte et al., 2002).

Normal practice with commercial CAN configurations is to ensure that the schedulability analysis used includes provision for a plausible error model. In this case, Section 4.3 showed that such systems are guaranteed to be schedulable when no errors are present on the CAN bus provided that they were deemed to be schedulable in the presence of errors by the existing analysis.

We conclude that deadline misses in deployed CAN systems due to flaws in the existing analysis are extremely unlikely. Any such deadline failures are more likely to occur due to errors occurring on the bus at a higher rate than that accounted for by the error model.

We note that embedded CAN-based systems are built to be resilient to some messages missing their deadlines, and to much simpler forms of error such as wiring faults. CAN is not used, in its basic form, for safety critical systems due to known issues such as the “double receive” and “babbling idiot” problems (Rufino et al., 1998; Broster and Burns, 2003; Rufino, 2002).

## 7 Summary and conclusions

In this paper we highlighted a significant flaw in long-standing, highly cited, and widely used schedulability analysis of CAN. We showed how this flaw could lead to the computation of optimistic worst-case response times for CAN messages, broken guarantees, and deadline misses. This paper provides revised analysis that can be used to calculate correct worst-case response times for CAN.

In addition, we showed that:

1. The existing analysis can provide optimistic worst-case response times for messages from the 3rd highest priority to the lowest priority.
2. The existing analysis can lead to broken guarantees and hence deadline misses in systems with low bus utilisation.
3. Where an error model has been considered, the flaw in the existing analysis is not sufficient to lead to CAN configurations that will result in missed deadlines when no errors are present on the bus. The desired robustness to errors may not however be achieved.
4. The omission of a single maximum length diagnostic message, accounted for by the existing analysis, reduces interference/blocking enough to ensure that the deadlines of all the remaining messages are met during normal operation.
5. Despite its flaws, the existing analysis gives the correct response time for any message where there is at least one lower priority message with the same or longer transmission time/message length.

We discussed the implications of these results for commercial CAN systems developed using flawed analysis and provided two simple, sufficient schedulability tests enabling a “quick-fix” to be made to commercial CAN schedulability analysis tools.

Finally, we showed that neither deadline monotonic nor (D-J)-monotonic priority assignment is optimal for CAN. Audsley’s priority assignment algorithm is however optimal for fixed priority non-pre-emptive systems and can be used to obtain a schedulable priority ordering for CAN whenever one exists.

### 7.1 Future work

A considerable body of academic work has grown up from Tindell’s seminal analysis of CAN. The flaws in that original work may have partly undermined some of the subsequent research built upon it. Authors that have cited the original CAN analysis in their work are therefore encouraged to check the implications. In particular the academic work most likely to be affected is that which extends the original analysis and pushes system schedulability to its limits, for example work on error models.

### 7.2 Postscript

Volcano Network Architect (VNA) is a commercial CAN design and analysis tool originally developed by Volcano Communications Technologies AB, and now owned by Mentor Graphics Corporation. By 2004, over 20 million cars, with an average of 20 ECUs per car, had been programmed using this technology (Oswald, 2004).

The engineering team responsible for Volcano Network Architect was given early visibility of this paper, enabling them to check the validity of the schedulability analysis used in their commercial products.

The analysis provided by Volcano Network Architect was found to be sufficient: it assumes the longest possible blocking time irrespective of message priority (Horvath, 2006) and therefore computes an upper bound on response times, similar to that given by the sufficient schedulability tests described in Section 3.4.

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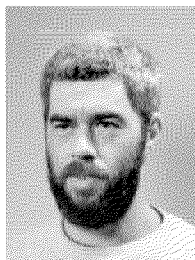
**Robert I. Davis** received a DPhil in Computer Science from the University of York in 1995. Since then he has founded three start-up companies, all of which have succeeded in transferring real-time systems research into commercial product. At Northern Real-Time Technologies Ltd. (1995–1997) he was responsible for development of the Volcano CAN software library. At LiveDevices Ltd. (1997–2001) he was responsible for development of the Real-Time Architect suite of products, including an OSEK RTOS and schedulability analysis tools. In 2002, Robert returned to the University of York, and in 2004 he was involved in setting up a spin out company, Rapita Systems Ltd., aimed at transferring worst-case execution time analysis technology into industry. Robert is a member of the Real-Time Systems Research Group at the University of York, and a director of Rapita Systems Ltd. His research interests include scheduling algorithms and schedulability analysis for real-time systems.



**Alan Burns** is head of the Real-Time Systems Research Group at the University of York. His research interests cover a number of aspects of real-time systems including the assessment of languages for use in the real-time domain, distributed operating systems, the formal specification of scheduling algorithms and implementation strategies, and the design of dependable user interfaces to real-time applications. He has authored/co-authored over 370 papers and 10 books, with a large proportion of them concentrating on real-time systems and the Ada programming language. Professor Burns has been actively involved in the creation of the Ravenscar Profile, a subset of Ada's tasking model, designed to enable the analysis of real-time programs and their timing properties.



**Reinder J. Bril** received a B.Sc. and an M.Sc. (both with honours) from the University of Twente, and a Ph.D. from the Technische Universiteit Eindhoven, the Netherlands. He started his professional career in January 1984 at the Delft University of Technology. From May 1985 until August 2004, he was with Philips, and worked in both Philips Research as well as Philips' Business Units. He worked on various topics, including fault tolerance, formal specifications, software architecture analysis, and dynamic resource management, and in different application domains, e.g. high-volume electronics consumer products and (low volume) professional systems. In September 2004, he made a transfer back to the academic world, to the System Architecture and Networking (SAN) group of the Mathematics and Computer Science department of the Technische Universiteit Eindhoven. His main research interests are currently in the area of reservation-based resource management for networked embedded systems with real-time constraints.



**Johan J. Lukkien** has been head of the System Architecture and Networking Research group at Eindhoven University of Technology since 2002. He received an M.Sc. and a Ph.D. from Groningen University in the Netherlands. In 1991, he joined Eindhoven University, after two years leave at the California Institute of Technology. His research interests include the design and performance analysis of parallel and distributed systems. Until 2000 he was involved in large-scale simulations in physics and chemistry. Since 2000, his research focus has shifted to the application domain of networked resource-constrained embedded systems. Contributions of the SAN group are in the area of component-based middleware for resource-constrained devices, distributed co-ordination, Quality of Service in networked systems and schedulability analysis in real-time systems.

# Controller Area Network

*Marco Di Natale*  
*Scuola Superiore S. Anna- Pisa, Italy*

# CAN bus

## Controller Area Network

- Publicly available standard [1]  
<http://www.semiconductors.bosch.de/pdf/can2spec.pdf>

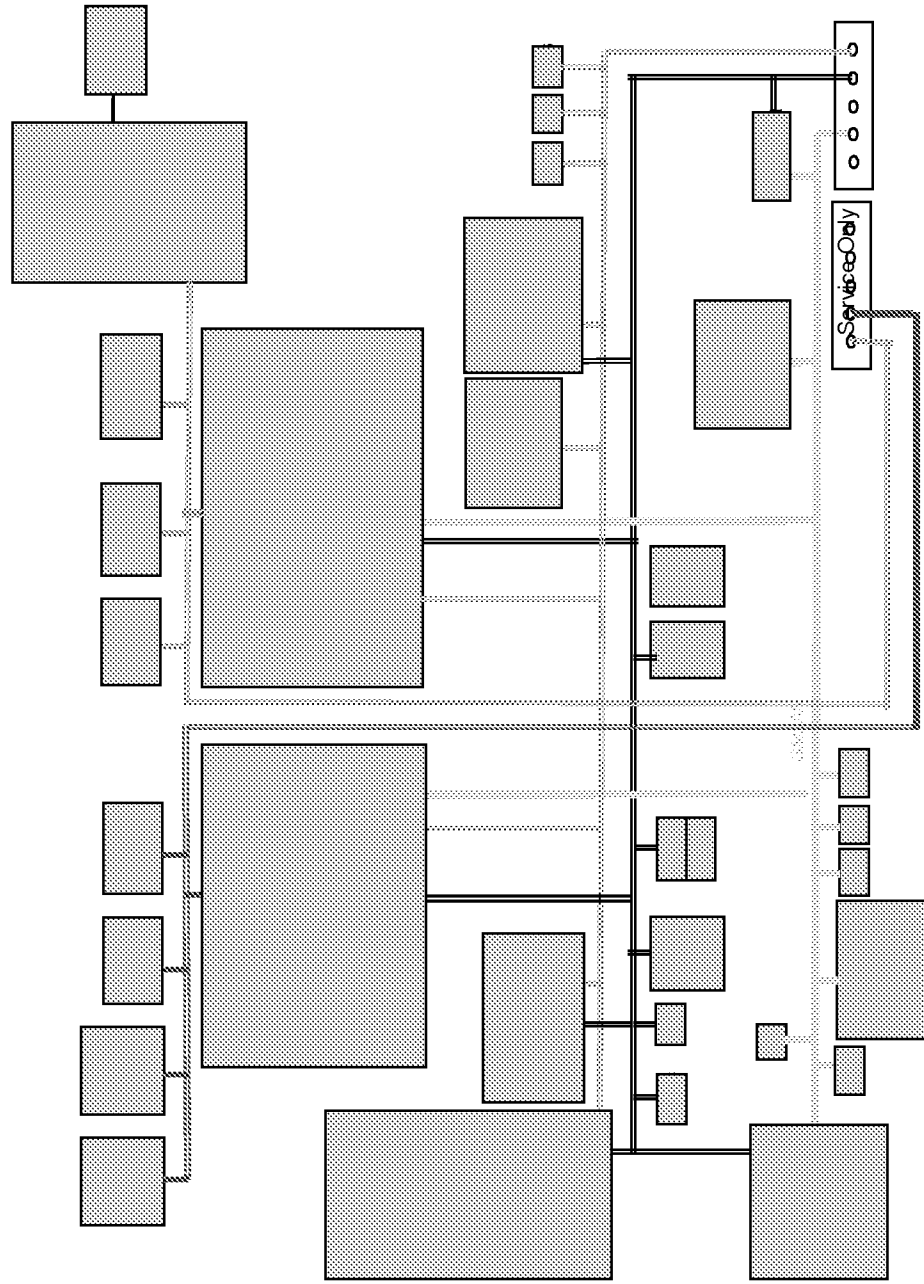
## Serial data bus developed by Bosch in the 80s

- Support for broadcast and multicast comm
- Low cost
- Deterministic resolution of the contention
- Priority-based arbitration
- Automotive standard but used also in automation, factory control, avionics and medical equipment
- Simple, 2 differential (copper) wire connection
- Speed of up to 1Mb/s
- Error detection and signalling



## Architecture Model: An example automotive system

All the color lines in  
the drawing are  
CAN buses!



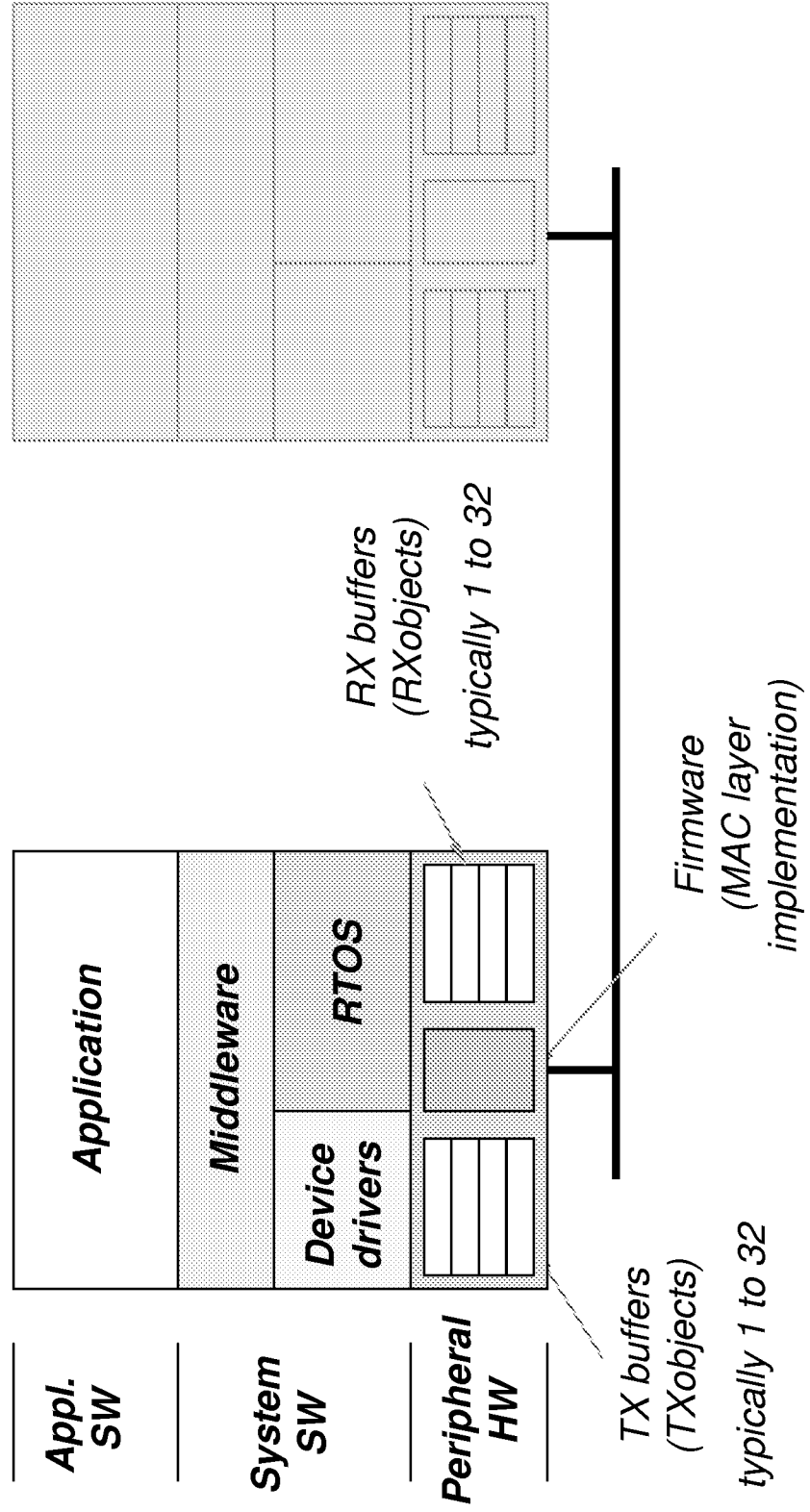
# CAN bus

## Purpose of this Lesson

- Yet another communication protocol standard ?
- Develop time analysis for real-time messages
- Study the effect on timing of multiple layers (HW and SW)
- Understand how firmware can affect the time determinism and spoil the priority assignment
- Understand how device drivers and middleware layers influence the timing behavior
- Present multiple views for the time analysis (worst-case, stochastic, simulation-based)

# CAN bus

## A CAN-based system



## CAN bus

### CAN standard (MAC protocol)

- Fixed format messages with limited size
- CAN communication does not require node (or system) configuration information (addresses)
  - Flexibility – a node can be added at any time
  - Message delivery and routing – the content is identified by an IDENTIFIER field defining the message content
  - Multicast – all messages are received by all nodes that can filter messages based on their IDs
  - Data Consistency – A message is accepted by all nodes or by no node

# CAN bus

## Frame types

### DATA FRAME

- Carries regular data

### REMOTE FRAME

- Used to request the transmission of a DATA FRAME with the same ID

### ERROR FRAME

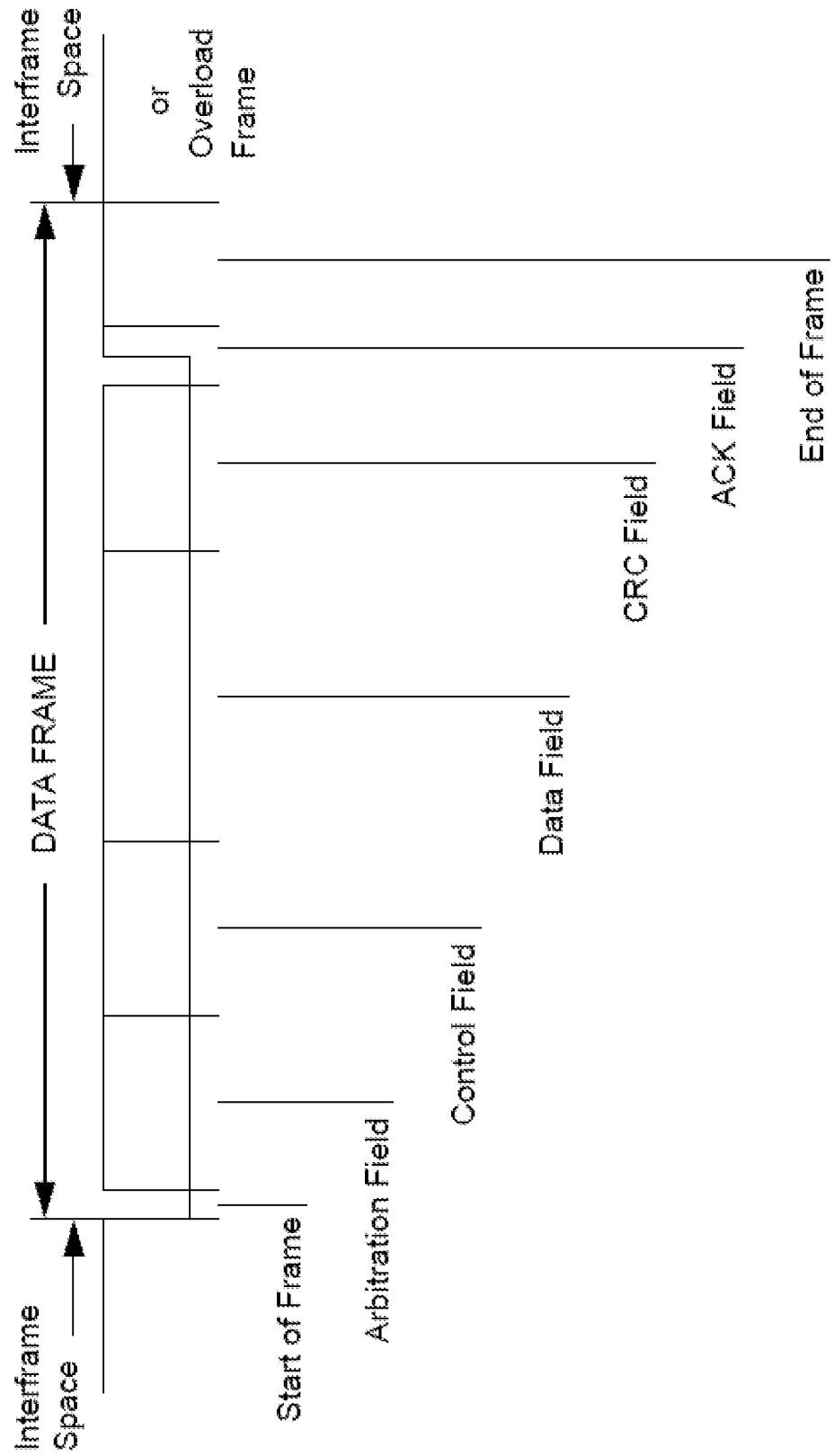
- Transmitted by any unit detecting a bus error

### OVERLOAD FRAME

- Used to force a time interval in between frame transmissions

# CAN bus

## DATA FRAME



# CAN bus

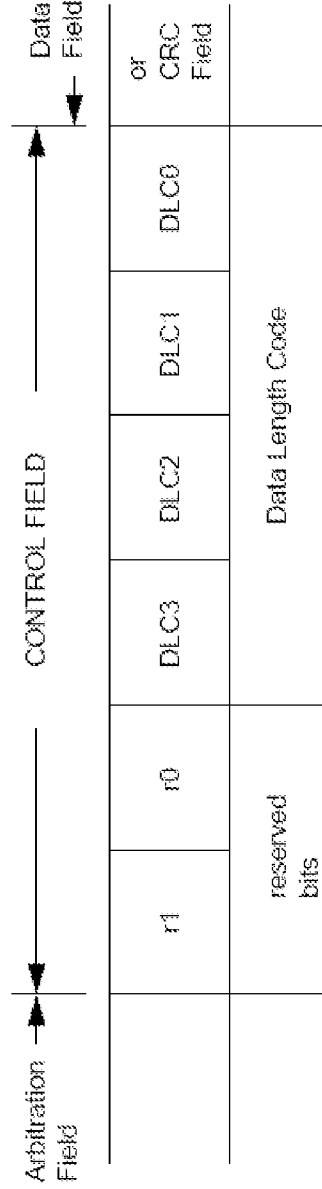
## DATA FRAME

*Start of frame* – 1 dominant bit. A frame can only start when the bus is IDLE. All stations synchronize to the leading edge of the SOF bit

*Identifier* – 11 (or 29 in version 2.0) bits. In order from most significant to least significant. The 7 most significant bits cannot be all recessive

*RTR* – remote transmission request, dominant for REQUEST frames, recessive for DATA frames

*CONTROL* – (see figure) maximum data length is 8 (bytes) other values are not used



## CAN bus

### DATA FRAME (continued)

*Data* – 0 to 8 bytes of data

*CRC* – 15 CRC bits plus one CRC delimiter bit (recessive)

*ACK* – two bits (SLOT + DELIMITER) all stations receiving the message correctly (CRC check) set the SLOT to dominant (the transmitter transmits a recessive). The DELIMITER is recessive

*END OF FRAME* – seven recessive bits

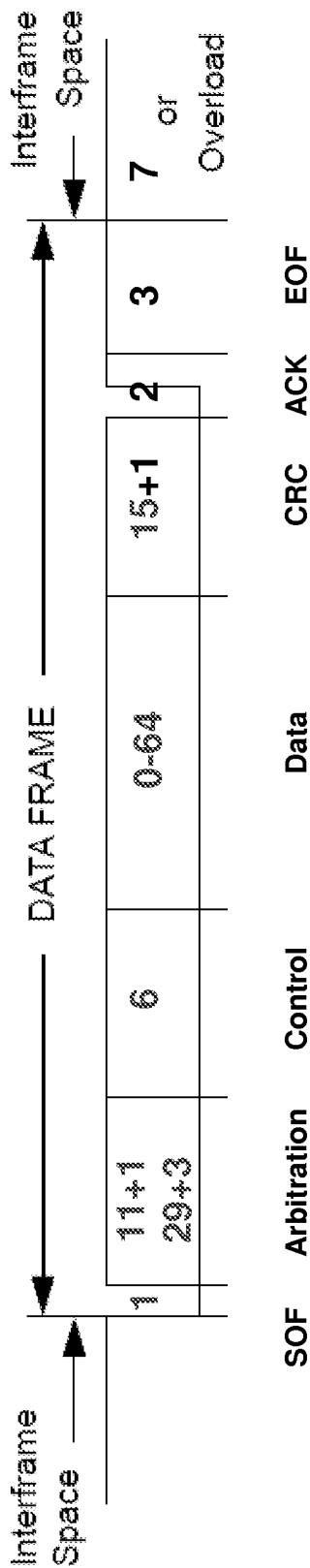
### Bit stuffing

any sequence of 5 bits of the same type requires the addition of an opposite type bit by the TRANSMITTER (and removal from the receiver)



# CAN bus

Some considerations ...



*Worst case frame length*

34 bits subject to stuffing

$$64 + \lfloor (64 + 34)/4 \rfloor + 47 = 111 + 24 = 135$$

*Protocol overhead*

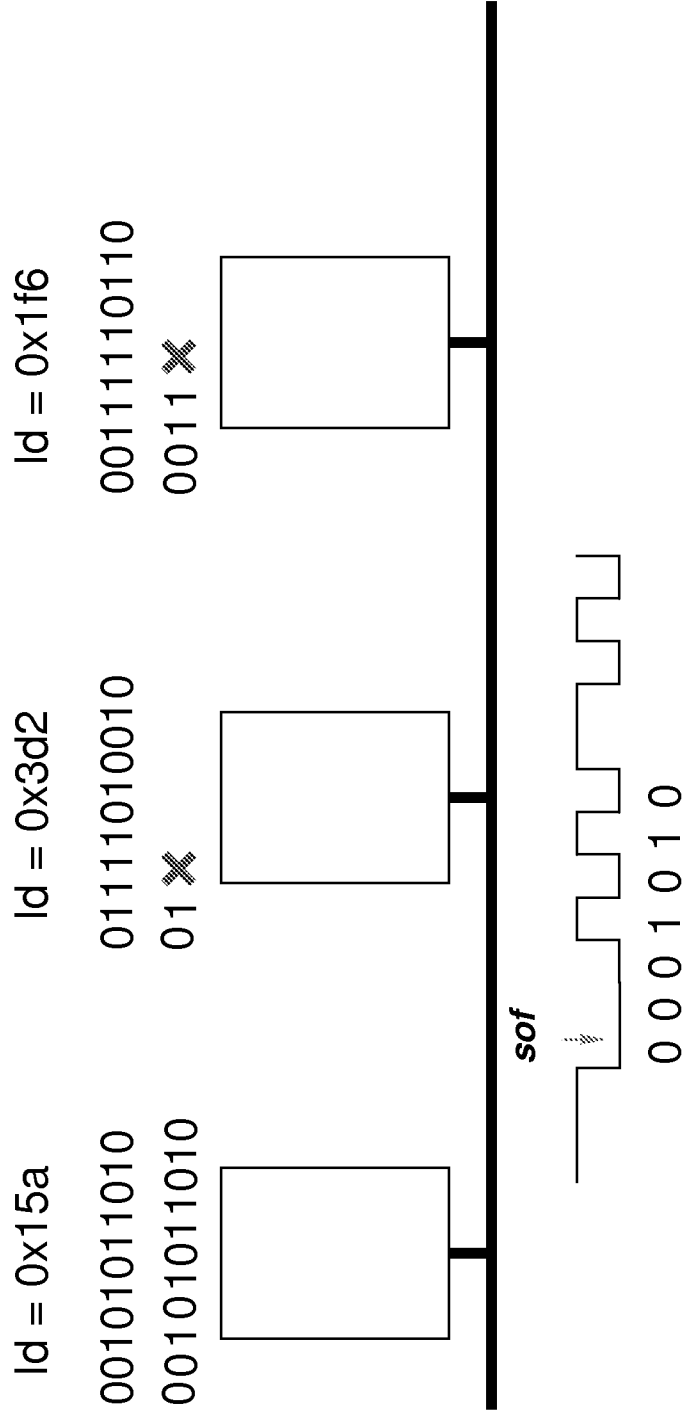
(minimum with no stuffing)

$$64/111 = 0.576 \text{ data efficiency (73.4\% protocol overhead)}$$

# CAN bus

## Arbitration

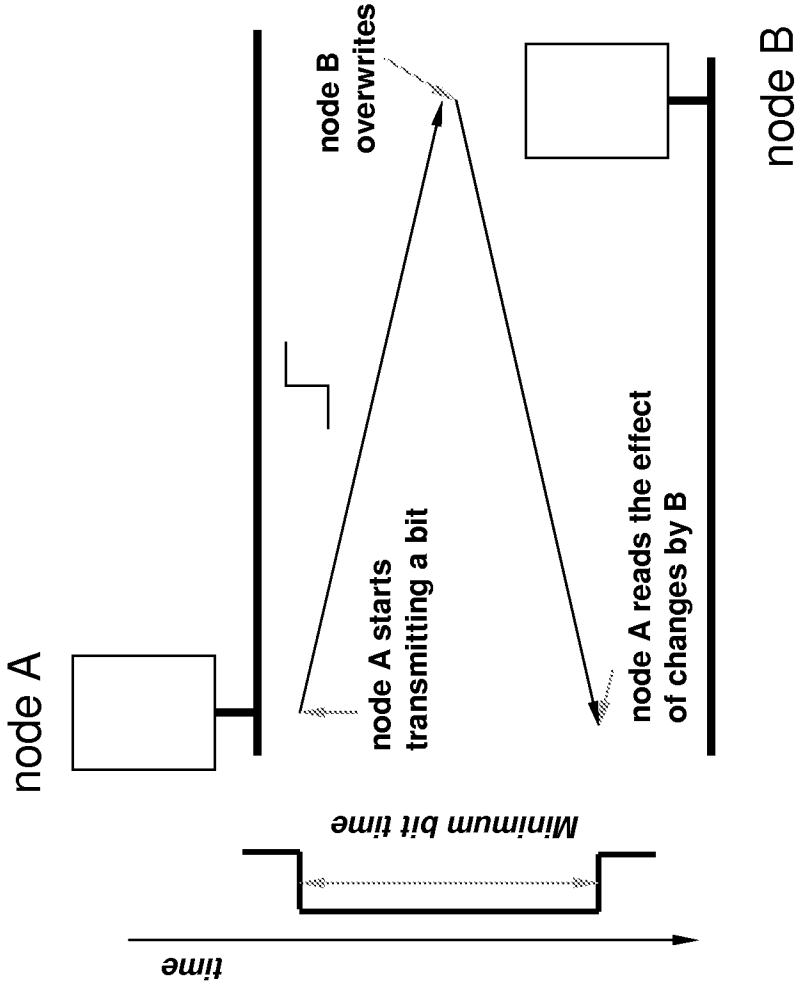
*All nodes are synchronized on the SOF bit*  
*The bus behaves as a wired-AND (wired-OR)*  
*An example ...*



# CAN bus

The type of arbitration implies that the bit time is at least twice the propagation latency on the bus

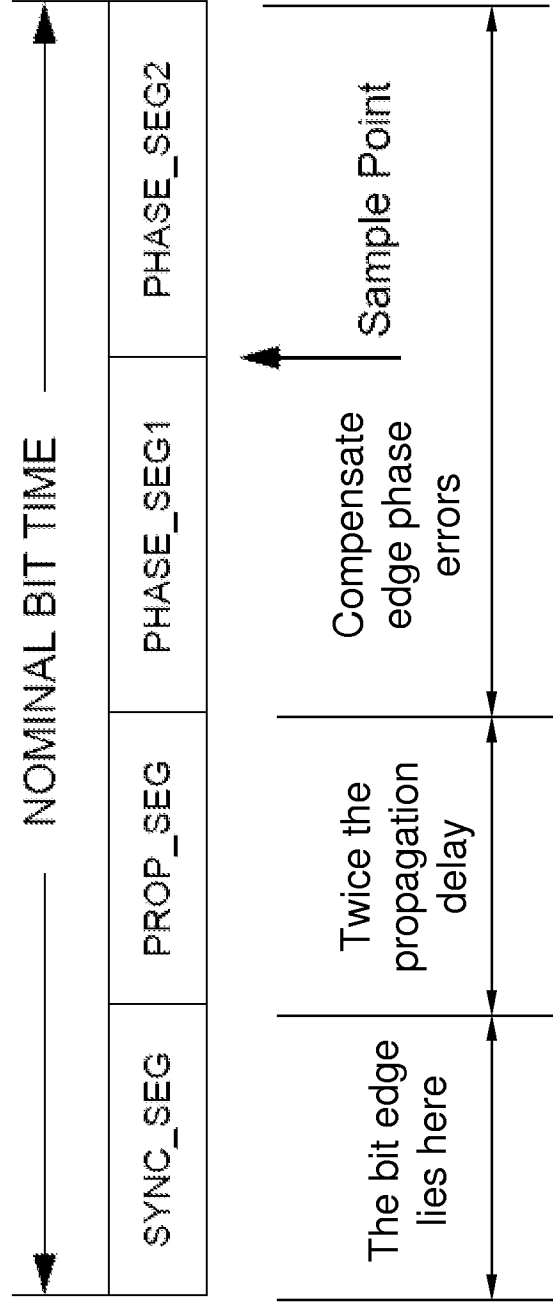
This defines a relation between the maximum bus length and the transmission speed. The available values are



| Bit rate   | Bus length |
|------------|------------|
| 1 Mbit/s   | 25 m       |
| 800 kbit/s | 50 m       |
| 500 kbit/s | 100 m      |
| 250 kbit/s | 250 m      |
| 125 kbit/s | 500 m      |
| 50 kbit/s  | 1000 m     |
| 20 kbit/s  | 2500 m     |
| 10 kbit/s  | 5000 m     |

# CAN bus

## Bit time



## CAN bus

### Error and fault containment

There are 5 types of error

#### BIT ERROR

The sender monitors the bus. If the value found on the bus is different from the one that is sent, then a BIT ERROR is detected

#### STUFF ERROR

Detected if 6 consecutive bits of the same type are found

#### CRC ERROR

Detected by the receiver if the received CRC field does not match the computed value

#### FORM ERROR

Detected when a fixed format field contains unexpected values

#### ACKNOWLEDGEMENT ERROR

Detected by the transmitter if a dominant value is not found in the ack slot

## CAN bus

A station detecting an error transmits an ERROR FLAG.  
For BIT, STUFF, FORM, ACKNOWLEDGEMENT errors, it  
is sent in the immediately following bit.  
For CRC it is sent after the ACK DELIMITER  
The ERROR FLAG is part of an ERROR FRAME

## CAN bus

An ERROR FRAME is simply the superposition of ERROR FLAGS from different nodes, plus an ERROR DELIMITER

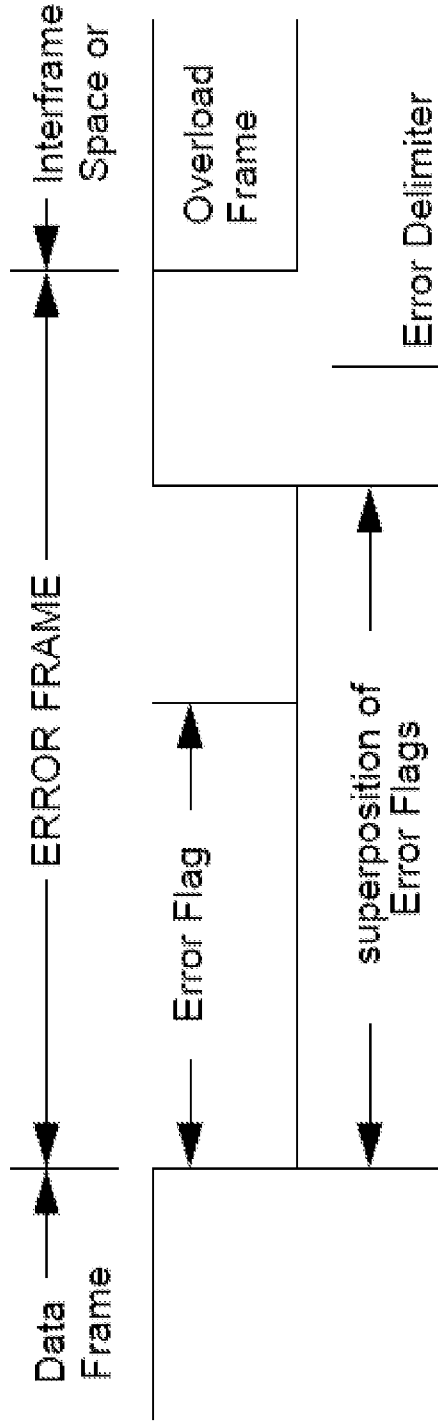
There are two types of error flags:

- An ACTIVE ERROR flag consists of 6 consecutive dominant bits

- A PASSIVE ERROR flag consists of 6 consecutive recessive bits

The superposition of all the error flags goes from 6 to 12 bits

The error delimiter consists of 8 recessive bits



# CAN bus

## Fault containment

Each node can be in 3 states:

- Error active

- Error passive: limited error signalling and transmission features

- Bus off: cannot influence the bus

Each node has two counters:

- TRANSMIT ERROR COUNT:

  - increased – (list) by 8 when the transmitter detects an error ...

  - decreased – by 1 after the successful transmission of a message (unless it is 0)

- RECEIVE ERROR COUNT:

  - increased – (list) by 1 when the node detects an error, by 8 if it detects a dominant bit as the first bit after sending an error flag ...

  - decreased – (if between 1 and 127 by 1, if >127 set back to a value between 119 and 127) after successful reception of a message



# CAN bus

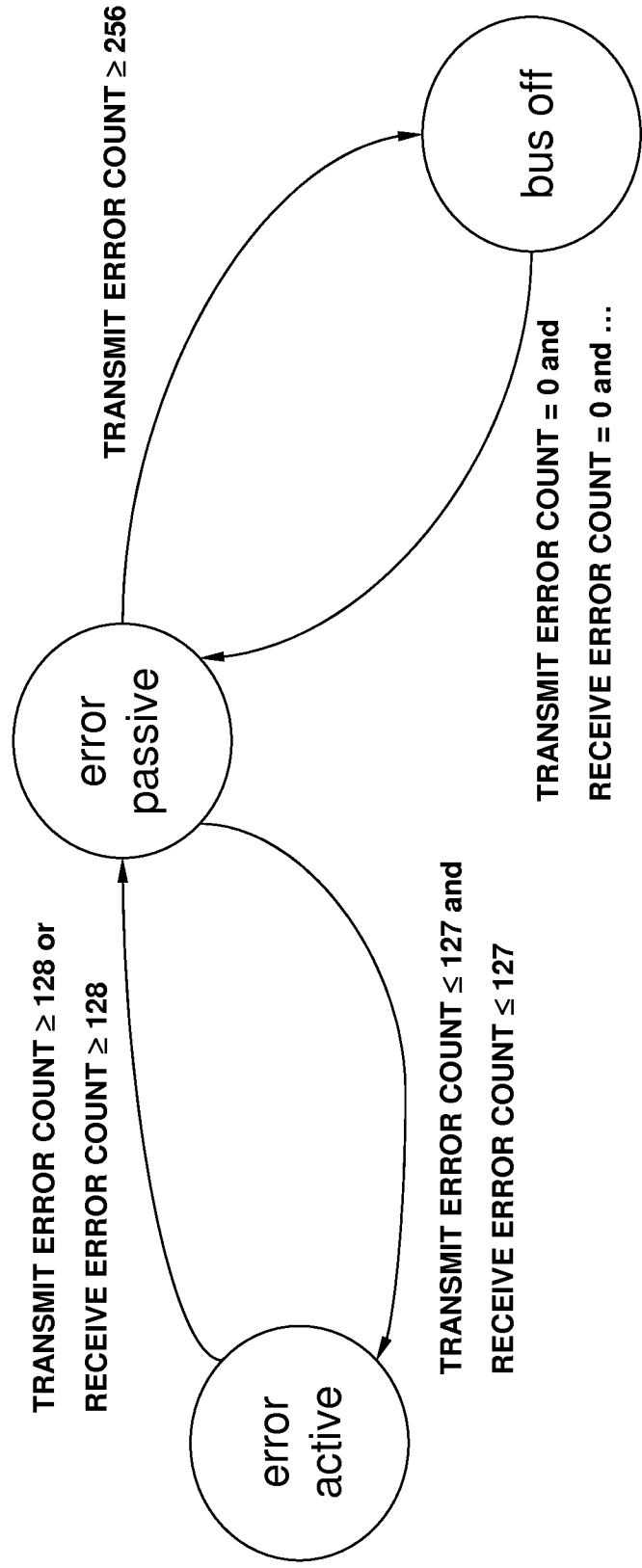
## Fault containment

Each node can be in 3 states:

Error active

Error passive: limited error signalling and transmission features

Bus off: cannot influence the bus



# CAN bus

## Error detection

Possible problems on the last but one bit [7]

CAN misbehavior is possible because of the different error detection mechanisms at the transmitter and receiver sites

A message is valid for the transmitter is there is no error until the end of the frame

A message is valid for the receiver is there is no error until the last but one bit of the frame (last bit is do not care)

If the receiver accepts the message, it may have an inconsistent message duplicate

Use of sequence numbers fixes the duplicate error

...but does not prevent messages from being received in different orders

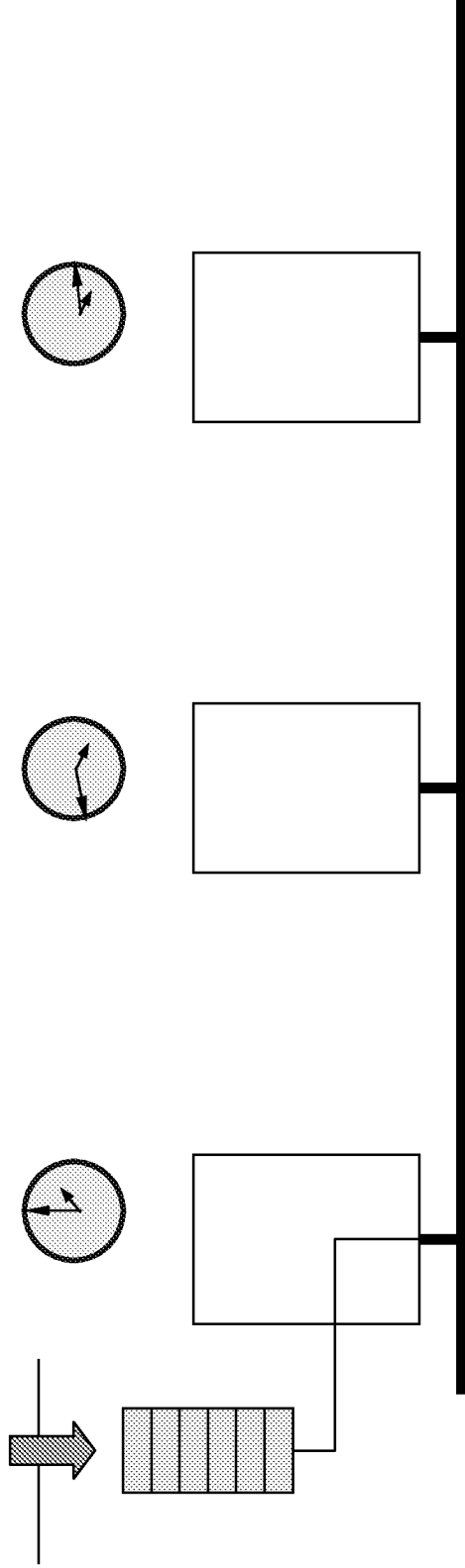
If the sender fails before retransmitting there may be an inconsistent message omission ...

# CAN bus

## Timing Analysis (and inversions) – Ideal behavior

Assumption 3: periodic messages, but no assumption on the message phases

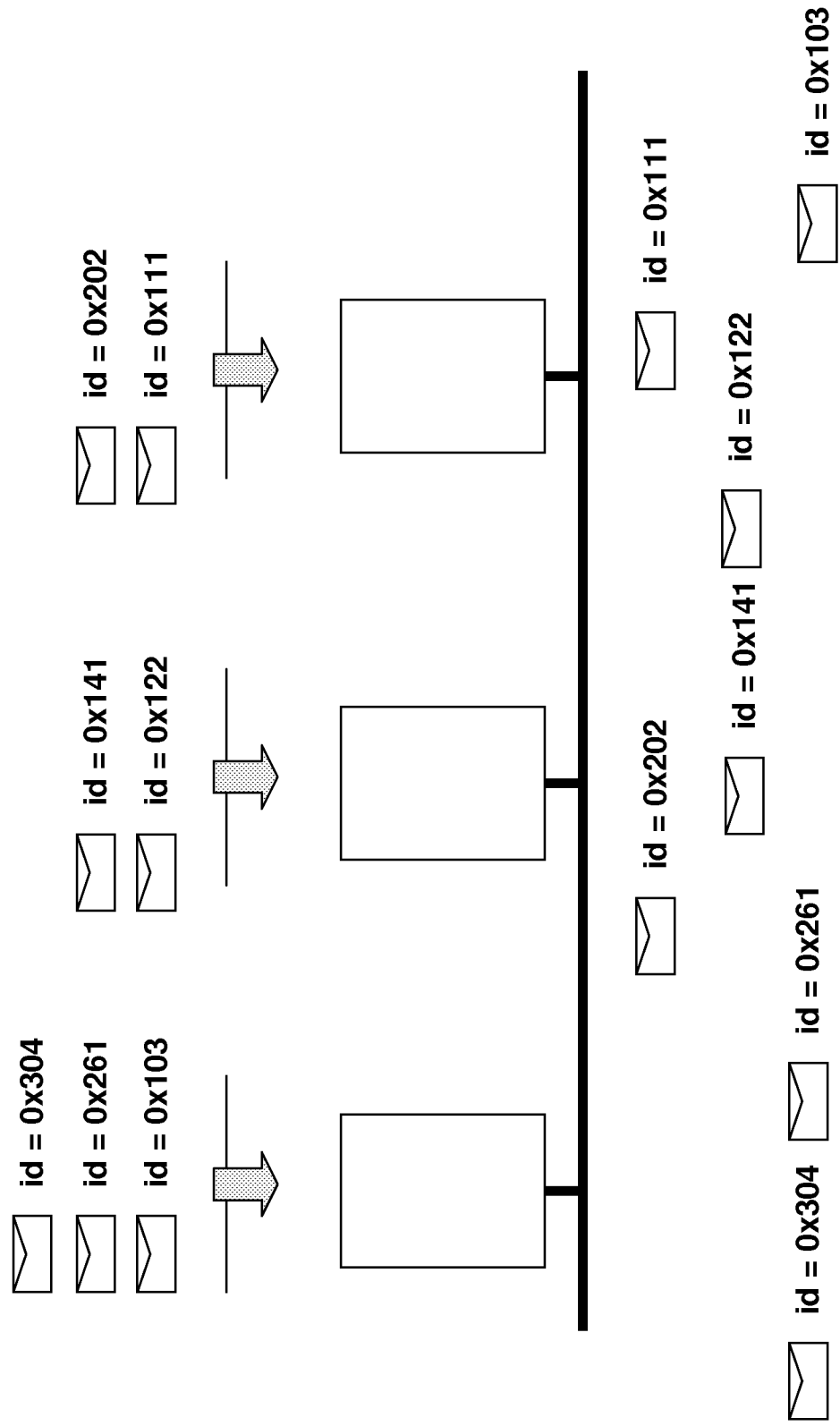
Assumption 1: nodes are not synchronized, nor any assumption on local clocks is used by the MW and driver levels



Assumption 2: messages are always transmitted by nodes based on their priority (ID) – ideal priority queue of messages

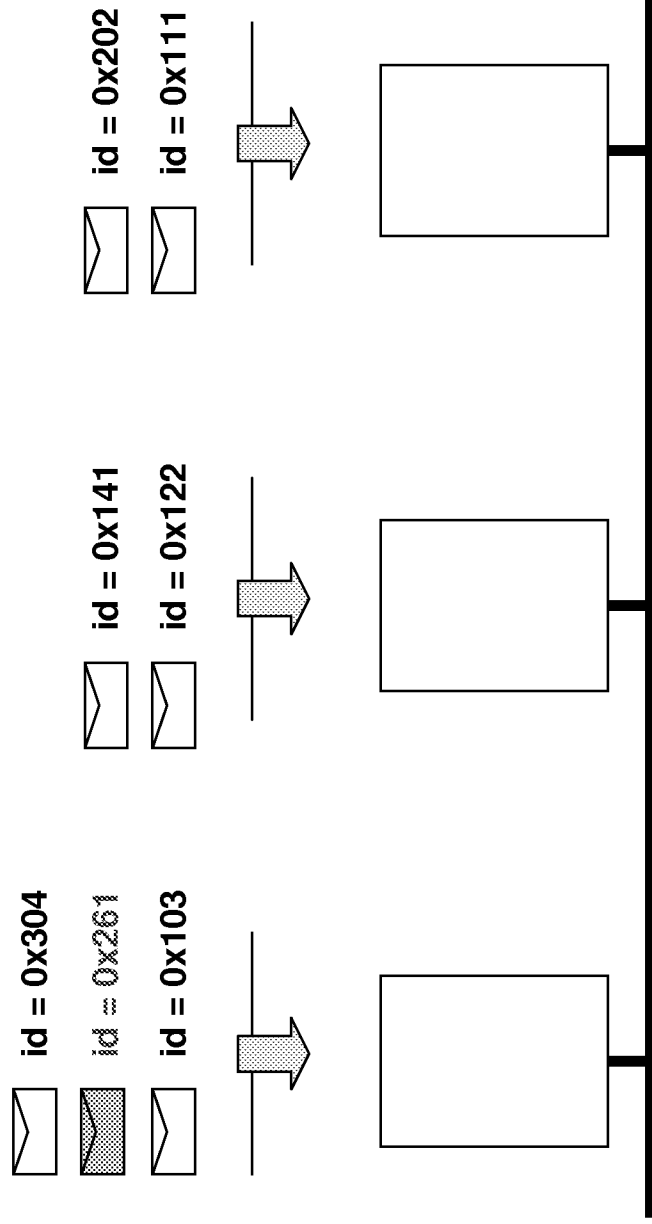
# CAN bus

## Timing Analysis (and inversions) – Ideal behavior



# CAN bus

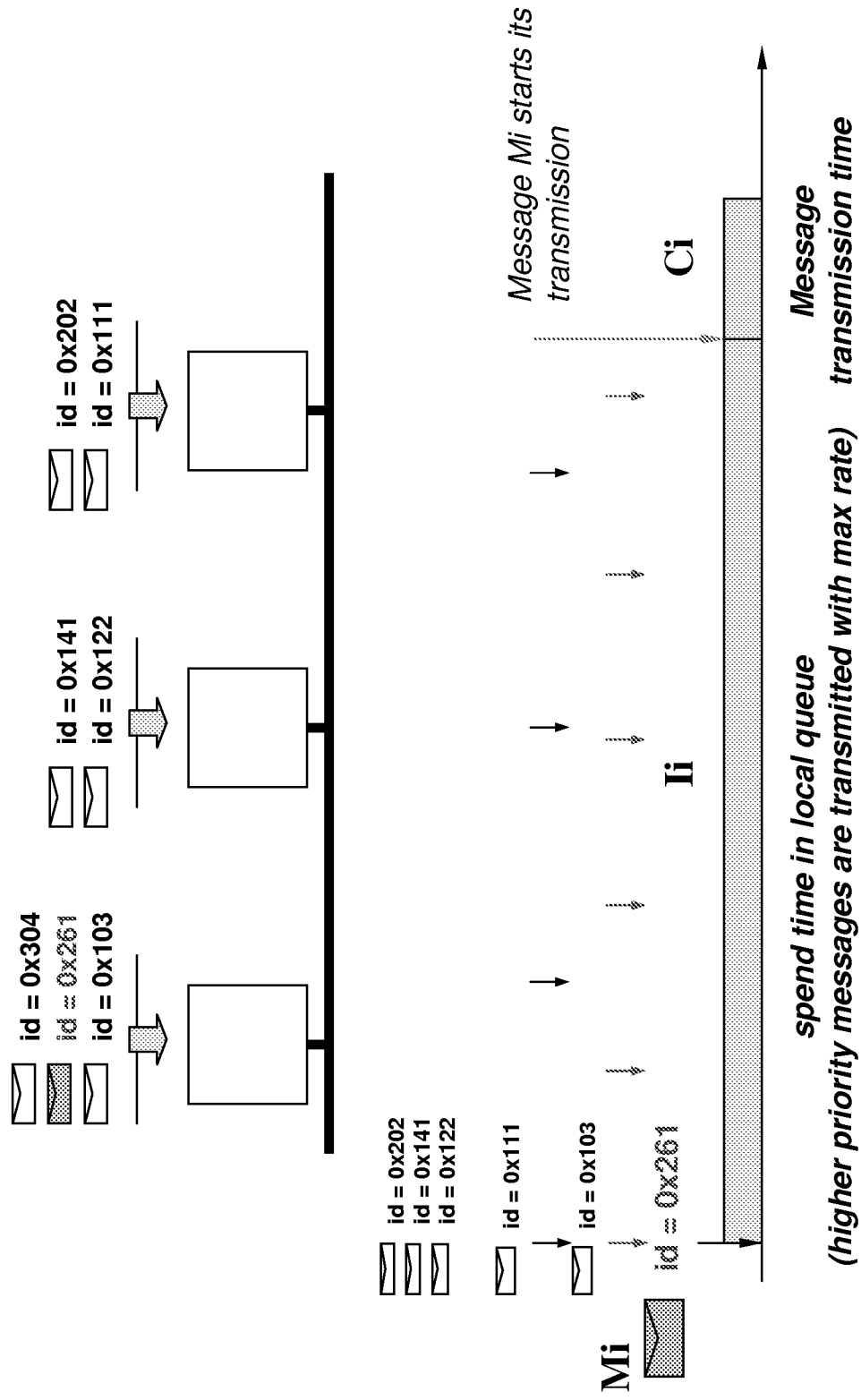
## Timing Analysis – worst case latency – Ideal behavior



Critical instant theorem: for a preemptive priority based scheduled resource, the worst case response time of an object occurs when it is released together with all other higher priority objects and they are released with their highest rate

# CAN bus

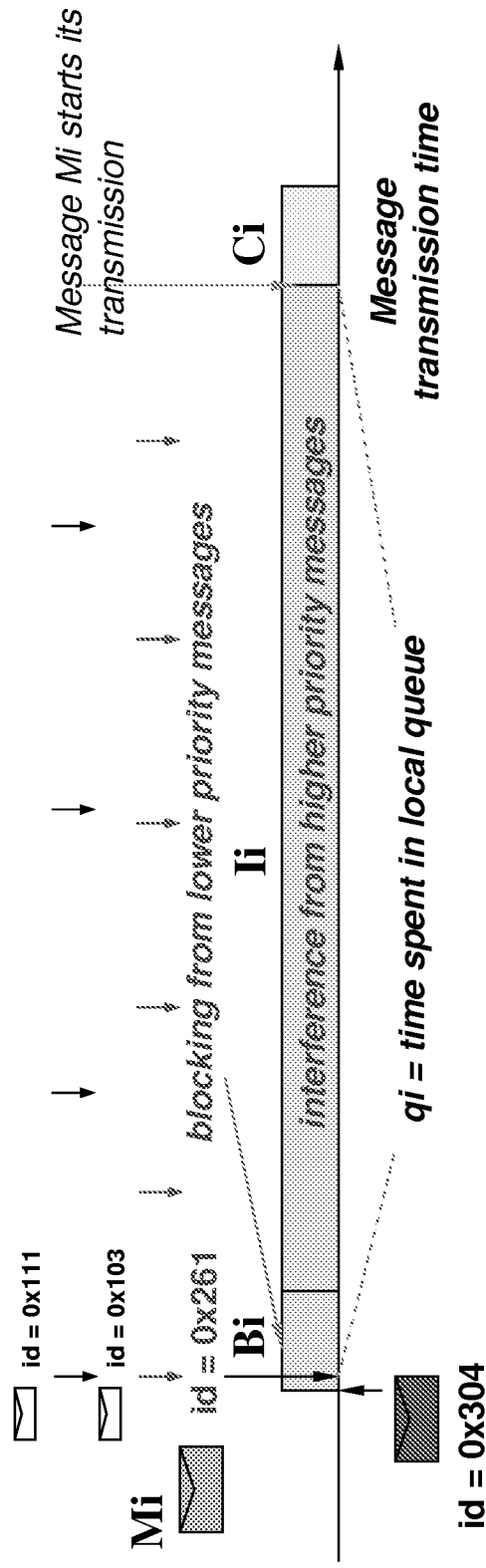
## Timing Analysis – worst case latency – Ideal behavior



# CAN bus

## Timing Analysis – worst case latency – Ideal behavior [2]

The transmission of a message cannot be preempted



$$q_i = B_i + \sum_{j \in hp(i)} \left\lceil \frac{q_i}{T_j} \right\rceil C_j$$

Fixed point formula: solved iteratively by setting  $q_i(0)=0$  until the minimum solution is found

$$I_i = \sum_{j \in hp(i)} I_{i,j}$$

$$q_i = B_i + I_i$$

$$I_{i,j} = \left\lceil \frac{q_i}{T_j} \right\rceil C_j$$

$$w_i = q_i + C_i$$

## CAN bus

The worst case response time analysis has been (partly) refuted and revised in [9]

An example (SAE benchmark) for a 125 kb/s bus [3]

| Msg | Size | T  | D  | C    | R    |
|-----|------|----|----|------|------|
| 1   | 1    | 50 | 5  | 0.52 | 1.44 |
| 2   | 2    | 5  | 5  | 0.60 | 2.04 |
| 3   | 1    | 5  | 5  | 0.52 | 2.56 |
| 4   | 2    | 5  | 5  | 0.60 | 3.16 |
| 5   | 1    | 5  | 5  | 0.52 | 3.68 |
| 6   | 2    | 5  | 5  | 0.60 | 4.28 |
| 7   | 6    | 10 | 10 | 0.92 | 7.88 |
| 8   | 1    | 10 | 10 | 0.52 | 8.4  |
| 9   | 2    | 10 | 10 | 0.60 | 9    |

| Msg | Size | T    | D    | C    | R     |
|-----|------|------|------|------|-------|
| 10  | 3    | 10   | 10   | 0.68 | 9.68  |
| 11  | 1    | 50   | 20   | 0.52 | 18.6  |
| 12  | 4    | 100  | 100  | 0.76 | 19.28 |
| 13  | 1    | 100  | 100  | 0.52 | 19.8  |
| 14  | 1    | 100  | 100  | 0.52 | 29.24 |
| 15  | 3    | 1000 | 1000 | 0.68 | 29.76 |
| 16  | 1    | 1000 | 1000 | 0.52 | 38.68 |
| 17  | 1    | 1000 | 1000 | 0.52 | 38.68 |



# CANBOUS

An example (Ci computed for maximum size, bus speed 500 kb/s)

| Message | ID  | Ti   | ECU  |       |     |      |      |       |     |      |       |
|---------|-----|------|------|-------|-----|------|------|-------|-----|------|-------|
| msg1    | 100 | 10   | ECU1 | msg24 | 123 | 12.5 | ECU3 | msg47 | 146 | 1000 | ECU4  |
| msg2    | 101 | 10   | ECU1 | msg25 | 124 | 100  | ECU4 | msg48 | 147 | 1000 | ECU3  |
| msg3    | 102 | 6.25 | ECU2 | msg26 | 125 | 20   | ECU4 | msg49 | 148 | 1000 | ECU4  |
| msg4    | 103 | 12.5 | ECU3 | msg27 | 126 | 25   | ECU2 | msg50 | 149 | 10   | ECU9  |
| msg5    | 104 | 10   | ECU4 | msg28 | 127 | 30   | ECU7 | msg51 | 150 | 1000 | ECU4  |
| msg6    | 105 | 12.5 | ECU2 | msg29 | 128 | 10   | ECU8 | msg52 | 151 | 1000 | ECU6  |
| msg7    | 106 | 5000 | ECU4 | msg30 | 129 | 20   | ECU8 | msg53 | 152 | 1000 | ECU4  |
| msg8    | 107 | 100  | ECU4 | msg31 | 130 | 50   | ECU3 | msg54 | 153 | 1000 | ECU3  |
| msg9    | 108 | 100  | ECU1 | msg32 | 131 | 50   | ECU5 | msg55 | 154 | 1000 | ECU1  |
| msg10   | 109 | 100  | ECU1 | msg33 | 132 | 50   | ECU1 | msg56 | 155 | 1000 | ECU10 |
| msg11   | 110 | 20   | ECU1 | msg34 | 133 | 500  | ECU9 | msg57 | 156 | 1000 | ECU7  |
| msg12   | 111 | 12.5 | ECU3 | msg35 | 134 | 100  | ECU3 | msg58 | 157 | 1000 | ECU11 |
| msg13   | 112 | 12.5 | ECU2 | msg36 | 135 | 100  | ECU4 | msg59 | 158 | 1000 | ECU12 |
| msg14   | 113 | 25   | ECU2 | msg37 | 136 | 100  | ECU3 | msg60 | 159 | 1000 | ECU5  |
| msg15   | 114 | 25   | ECU3 | msg38 | 137 | 100  | ECU3 | msg61 | 160 | 1000 | ECU13 |
| msg16   | 115 | 25   | ECU3 | msg39 | 138 | 250  | ECU4 | msg62 | 161 | 1000 | ECU9  |
| msg17   | 116 | 20   | ECU1 | msg40 | 139 | 250  | ECU3 | msg63 | 162 | 1000 | ECU2  |
| msg18   | 117 | 25   | ECU5 | msg41 | 140 | 250  | ECU3 | msg64 | 163 | 1000 | ECU4  |
| msg19   | 118 | 20   | ECU1 | msg42 | 141 | 500  | ECU3 | msg65 | 164 | 1000 | ECU4  |
| msg20   | 119 | 30   | ECU4 | msg43 | 142 | 500  | ECU2 | msg66 | 165 | 50   | ECU1  |
| msg21   | 120 | 10   | ECU1 | msg44 | 143 | 500  | ECU3 | msg67 | 166 | 50   | ECU1  |
| msg22   | 121 | 20   | ECU1 | msg45 | 144 | 500  | ECU6 | msg68 | 167 | 100  | ECU5  |
| msg23   | 122 | 12.5 | ECU6 | msg46 | 145 | 1000 | ECU4 | msg69 | 168 | 10   | ECU9  |

## CAN bus

In reality, this analysis can give optimistic results!

A number of issues need to be considered ...

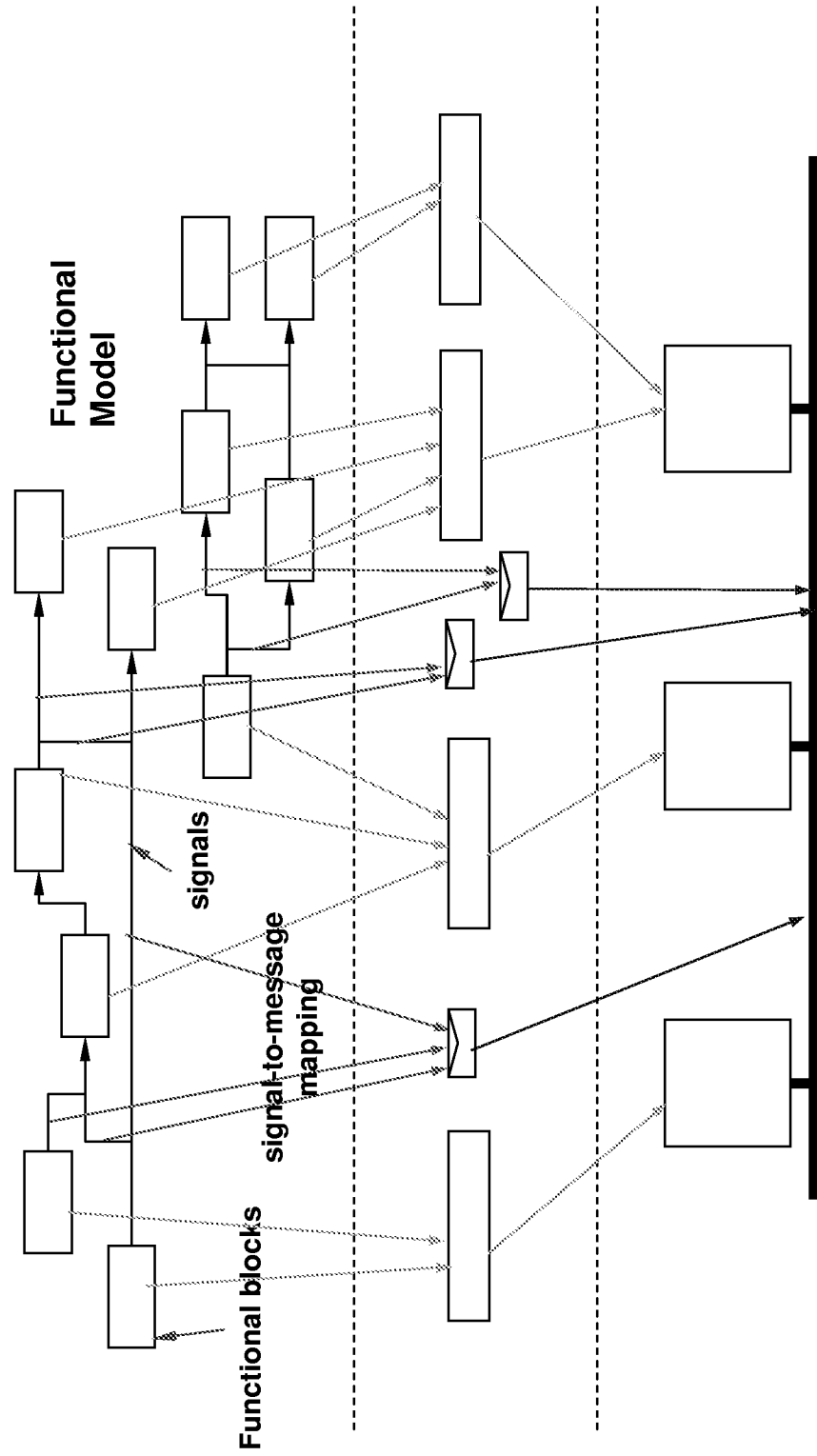
- Priority enqueueing in the sw layers
- Availability of TxObjects at the adapter
- Possibility of preempting (aborting) a transmission attempt
- Finite copy time between the queue and the TxObjects
- The adapter may not transmit messages in the TxObjects by priority

But first ....

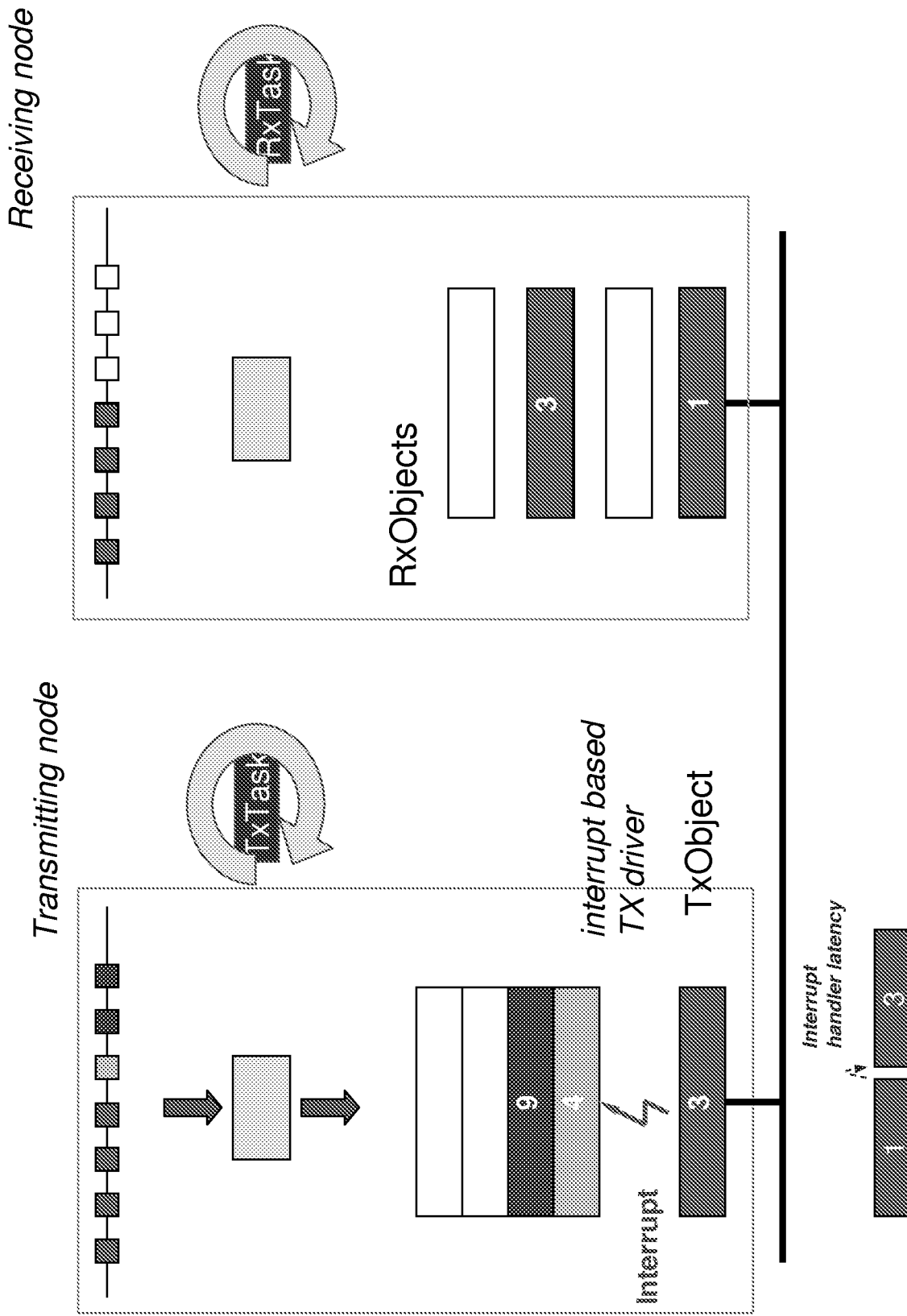
- *Let's examine the functional and architecture-level models and the MW, RTOS and driver management policies*

# CAN bus

## Functional and architecture-level models and the MW, RTOS and driver management policies



# Transmission modes (1)



## CAN bus

In reality, this analysis can give optimistic results!

A number of issues need to be considered ...

- Priority enqueueing in the sw layers

.....

If the messages are not enqueued by priority, additional priority inversion may occur. This may happen because of the way messages are enqueued in the SW layers (MW/drivers), for example if a FIFO queue is used

## CAN bus

In reality, this analysis can give optimistic results!

A number of issues need to be considered ...

- ...
  - Availability of TxObjects at the adapter
  - Finite copy time between the queue and the TxObjects
- Adapters typically only have a limited number of TxObjects  
or RxObjects available

# CAN bus

A number of issues need to be considered ...

.....

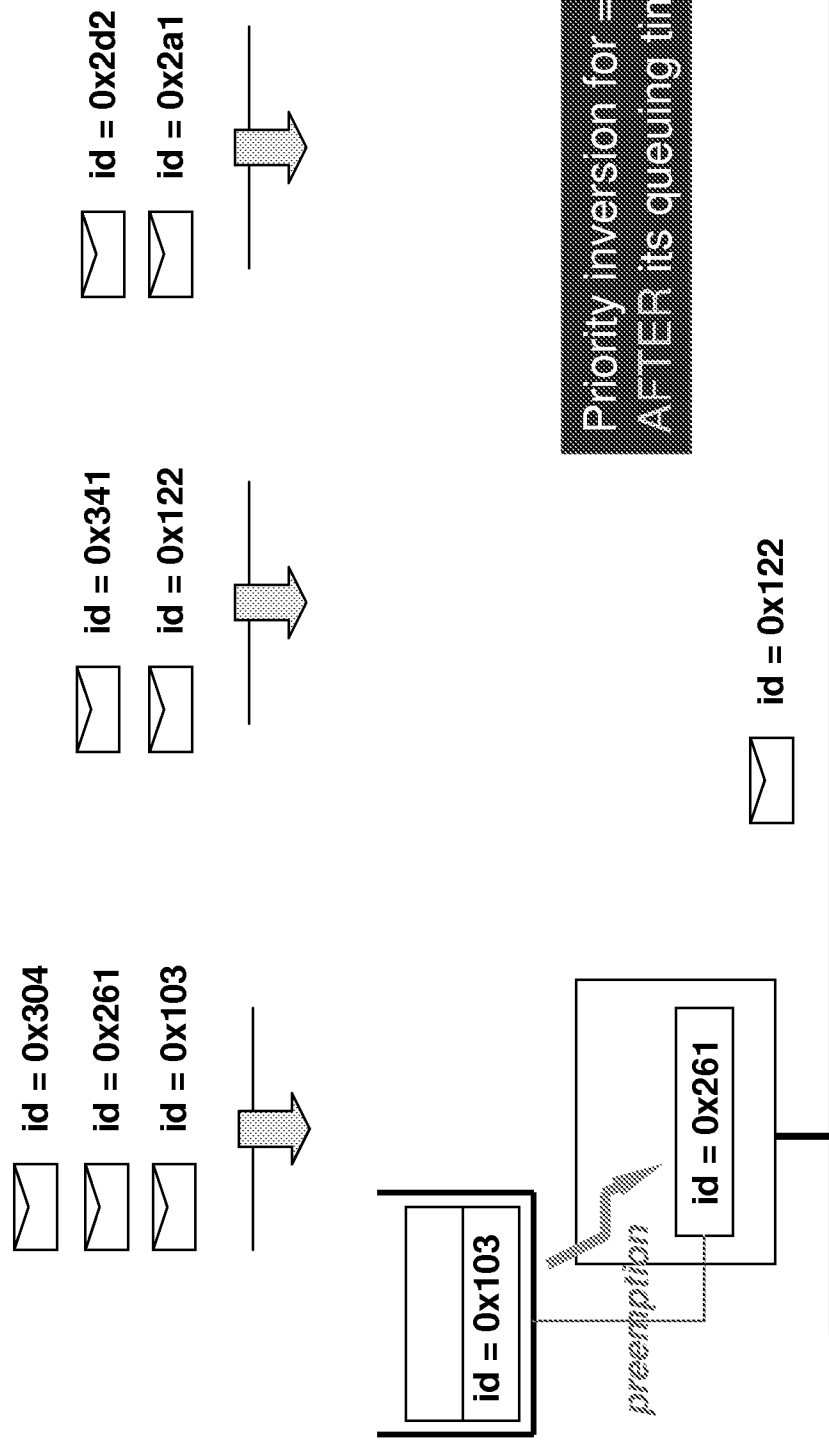
- Availability of TxObjects at the adapter
- Let's check the controller specifications!

| Model                                | Type                              | Buffer Type                        | Priority and Abort                        |
|--------------------------------------|-----------------------------------|------------------------------------|-------------------------------------------|
| Microchip<br>MCP2515                 | Standalone<br>controller          | 2 RX - 3 TX                        | lowest message ID,<br>abort signal        |
| ATMEL<br>AT89C51CC03<br>AT90CAN32/64 | 8 bit MCU<br>w. CAN controller    | 15 TX/RX<br>msg. objects           | lowest message ID,<br>abort signal        |
| FUJITSU<br>MB90385/90387<br>90V495   | 16 bit MCU<br>w. CAN controller   | 8 TX/RX<br>msg. objects            | lowest buffer num.<br>abort signal        |
| FUJITSU<br>90390                     | 16 bit micro<br>w. CAN controller | 16 TX/RX<br>msg. objects           | lowest buffer num.<br>abort signal        |
| Intel<br>87C196 (82527)              | 16 bit MCU<br>w. CAN controller   | 14 TX/RX + 1 RX<br>msg. objects    | lowest buffer num.<br>abort possible (?)  |
| INFINEON<br>XC161CJ/167<br>(82C900)  | 16 bit MCU<br>w. CAN controller   | 32 TX/RX<br>msg. objects (2 buses) | lowest buffer num.,<br>abort possible (?) |
| PHILIPS<br>8xC592 (SJA1000)          | 8 bit MCU<br>w. CAN controller    | one TX buffer                      | abort signal                              |

# CAN bus

What happens if only one TxObject is available?

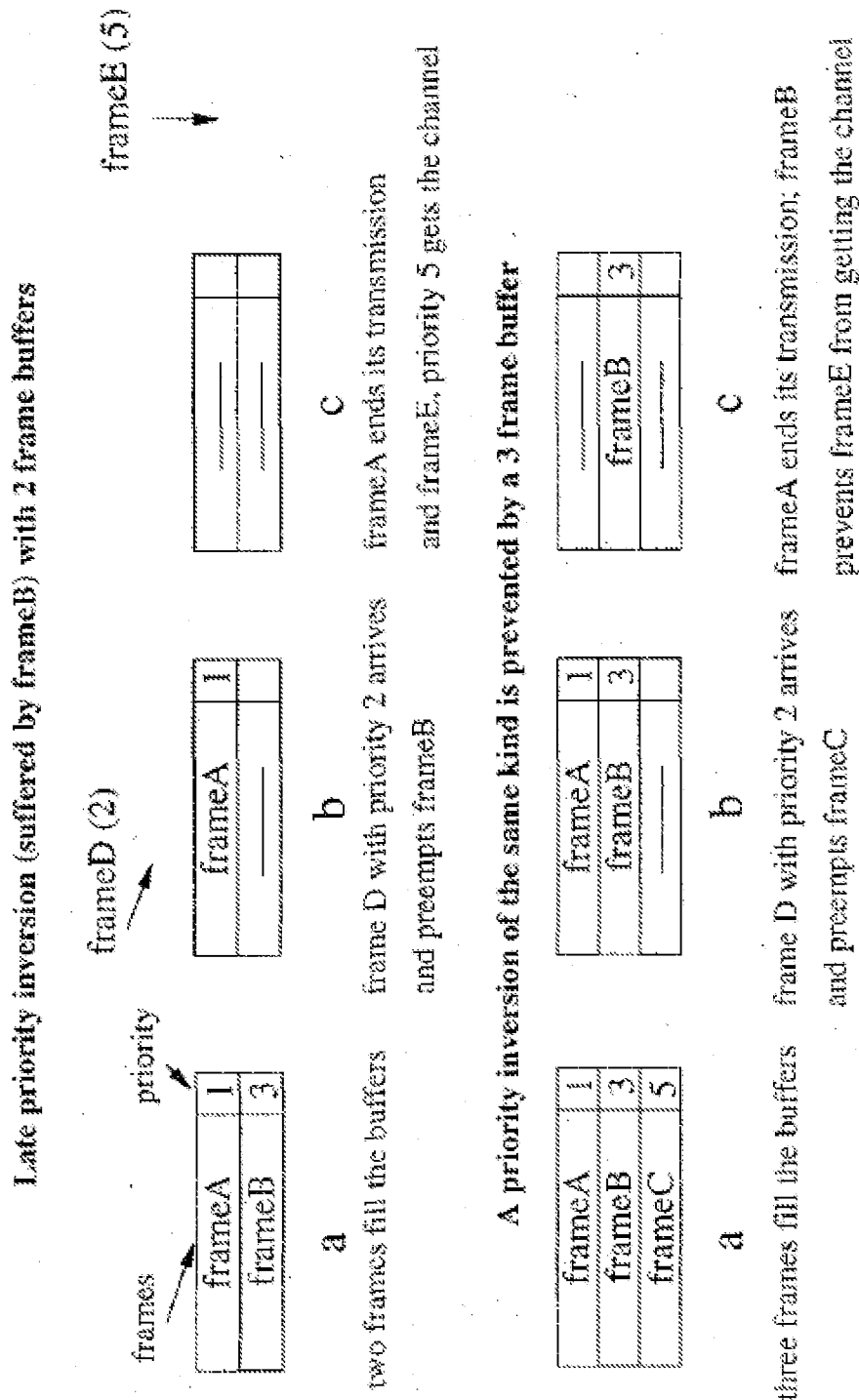
- Assuming preemption of TxObject





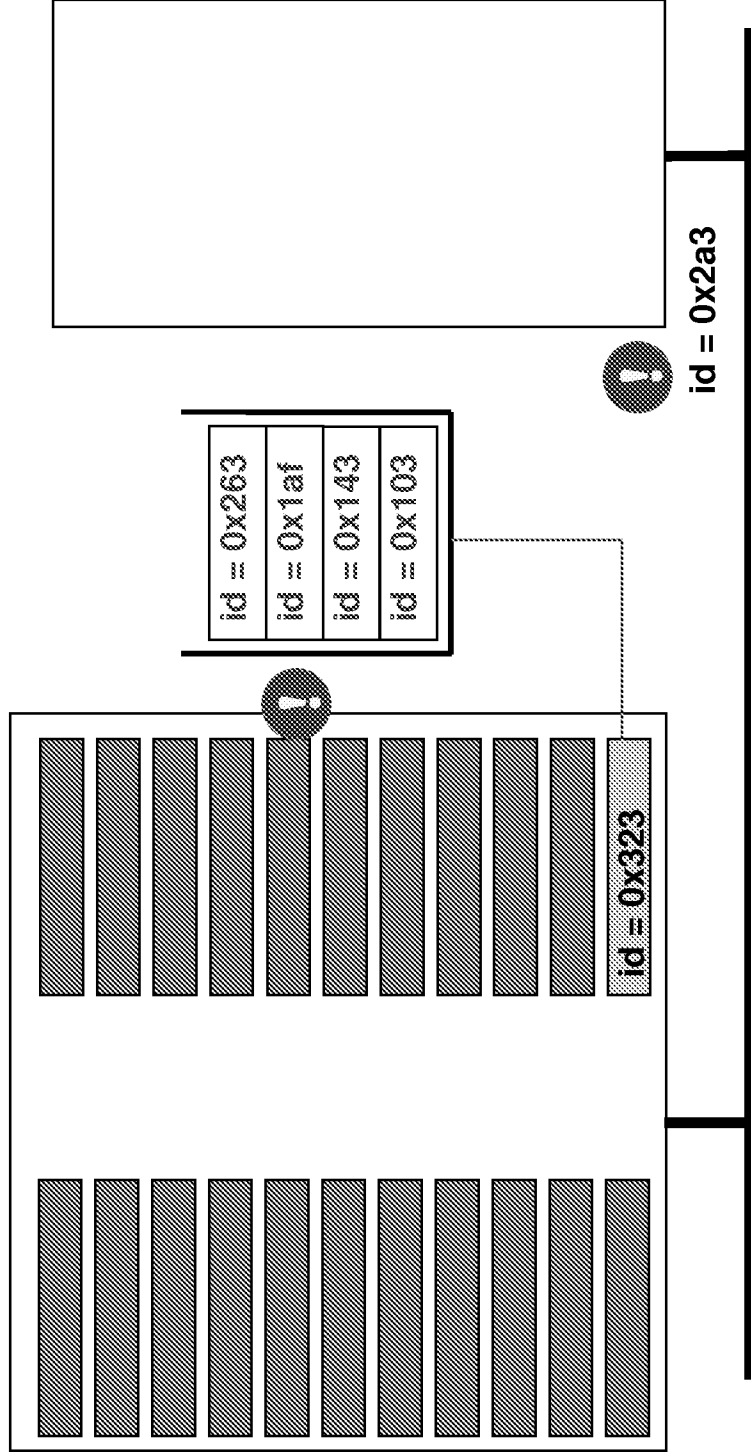
# CAN bus

## What happens if two TxObjects are available?



## CAN bus

In reality, because of the polling-based management at the receiving side, designers prefer to use as many Objects as possible for the purpose of receiving messages and only one (or a very limited number) for message transmission !



## CAN bus

In reality, this analysis can give optimistic results!

A number of issues need to be considered ...

- ...
- Possibility of preempling (aborting) a transmission attempt

And the TxObjects are usually not preempted!

## CAN bus

A number of issues need to be considered ...

.....

- The adapter may not transmit messages in the TxObjects by priority

- Let's check the controller specifications!

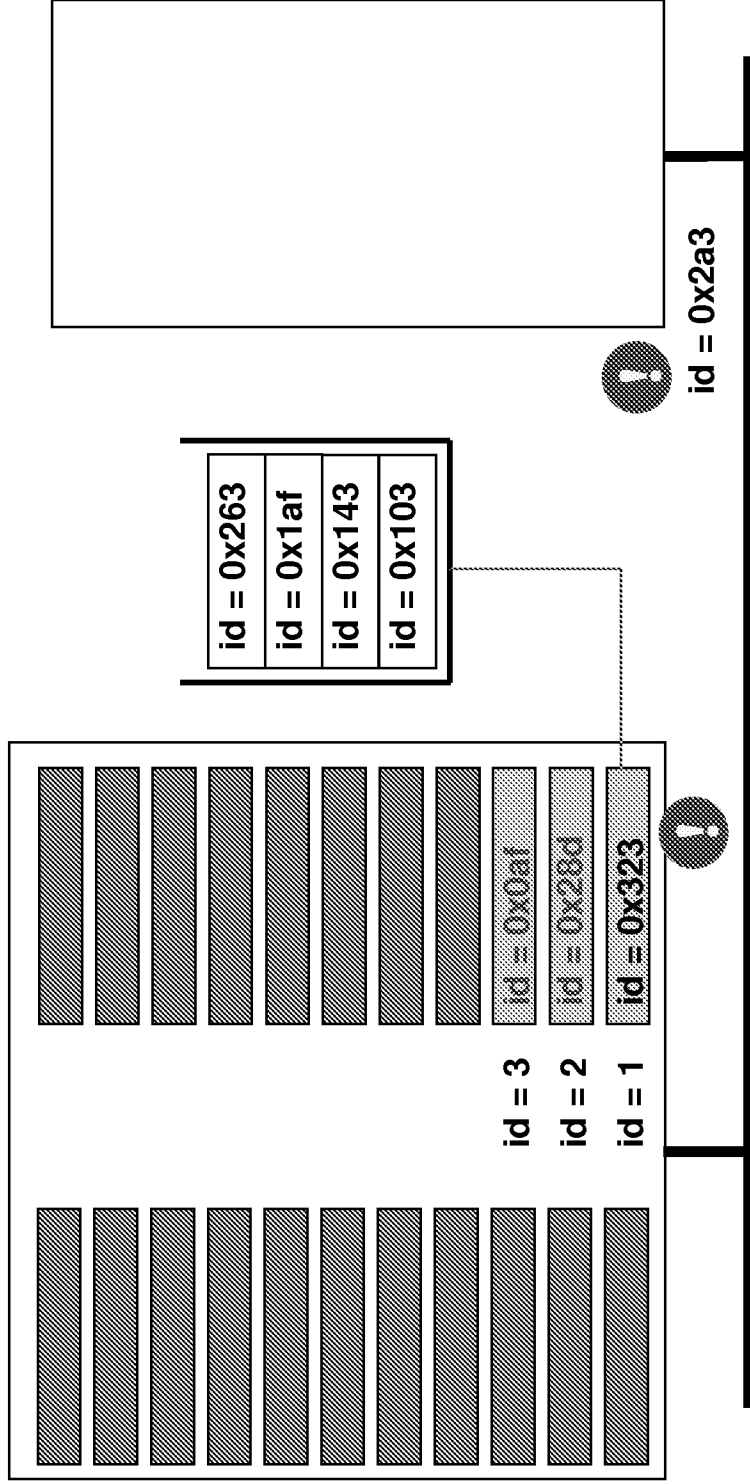
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| PHILIPS<br>8xC592 (SJA1000)          | 8 bit MCU<br>w. CAN controller    | one TX buffer                      | abort signal                              |



# CAN bus

In this case, especially if coupled with non-preemptability of TxObjects, the priority order of the queue may be completely subverted.

- Think of the problems in the implementation of a preemptive policy!

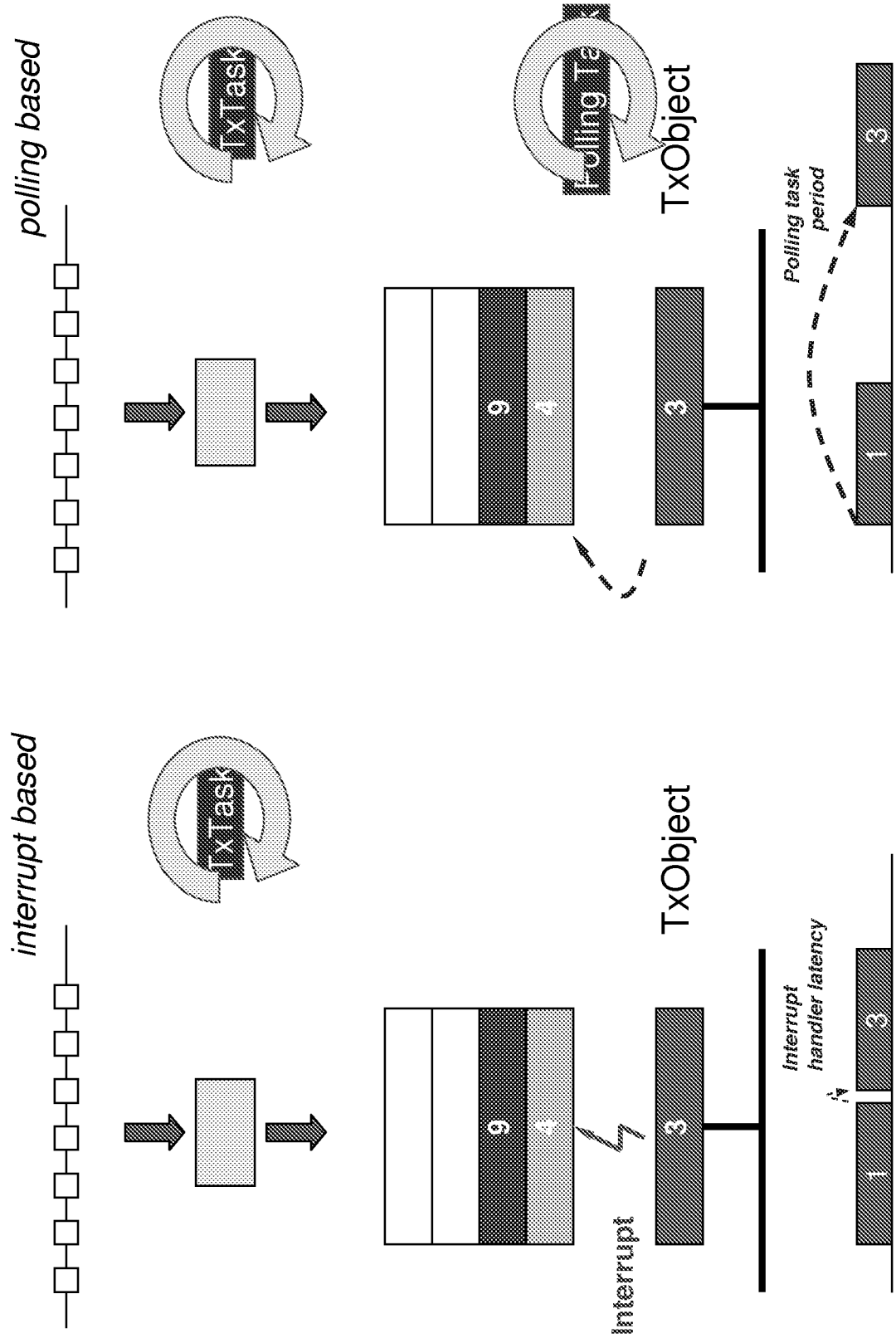


CAN bus

Finally ...

- The driver management policies may be different from what you would expect ...

# Transmission modes (1)

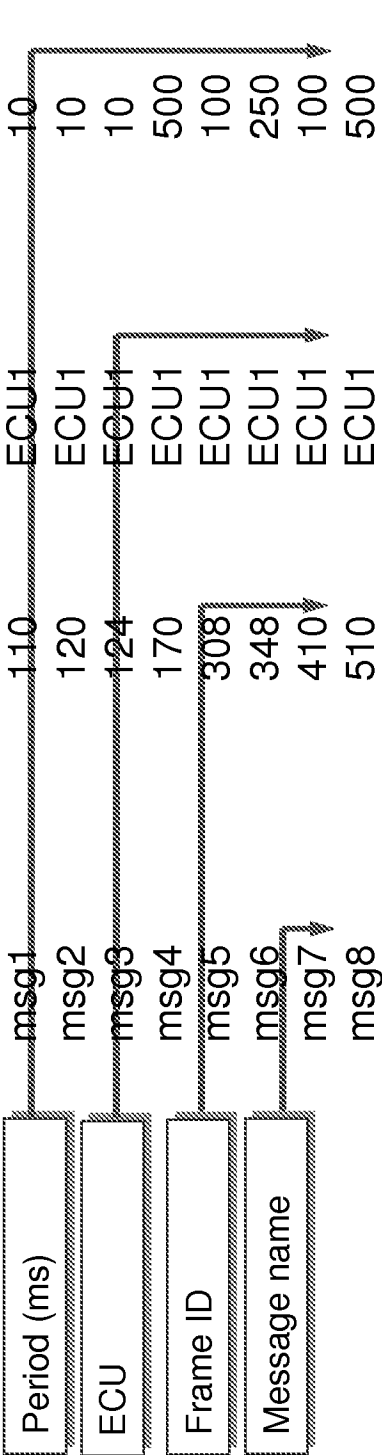


## CAN bus

Some examples of non-ideal behavior...



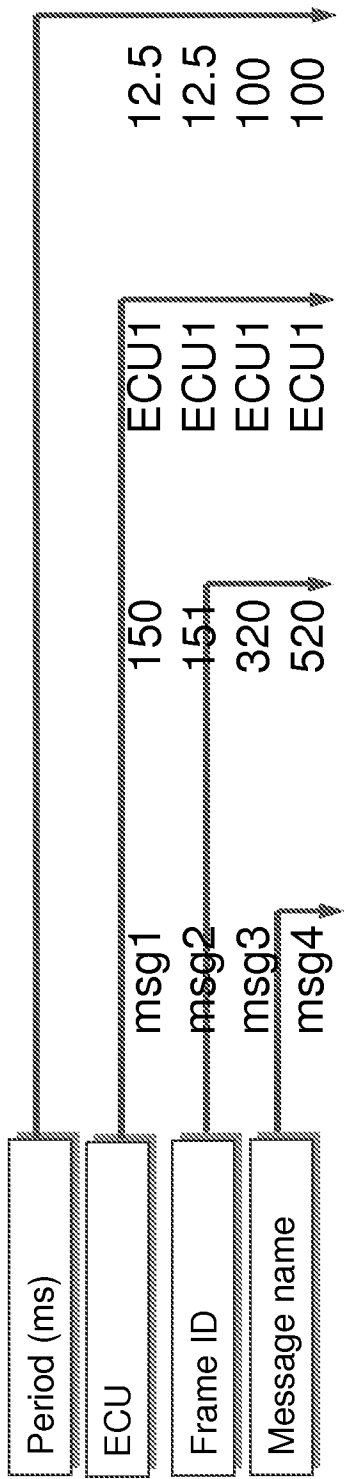
Violation of Priority-based Queuing



Message 0x170,  
0x308, 0x 348  
transmitted before  
0x124

|          |   |     |    |                             |
|----------|---|-----|----|-----------------------------|
| 1.857316 | 1 | 110 | Rx | d 8 00 09 BF 00 00 06 00 00 |
| 1.857548 | 1 | 120 | Rx | d 8 03 85 23 83 06 EA 03 85 |
| 1.857696 | 1 | 170 | Rx | d 3 01 00 86                |
| 1.858256 | 1 | 124 | Rx | d 5 00 03 83 03 85          |
| .....    |   |     |    |                             |
| 3.877361 | 1 | 110 | Rx | d 8 00 09 C4 00 00 06 00 00 |
| 3.877597 | 1 | 120 | Rx | d 8 03 83 23 81 06 EA 03 82 |
| 3.877819 | 1 | 308 | Rx | d 7 00 80 2A 00 00 00 AD    |
| 3.878309 | 1 | 124 | Rx | d 5 00 03 81 03 83          |
| .....    |   |     |    |                             |
| 4.017366 | 1 | 110 | Rx | d 8 00 09 C4 00 00 06 00 00 |
| 4.017600 | 1 | 120 | Rx | d 8 03 85 23 80 06 EA 03 81 |
| 4.017768 | 1 | 348 | Rx | d 4 08 48 43 FF             |
| 4.018312 | 1 | 124 | Rx | d 5 00 03 80 03 85          |

Possible Effect of Interrupt Service

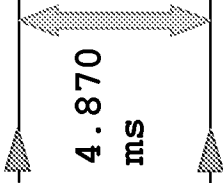


|          |   |     |    |                             |
|----------|---|-----|----|-----------------------------|
| 0.222236 | 1 | 150 | Rx | d 8 40 00 09 60 3F FF F6 9F |
| 0.222527 | 1 | 380 | Rx | d 8 09 42 20 00 70 40 FC BF |
| 0.222766 | 1 | 151 | Rx | d 8 00 FF 09 22 00 00 0F 3F |
| .....    |   |     |    |                             |
| 0.297743 | 1 | 150 | Rx | d 8 C0 00 09 60 3F FD F6 9D |
| 0.297989 | 1 | 410 | Rx | d 8 00 00 00 96 2B 00 00 00 |
| 0.298229 | 1 | 151 | Rx | d 8 00 FF 09 25 00 00 0F 3F |
| .....    |   |     |    |                             |
| 0.322497 | 1 | 150 | Rx | d 8 40 00 09 60 3F FF F6 9F |
| 0.322733 | 1 | 388 | Rx | d 8 21 12 68 19 00 00 DC 80 |
| 0.322978 | 1 | 151 | Rx | d 8 00 FF 09 21 00 00 0F 3F |

Message 0x380,  
0x410, 0x 388  
transmitted before  
0x151

# A trace with problems ...

|           |        |        |             |           |     |
|-----------|--------|--------|-------------|-----------|-----|
| t=1503560 | Id:0F1 | Len:32 | Act:1503440 | Lat:120   | REF |
| t=1503750 | Id:1E1 | Len:24 | Act:1493440 | Lat:10310 | REF |
| t=1504410 | Id:0C1 | Len:64 | Act:1504238 | Lat:172   |     |
| t=1504650 | Id:0C5 | Len:64 | Act:1504238 | Lat:412   |     |
| t=1504900 | Id:1C7 | Len:56 | Act:1504830 | Lat:70    |     |
| t=1505170 | Id:1E5 | Len:64 | Act:1504238 | Lat:932   |     |
| t=1506360 | Id:1F1 | Len:64 | Act:1493440 | Lat:12920 | REF |
| t=1507960 | Id:0C9 | Len:56 | Act:1506850 | Lat:1110  | REF |
| t=1508190 | Id:191 | Len:64 | Act:1506850 | Lat:1340  |     |
| t=1508910 | Id:1F3 | Len:16 | Act:1493440 | Lat:15470 | REF |
| t=1511250 | Id:3C9 | Len:64 | Act:1493440 | Lat:17810 | REF |
| t=1512390 | Id:524 | Len:64 | Act:1512280 | Lat:110   | REF |
| t=1512570 | Id:528 | Len:40 | Act:1512280 | Lat:290   |     |
| t=1513580 | Id:0F1 | Len:32 | Act:1513440 | Lat:140   | REF |
| t=1513780 | Id:1F3 | Len:16 | Act:1513440 | Lat:340   |     |



|         |         |                    |
|---------|---------|--------------------|
| ECU=xxx | #Tx=10  | #M=15              |
| Id=0F1  | EP=10   | TP=0 ECU:BCM_hSCAN |
| Id=120  | EP=5000 | TP=0 ECU:BCM_hSCAN |
| Id=12A  | EP=100  | TP=0 ECU:BCM_hSCAN |
| Id=130  | EP=1000 | TP=0 ECU:BCM_hSCAN |
| Id=138  | EP=1000 | TP=0 ECU:BCM_hSCAN |
| Id=1E1  | EP=30   | TP=0 ECU:BCM_hSCAN |
| Id=1F1  | EP=100  | TP=0 ECU:BCM_hSCAN |
| Id=1F3  | EP=20   | TP=0 ECU:BCM_hSCAN |
| Id=3C9  | EP=100  | TP=0 ECU:BCM_hSCAN |
| Id=3F1  | EP=250  | TP=0 ECU:BCM_hSCAN |
| Id=4E1  | EP=1000 | TP=0 ECU:BCM_hSCAN |
| Id=4E9  | EP=1000 | TP=0 ECU:BCM_hSCAN |
| Id=514  | EP=1000 | TP=0 ECU:BCM_hSCAN |
| Id=52A  | EP=1000 | TP=0 ECU:BCM_hSCAN |
| Id=771  | EP=1000 | TP=0 ECU:BCM_hSCAN |

# A trace with problems ...

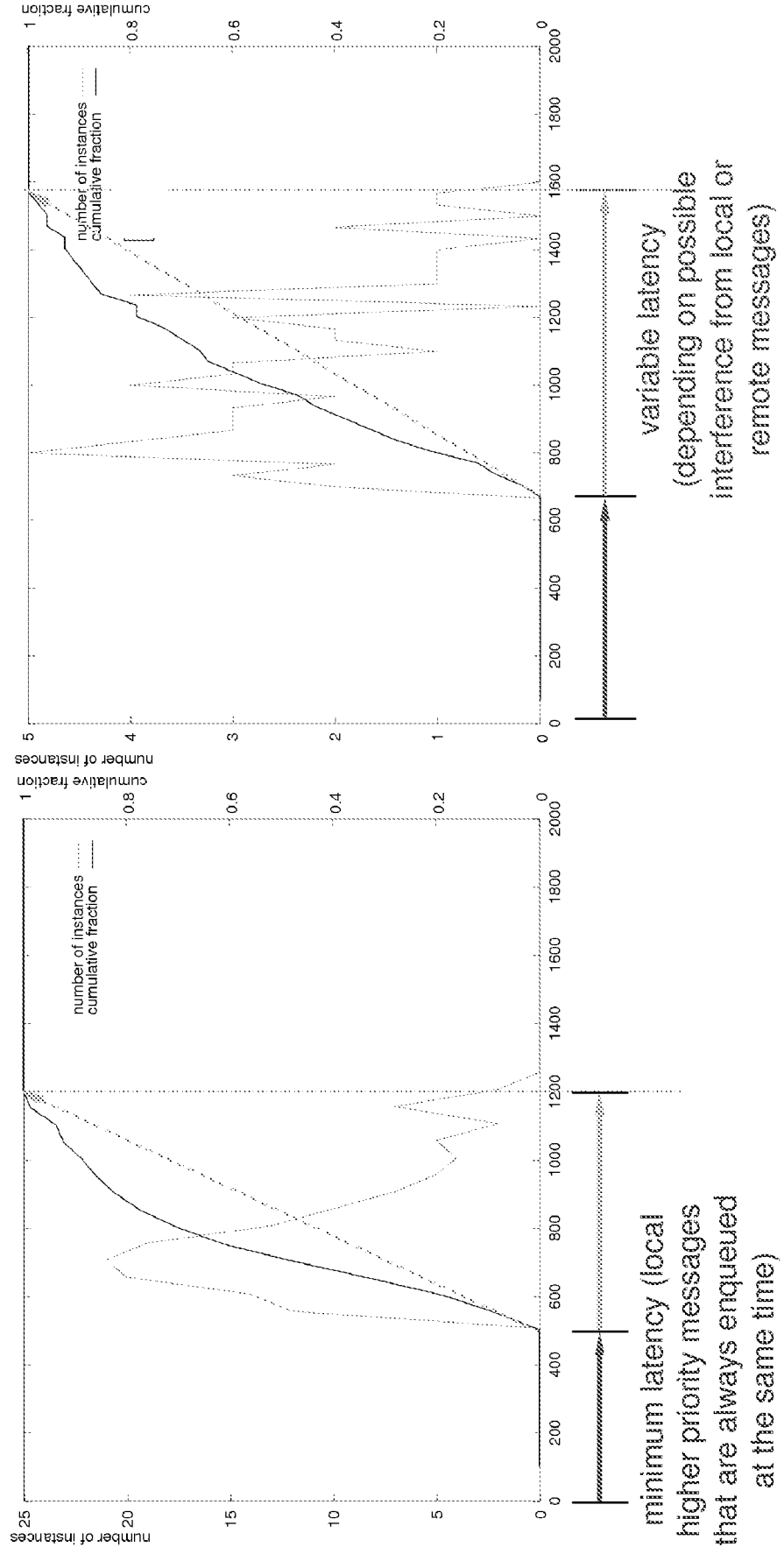
|                                                                                       |           |        |        |             |           |     |
|---------------------------------------------------------------------------------------|-----------|--------|--------|-------------|-----------|-----|
|    | t=1493860 | Id:0F1 | Len:32 | Act:1493440 | Lat:420   |     |
|                                                                                       | t=1494120 | Id:0C5 | Len:64 | Act:1493620 | Lat:500   |     |
|                                                                                       | t=1494350 | Id:184 | Len:48 | Act:1493620 | Lat:730   |     |
|                                                                                       | t=1494640 | Id:1E5 | Len:64 | Act:1493620 | Lat:1020  |     |
|                                                                                       | t=1494850 | Id:0C9 | Len:56 | Act:1494352 | Lat:498   |     |
|                                                                                       | t=1495090 | Id:1E9 | Len:64 | Act:1493620 | Lat:1470  |     |
|                                                                                       | t=1495320 | Id:191 | Len:64 | Act:1494352 | Lat:968   |     |
|                                                                                       | t=1495510 | Id:2F9 | Len:40 | Act:1493620 | Lat:1890  |     |
|                                                                                       | t=1495650 | Id:1A1 | Len:24 | Act:1494352 | Lat:1298  |     |
|                                                                                       | t=1495860 | Id:1C3 | Len:40 | Act:1495109 | Lat:751   |     |
|    | t=1496810 | Id:120 | Len:40 | Act:1493440 | Lat:3370  | REF |
|    | t=1499010 | Id:12A | Len:64 | Act:1493440 | Lat:5570  | REF |
|    | t=1500890 | Id:130 | Len:40 | Act:1493440 | Lat:7450  | REF |
|    | t=1501240 | Id:138 | Len:40 | Act:1493440 | Lat:7800  | REF |
|                                                                                       | t=1501860 | Id:0F9 | Len:64 | Act:1501718 | Lat:142   | REF |
|                                                                                       | t=1502060 | Id:199 | Len:64 | Act:1501718 | Lat:342   |     |
|                                                                                       | t=1502410 | Id:524 | Len:64 | Act:1502280 | Lat:130   | REF |
|                                                                                       | t=1502590 | Id:528 | Len:40 | Act:1502280 | Lat:310   |     |
|                                                                                       | t=1503560 | Id:0F1 | Len:32 | Act:1503440 | Lat:120   | REF |
|    | t=1503750 | Id:1E1 | Len:24 | Act:1493440 | Lat:10310 |     |
|                                                                                       | t=1504410 | Id:0C1 | Len:64 | Act:1504238 | Lat:172   | REF |
|                                                                                       | t=1504650 | Id:0C5 | Len:64 | Act:1504238 | Lat:412   |     |
|                                                                                       | t=1504900 | Id:1C7 | Len:56 | Act:1504830 | Lat:70    |     |
|                                                                                       | t=1505170 | Id:1E5 | Len:64 | Act:1504238 | Lat:932   |     |
|  | t=1506360 | Id:1F1 | Len:64 | Act:1493440 | Lat:12920 | REF |
|                                                                                       | t=1507960 | Id:0C9 | Len:56 | Act:1506850 | Lat:1110  | REF |
|                                                                                       | t=1508190 | Id:191 | Len:64 | Act:1506850 | Lat:1340  |     |
|  | t=1508910 | Id:1F3 | Len:16 | Act:1493440 | Lat:15470 | REF |
|  | t=1511250 | Id:3C9 | Len:64 | Act:1493440 | Lat:17810 | REF |
|                                                                                       | t=1512390 | Id:524 | Len:64 | Act:1512280 | Lat:110   | REF |
|                                                                                       | t=1512570 | Id:528 | Len:40 | Act:1512280 | Lat:290   |     |
|                                                                                       | t=1513580 | Id:0F1 | Len:32 | Act:1513440 | Lat:140   | REF |
|                                                                                       | t=1513780 | Id:1F3 | Len:16 | Act:1513440 | Lat:340   |     |

# Message latencies – ECU1/interrupt based

msgA (med) – ECU1

msgB (med) – ECU1

The latencies of medium and low priority messages follow a typical shape in which offset and rise time depend on the message priority.

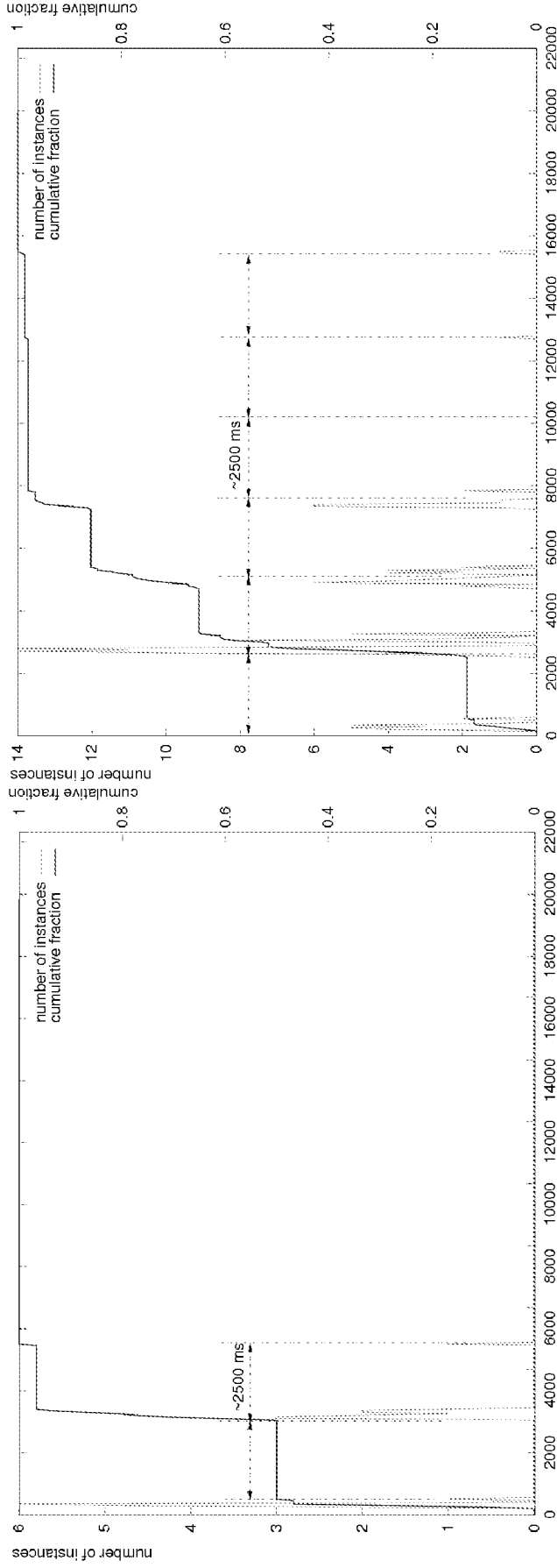


# Message latencies – ECU2/Poling based

msgC (med) – ECU2

msgD (low) – ECU2

The latencies of medium and low priority messages follow a staircase *cdf* and the values are grouped in spikes separated by (approx.) the period of the polling task.



# CAN bus

How about the average latency behavior ?

Other types of analysis are possible

By simulation

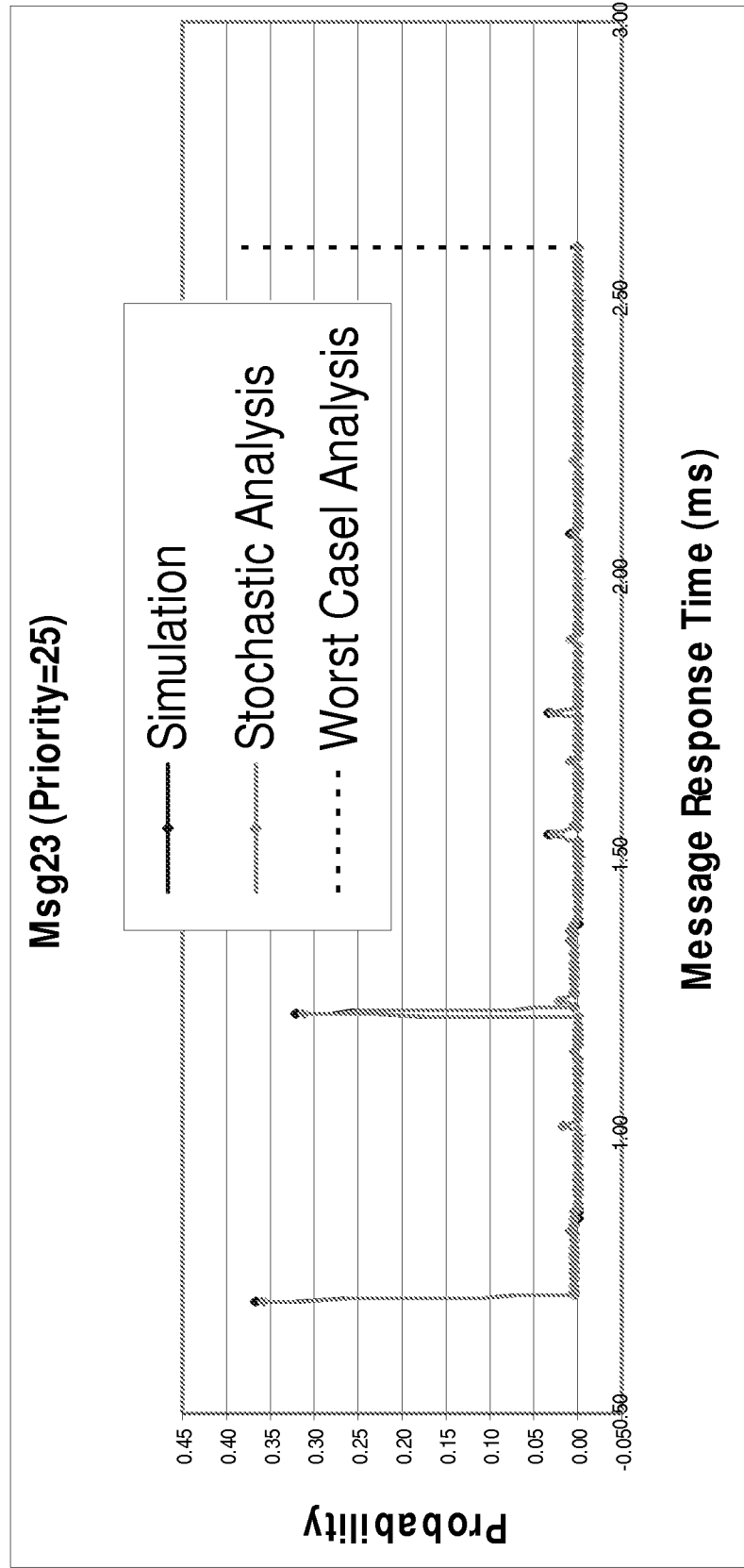
- Probably the only one that can capture effects like finite copy times, insufficient number of buffers, non-preemptability of TxObjects ...

Stochastic analysis

- See recent work with Haibo Zeng [8].
- Surprisingly close to the results of trace analysis with non-preemptable single TxObjects and finite copy times!

## Experimental Results

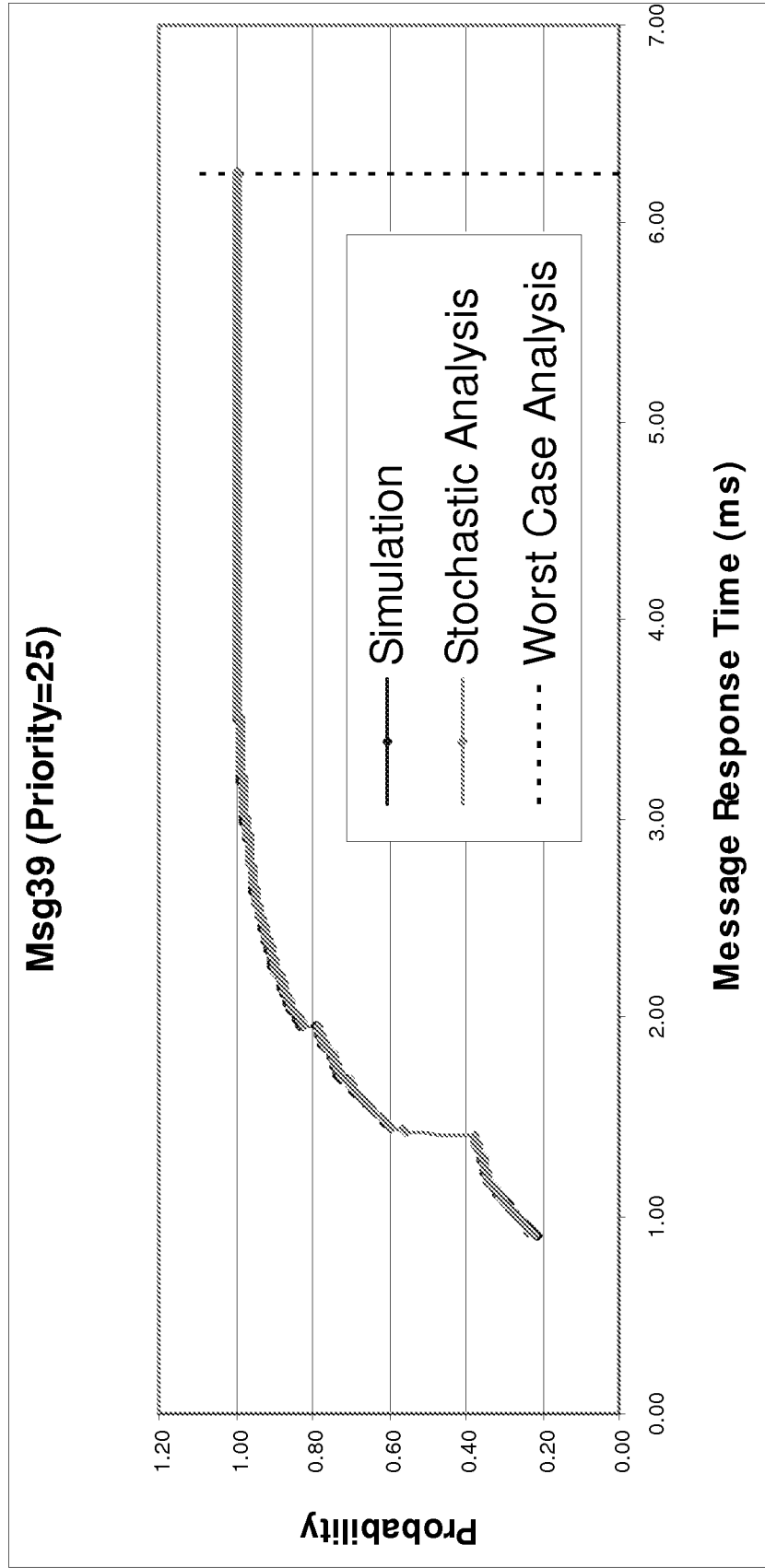
- Probability Mass Function for Medium Priority Message
  - Mixture of blocking and interference





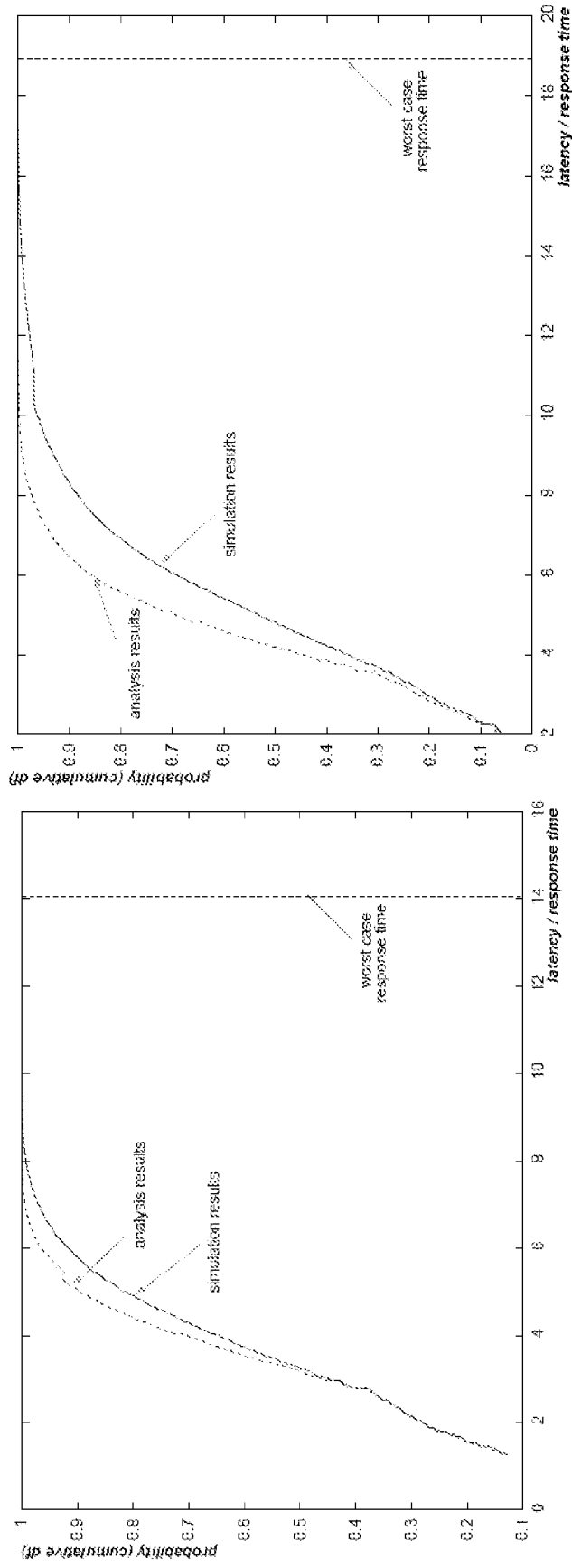
## Experimental Results

- Cumulative Distribution Function for Medium Priority Message
  - Mixture of blocking and interference



# Experimental Results

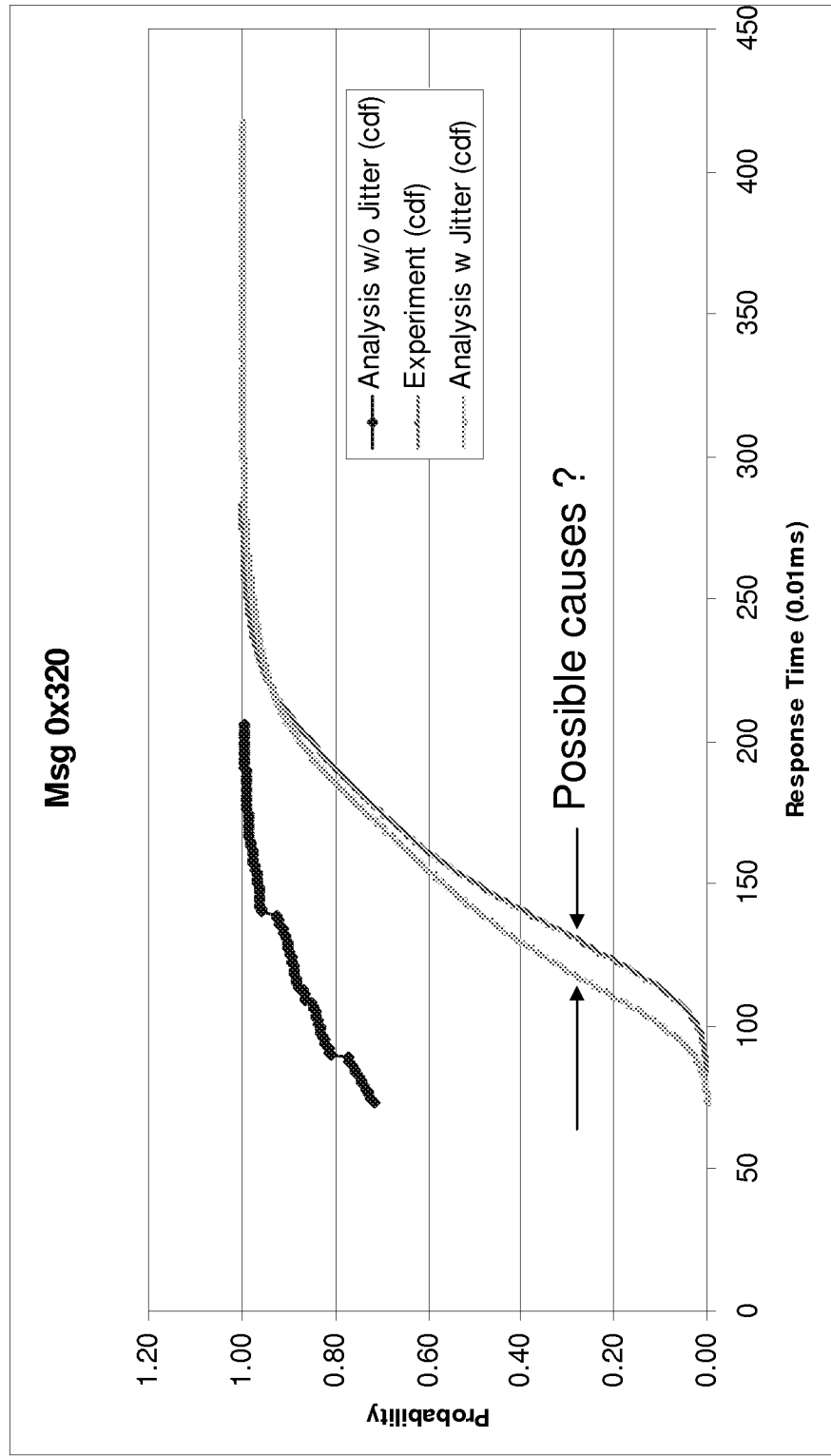
- Cumulative Distribution Function for Low Priority Messages
  - Increasing errors



# Trace analysis vs. Stochastic predictions

MsgA: Medium Priority

Msg 0x320



# CAN bus

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# Scheduling for a TTCAN network with a stochastic optimization algorithm

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The TTCAN protocol is a new development in CAN technology that specifies a time-slot based communication mechanism. TTCAN technology avoids the transmission collisions commonly found in standard CAN networks. In TTCAN, all the message instances are transmitted only on previously allocated time-slots. No other instance may be transmitted on an allocated time-slot, so transmission collisions are avoided.

Before transmitting a message set over a TTCAN network, it is necessary to create a valid scheduling table that specifies how the time is discretized into time-slots and how the message instances are allocated into those time-slots. Building a valid optimized scheduling table that follows the TTCAN specification isn't trivial. Additionally, several distinct scheduling tables may be built for the same message set, so it is necessary to use some quality criterion to select one among all. Typical message sets include a large number of messages, making manual scheduling a very hard and error-prone process. This means it is desirable to use automated tools that compute a feasible scheduling table automatically for a given message set. In this paper, we present a scheduling tool for TTCAN networks that generates a valid scheduling table using a stochastic optimization algorithm. The tool attempts to optimize the scheduling table so it will generate solutions with low jitter. The tool was applied to two well known message sets used in the automotive industry and results are positive.

## 1. Introduction

The CAN fieldbus has been used in automotive industry for real-time distributed systems embedded in vehicles since several years. Recently, the interest of the industrial and research communities in communication based on the time-triggered paradigm [1] has increased substantially and a standardization process led to the definition of a new session layer for CAN. The future standard, known as time-triggered CAN (TTCAN) [4] uses a scheduling table that must be built off-line, prior to the system start of operation. In this paper, we present an early version of a tool that can be used to simplify the construction of the required scheduling table. We begin with a brief presentation of the TTCAN protocol, and then we follow by describing the scheduler and optimizer algorithms. We briefly describe the tool operation and some of its screens. We show some results obtained from applying the tool to a modified PSA message set [3] with messages having harmonic periods. The results

are briefly analyzed, some conclusions are extracted and some future work is identified.

## 2. TTCAN – Time-triggered CAN

During the last years, CAN – Controller Area Network has become the main fieldbus used in the time critical parts of automotive systems. Although CAN operates following the event-triggered paradigm, recent academic studies [8] pointed to the possibility of using a time-triggered approach in part of the operation of CAN based distributed systems. This feature could improve the bandwidth utilization in CAN-based real-time systems by separating the periodic traffic from the aperiodic one and keeping the timeliness guarantees of the former. From the industrial side, the interest of using the time-triggered approach in CAN has also been recognized since some time and, as a consequence, a standardization task force (ISO/TC 22/SC 3/WG 1/TF 6) was launched under International Standards Organization in order to achieve a definition for a session layer for CAN. This standard, which will be numbered

11898-4, is already known as TTCAN, from Time-Triggered Controller Area Network.

In TTCAN, a special node, the time master, is responsible for the transmission of a systolic message, the reference message, which is used to achieve synchronization between the fieldbus nodes. The reference message marks the start of a time slot called the Basic Cycle (BC). The BC may be divided in different types of windows, namely, the exclusive windows and the arbitrating windows. An exclusive window is used to transmit a specific periodic message. An arbitrating window may be used to transmit any message, provided it gains the bitwise arbitrating process as in normal CAN operation and provided it finishes transmission before the end of the window, thus guaranteeing temporal isolation between the different types of traffic.

The complete traffic pattern in a TTCAN system consists in a fixed number of consecutive BCs and is named the System Matrix or Matrix Cycle (SM). In figure 1, an example of a system SM is presented. There, it is possible to notice one of the major restrictions in the SM construction, which is the column like organization. All the windows of the same column in every BC must be of the same size. With this organization it is possible to define a set of trigger instants (offsets from the reference message) which is kept constant from BC to BC all along the SM, thus simplifying the TTCAN controllers hardware. Once the MC is defined, it is possible to merge two (or more) consecutive arbitrating windows in the same BC in order to facilitate the transmission of normal CAN messages. Finally, The other major restriction is in the number of BCs per SM, which must be an integer power of two.

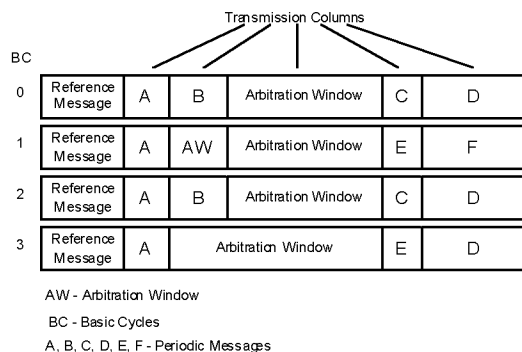


Figure 1 Example of a Matrix Cycle in TTCAN.

In TTCAN, the system matrix must be defined off-line. All the nodes must have stored the correspondent information prior to the start of

operation. Details about TTCAN operation modes, synchronization techniques and other specification details can be found in [4], [5] and in the draft standard.

### 3. Building a schedule

The process of off-line scheduling a message set in the case of a TTCAN network consists in building the system matrix (SM). It includes:

- The determination of the number of columns.
- The determination of the number of rows.
- The definition of the duration of each column.
- The indication of the message to be transmitted in each cell (row, column).

This must be done respecting the messages' period and duration. In what concerns the period, the first approach is to keep the average period of each message identical to the respective instantaneous period. This is done using the appropriate number of message instances in the system matrix. The average period is equal to the duration of SM divided by the number of message instances. In what concerns the messages' duration, this determines the column width.

In spite of these restrictions and of the one imposed to the number of Basic Cycles as indicated in section 2, it is usually possible to build several distinct system matrixes for the same message set. Consequently, it is possible to assess the quality of the schedule in the System Matrix according to some pre-defined criterion.

In the present case we use a cost function based on the sum of the message jitter values. Jitter is determined for every instance of every message all over the system matrix. The cost function is weighted by the system matrix duration. The correspondent expression is the following:

$$Jitter = \frac{1}{M} \sum_p \sum_i |e_i^p - a_i^p|$$

where  $e_i^p$  is the expected beginning time of transmission of instance  $i$  of message  $p$ ,  $a_i^p$  is the actual beginning time and  $M$  is the duration of the system matrix.

Considering now the automatic tool operation, the required phases needed to build the system matrix are the following:

- Scheduling.
- Optimization.

The first corresponds to the generation of a feasible set of distinct system matrixes (SMs). The second does the selection of the best SMs according to the cost function above.

In order to be able to maintain the average period of every message, the SMs duration,  $M$ , must be the least common multiple of the messages' periods (it could also be an integer multiple of it). The average period is kept with  $M/P_i$  instances of every message  $i$  of period  $P_i$  during the SM.

The first phase, scheduling, includes the following steps:

1. Determination of the maximum number of lines of the system matrix.
2. Message allocation.
3. Free time redistribution.

Ignoring the restriction about the number of basic cycles, it is obvious that the maximum number of lines in the SM is bounded by:

$$L_{\max} = \frac{M}{T_{\max}}$$

where  $T_{\max}$  is the maximum transmission time of all the messages in the set.

Before starting the allocation process, the automatic tool generates an ordered set  $I$  which includes every instance of every message in the initial set. This set is organized by decreasing order of the message transmission time  $I$ :

$$I = \{I_1^1, I_1^2, \dots, I_1^{K_1}, I_2^1, \dots, I_2^{K_2}, \dots, I_n^1, \dots, I_n^{K_n}\}$$

with  $n$  being the number of different messages in the initial set and:

$$K_i = \frac{M}{P_i} \text{ and}$$

$$T_1 = T_{\max} > T_2 > \dots > T_i$$

The next step in the operation of the tool consists in defining a random number of lines:

$$L \leq L_{\max}$$

Then, the tool removes the first  $L$  instances in  $I$  and allocates them in the first column of the system matrix. The tool repeats this last step until all instances in  $I$  are removed, thus obtaining a SM with the following number of columns,  $\#C$ :

$$\#C = \left\lceil \frac{\#I}{L} \right\rceil$$

As the longer messages are taken into consideration first,  $\#C$  is minimum.

At this moment it is possible to determine the minimum duration of the basic cycle for this particular system matrix:

$$D_{BC} = \sum_{i=1}^{\#C} D_i$$

with  $D_i$  being the duration of each column.

With this value it is possible to determine if the set is schedulable which happens when:

$$D_{BC} \leq \frac{M}{L}$$

If the set is schedulable then there is some free time available in each basic cycle:

$$t_{free} = \frac{M}{L} - D_{BC}$$

The tool inserts a free column between each two occupied columns and redistributes the free time randomly between the first ones. This is the only random factor in the construction of the first set of system matrixes.

|   |   |  |   |   |  |   |  |
|---|---|--|---|---|--|---|--|
| A | B |  | C | A |  | D |  |
| A | B |  | C | A |  | D |  |
| A | B |  | C | B |  |   |  |
| A | B |  | C | D |  |   |  |

Figure 2 - Example of a first System Matrix, after an initial random transformation.

### 3.1 Optimization process

The optimization process uses a set of feasible system matrixes built as described previously. These matrixes, considered the initial population in a similar way to genetic algorithms, will be subject to random transformations. These transformations must guarantee that the matrixes are still feasible afterwards. The cost function defined above determines the quality of the matrixes. The complete set of steps in this process is the following:

1. Generation of the initial population;
2. Diversification of the population;
3. Random selection of a matrix;
4. Application of a random transformation to the selected matrix;
5. Evaluation of the cost function for this matrix.
6. If this matrix is worse than the worst matrix in the population then it is eliminated, otherwise it replaces the latter;
7. Repeat steps 4 to 6 till the pre-defined maximum number of iterations is attained.

Considering step 1, the number of elements that constitute the initial population is defined previously by the user. The scheduler generates then a feasible system matrix as it was explained before.

In step 2 the tool applies to the elements of the population a random transformation without

caring about quality. This originates some diversity in the initial population. This operation ends the initialization process.

Now the main body of the optimization algorithm is attained. The algorithm is based on a steady state genetic algorithm [6], [7]. However, we called it a stochastic algorithm, as we couldn't find any simple process to apply crossover keeping the system matrixes feasible.

Another issue regarding the completion of the algorithm is the number of iterations. In fact, it is impossible to define an absolute value for the cost function that could be used in every message set. Jitter depends on the transmission load and on the relationship between the messages' periods. The number of iterations must then be pre-imposed by the user. It is easy to choose an adequate value after running a couple of optimization processes.

### 4. A brief look at the tool and some results

Before starting the operation of the tool, the optimization settings must be initialized (figure 3). These are the number of runs, the number of iterations, the size of the initial population and the probabilities of each transformation.

The 'Optimization Settings' dialog box includes the following fields:

- Number of runs:** A text box containing the value '1'.
- Single run duration:** A section header.
- Number of iterations:** A text box containing the value '1000'.
- Population dimension:** A section header.
- Number of alternative settings:** A text box containing the value '50'.
- Optimization transformation probabilities:** A section header.
- Column swap:** A text box containing the value '20'.
- Cell swap:** A text box containing the value '20'.
- Free time distribution:** A text box containing the value '20'.
- Vertical mirror:** A text box containing the value '20'.
- Horizontal mirror:** A text box containing the value '20'.
- Ok:** A button at the bottom right.

Figure 3 – Initialization of parameters.

After, a message set must be chosen from a file or a new one must be created. The tool has also the adequate editing screen (figure 5).



When this is done, it is possible to run the optimization tests. When the message set has not too many messages, the user can get a flavor of the final optimized schedule directly from the main tool screen (figure 6). The accurate results can be obtained from an output file. An example is shown in figure 4.

In [9] it was shown that the optimization tool was able to schedule the well known SAE [2] and PSA [3] message sets which are often used as benchmarks for fieldbus based distributed systems. The messages in the sets have non-harmonic periods so, it is only possible to reduce jitter, which was achieved by the tool, but it is impossible to eliminate it.

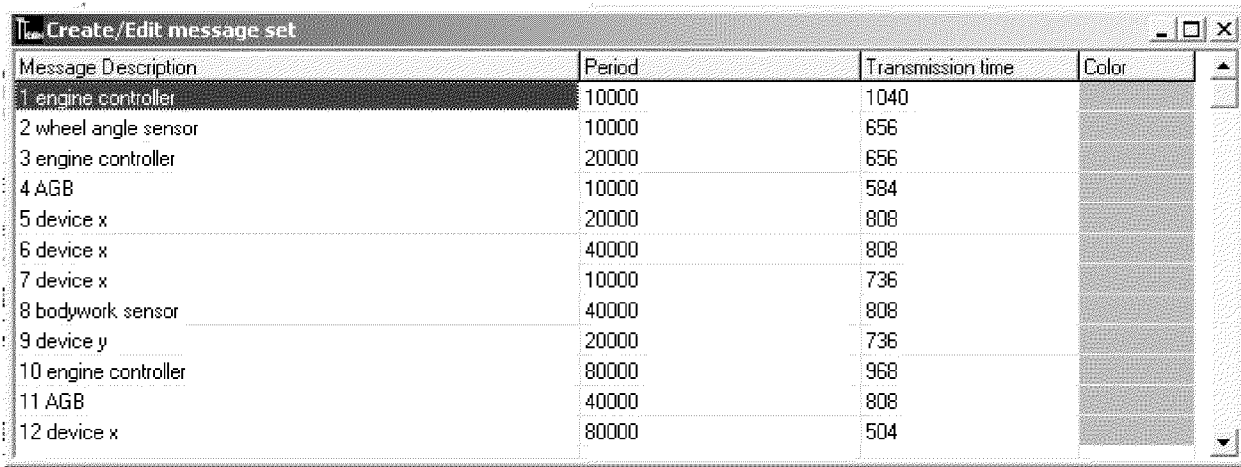
In order to verify if the tool is able to find a zero jitter solution, we decided to use a modified PSA message set in which the messages' periods were slightly reduced in order to become harmonic. The messages' parameters are the ones in figure 5.

noticed also many solutions with a very reduced jitter and some with jitter in two or three messages. It was clear that the number of iterations was enough to arrive to a steady population, so we think that the optimization often discovers just a local minimum. However, as the time to execute is just a few seconds in a normal PC, it is quick to make a reasonable number of optimizations and it is almost sure that a good schedule is found.

```
Config
      Pop size:10
      Nr of iterations:20000
Probabilities
      column swap:20
      cell swap:20
      free time distrib:20
      horiz mirror :20
      vertical mirror :20
Rows:8
Columns:12
Column duration:
808 736 1040 1040 1096 844 584 1427
260 736 773 656
Scheduling matrix:
(-1 represents an empty cell, other
values are the index of the message
(with the same order that was
defined in the input file))
4 6 0 10 -1 -1 3 -1 -1 8 -1 1
5 6 0 9 -1 -1 3 -1 -1 2 -1 1
4 6 0 -1 -1 -1 3 -1 -1 8 -1 1
11 6 0 7 -1 -1 3 -1 -1 2 -1 1
4 6 0 10 -1 -1 3 -1 -1 8 -1 1
5 6 0 -1 -1 -1 3 -1 -1 2 -1 1
4 6 0 -1 -1 -1 3 -1 -1 8 -1 1
-1 6 0 7 -1 -1 3 -1 -1 2 -1 1
Jitter:0
```

Figure 4 – Schedule with 0 jitter (output from the tool).

Some tenths of simulations were then made with that set. Several zero jitter solutions such as the one in figure 4 were obtained. We



| Message Description  | Period | Transmission time | Color |
|----------------------|--------|-------------------|-------|
| 1 engine controller  | 10000  | 1040              |       |
| 2 wheel angle sensor | 10000  | 656               |       |
| 3 engine controller  | 20000  | 656               |       |
| 4 AGB                | 10000  | 584               |       |
| 5 device x           | 20000  | 808               |       |
| 6 device x           | 40000  | 808               |       |
| 7 device x           | 10000  | 736               |       |
| 8 bodywork sensor    | 40000  | 808               |       |
| 9 device y           | 20000  | 736               |       |
| 10 engine controller | 80000  | 968               |       |
| 11 AGB               | 40000  | 808               |       |
| 12 device x          | 80000  | 504               |       |

Figure 5 – View of the Create/Edit message screen with the modified PSA set.

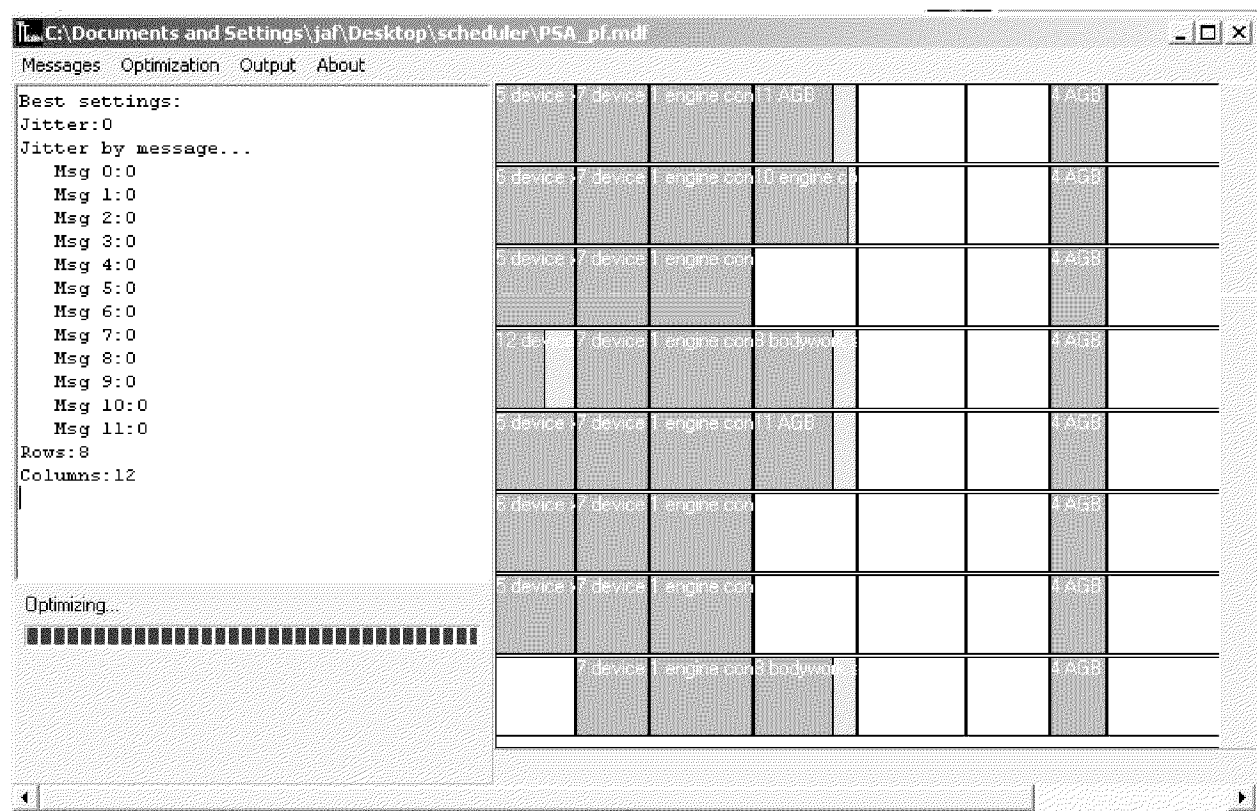


Figure 6 – Main screen of the tool showing a schedule with 0 jitter (output from the tool).

## 5. Conclusions

We developed a scheduling and optimization tool capable of building the so-called system matrix for a TTCAN based network given a set of periodic messages. The tool, based on a stochastic algorithm similar to a genetic one, always generates a valid scheduling solution for

feasible sets. An optimization phase applies different transformations to the schedule in order to refine the solution so that message jitter can be reduced or, if possible, eliminated. The tool has been tried with SAE and PSA message sets and could find several zero jitter schedules with a modified version of this last set.

However, there is yet some research work to do on it. First, we would like to tune some initial parameters such as the percentages of the optimization transformations. Also, we would like to find more of those transformations and to study the possibility of applying a transformation similar to the crossover operation in genetic algorithms.

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# CAN Network with Time Triggered Communication

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The communication in the classic CAN network is event triggered; peak loads may occur when the transmission of several messages is requested at the same time. CAN's non-destructive arbitration mechanism guarantees the sequential transmission of all messages according to their identifier priority. For hard real-time systems, a scheduling analysis of the whole system has to be done to ensure that all transmission deadlines are met even at peak bus loads.

For a RTOS that is based on static cyclic scheduling of all tasks, system integration and composability are served when the communication on the CAN network also follows a synchronised schedule.

The time triggered communication option of the forthcoming new edition of ISO11898-1 describes the prerequisites needed for the synchronisation of all nodes in the CAN network. Based on the synchronisation of the nodes, the time triggered communication facilitates also the establishment of a global time in higher-layer protocols. A higher-layer protocol above the unchanged standard CAN protocol is in the process of standardization by ISO TC22/SC3/WG1/TF6, as ISO11898-4.

In parallel to the standardization process, Bosch has implemented the time triggered communication function into a CAN IP module that maintains the cyclic transmission schedule autonomously, not depending on software control.

This paper describes a CAN network with time triggered communication consisting of CAN controllers with autonomous message scheduling.

## 1 Introduction

TTCAN is a higher-layer protocol above the unchanged standard CAN protocol that synchronises the communication schedules of all CAN nodes in a network and that provides a global system time. When the nodes are synchronised, any message can be transmitted at a specific time slot, without competing with other messages for the bus. Thus the loss of arbitration is avoided, the latency time becomes predictable. Apart from the synchronised communication schedule, the TTCAN nodes operate according to the standard CAN protocol as defined by ISO 11898-1. The TTCAN protocol is in the process of standardization [4] by ISO TC22/SC3/WG1/TF6. [1] describes TTCAN on system level. This paper describes the implementation of TTCAN features into a CAN module and the evaluation of a TTCAN network.

## 2 Time Reference

In order to synchronise the activities of all CAN nodes within a network, a common time reference is needed. Each node has its own local time, which is a counter that is incremented each network time unit (NTU). The system wide NTU is derived from the node's local clock and local time unit ratio (TUR).

In TTCAN, the cyclic transmission schedule is synchronised by the repeated transmission of a particular CAN message, the reference message. This reference message (transmitted by a time master) restarts the cycle time in each node. The cycle time is derived from the node's local time.

Figure 1 describes the synchronisation of the cycle time, performed in the same manner by all TTCAN nodes, including the time master. Any message received or transmitted

invokes a capture of the local time taken at the message's frame synchronisation. This frame synchronisation event occurs at the sample point of each start of frame (SOF) bit and causes the local time to be loaded into the Sync\_Mark register.

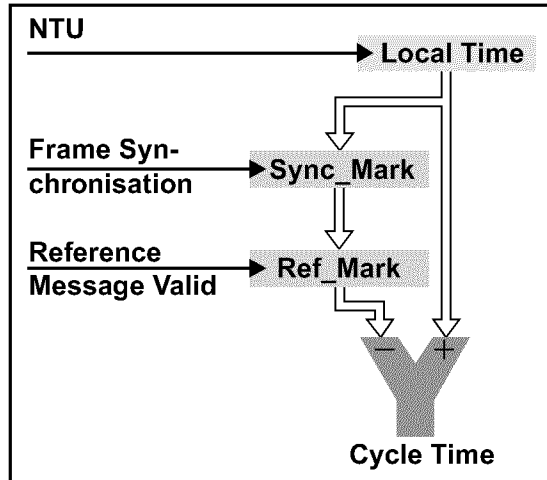


Figure 1: Cycle Time Synchronisation

Whenever a valid reference message is transmitted or received, the contents of the Sync\_Mark register is loaded into the Ref\_Mark register. The difference between the actual value of the Ref\_Mark and the local time is the cycle time ( $\text{Cycle Time} = \text{Local Time} - \text{Ref\_Mark}$ ).

### 3 Basic Cycle

Each reference message starts a new basic cycle; the cycle time counts the time since the start of the basic cycle. The basic cycle consists of several non-overlapping time windows of different size. The sequence of the time windows is described by time marks that define when a time window begins.

The structure of the basic cycle is defined once for the whole TTCAN network. Several basic cycles may be combined to build a matrix cycle or system matrix, the sequence of basic cycles in the matrix cycle is controlled by the reference messages. All possible messages in the TTCAN system are assigned to particular elements (time windows) of the system matrix. The system designer decides whether a time window is an exclusive window (only one particular message may be transmitted in this window), an arbitrating window (messages may arbi-

trate for bus access), or a free window (may be reserved for further extensions of the network). The automatic retransmission of messages that could not be transmitted successfully is disabled, guaranteeing that messages in exclusive time windows are not delayed by other bus traffic.

A TTCAN node is not required to know the whole system matrix. It is sufficient to implement only that time marks that are necessary to define the time slots for the node's own transmit messages and to check whether received messages have arrived on time. The time marks are compared to the cycle time (see Figure 1). When the cycle time reaches a time mark, a particular action is triggered.

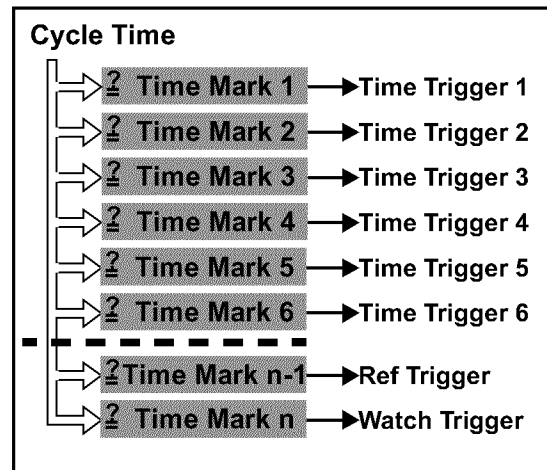


Figure 2: Scheduling based on Cycle Time

With the exception of the Watch Triggers, all Time Triggers are linked to messages of the CAN node. They either cause the start of the message's transmission or they define when the reception of the message is checked.

The Ref Trigger is linked to the reference message. When the time master transmits a reference message, a new basic cycle starts and the cycle time is reset. A Watch Trigger can only be reached when the reference message is not completed on time; an error handling procedure is initiated.

### 4 Global System Time

Time triggered CAN will be implemented in two levels. Level 1 is restricted to the cyclic message transfer only, level 2 also supports a global system time. The time master estab-

lishes its own local time as global time by transmitting its own Ref\_Marks in the reference message, as Master\_Ref\_Marks.

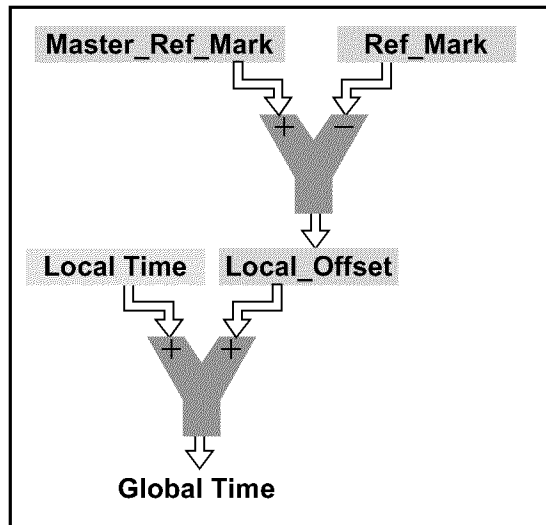


Figure 3: Generating the Global Time

The time slaves calculate their local time offset to the global time by comparing (see Figure 3) their local Ref\_Mark with the received Master\_Ref\_Mark. The node's view of the global time is local time + local offset.

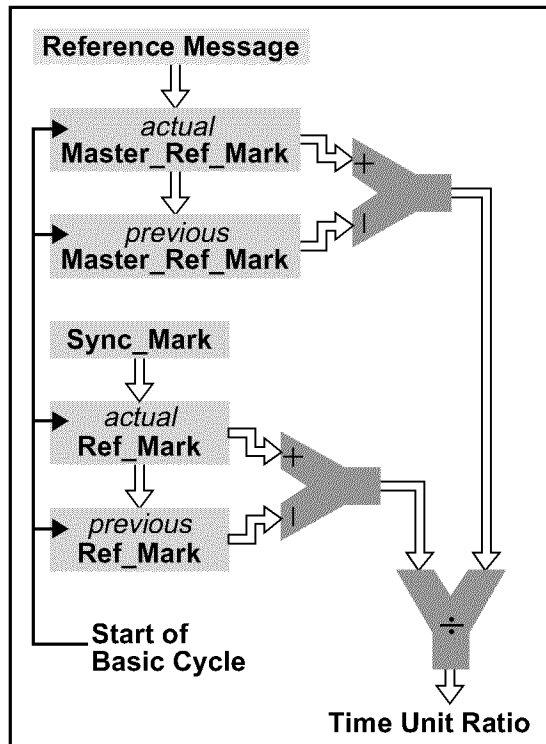


Figure 4: Drift Compensation

To compensate for slightly different clock drifts in the TTCAN nodes and to provide a

consistent view of the global time, the nodes perform a drift compensation operation (see Figure 4). They compare the length of the basic cycle in local time (Ref\_Mark – previous Ref\_Mark) with the length of the basic cycle in global time (Master\_Ref\_Mark – previous Master\_Ref\_Mark). The quotient of the two values gives the adapted time unit ratio.

## 5 TTCAN Implementation

The cyclic message transfer of TTCAN level 1 can be implemented in software, based on existing CAN modules. Depending on the CAN bit rate and on the number of messages in the system matrix, the software approach may result in a high CPU load. For the evaluation of the TTCAN protocol, the hardware approach was chosen.

In parallel to the standardization process, Bosch develops an IP module that implement the TTCAN protocol. This IP module, the TT\_CAN, is based on the existing C\_CAN IP module [5] and will be available as VHDL code to be synthesized in FPGAs, supporting the development of CAN based time triggered communication networks.

The C\_CAN consists of the components (see Figure 5) CAN Core, Message RAM, Message Handler, Control Registers, and Module Interface.

The CAN\_Core performs communication according to the CAN protocol version 2.0, as defined in ISO 11898-1. The bit rate can be programmed to values up to 1MBit/s depending on the used technology. For the connection to the physical layer additional transceiver hardware is required.

For communication on a CAN network, individual Message Objects are configured. The Message Objects and Identifier Masks for acceptance filtering of received messages are stored in the Message RAM.

All functions concerning the handling of messages are implemented in the Message Handler. Those functions are the acceptance filtering, the transfer of messages between the CAN Core and the Message RAM, and the handling of transmission requests as well as the control of the module interrupt.

The register set of the C\_CAN can be accessed directly by an external CPU via the module interface. These registers are used to control/configure the CAN Core and the Message Handler and to access the Message RAM.

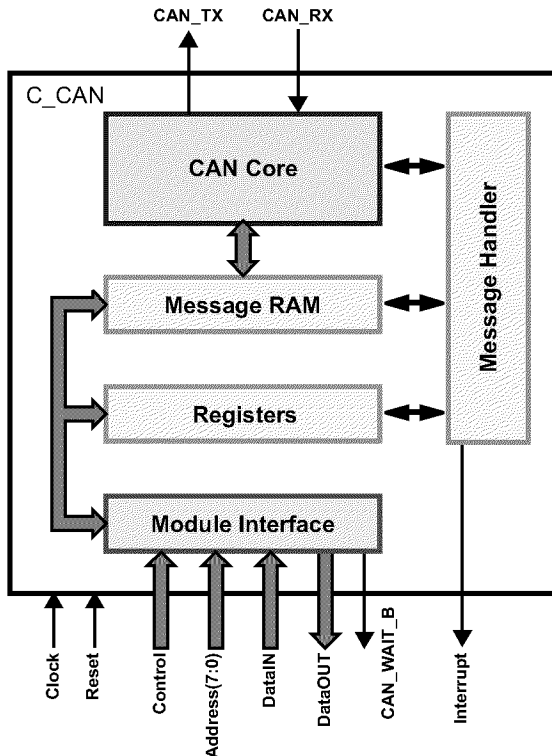


Figure 5: Block Diagram of the C\_CAN

Several Module Interfaces are available, including interfaces to ARM, Motorola and Texas Instruments CPUs.

Compared to the C\_CAN, the TT\_CAN is expanded by two functional blocks (see Figure 6), the Trigger Memory and the Frame Synchronisation Entity FSE.

The Trigger Memory stores the time marks of the system matrix that are linked to the messages in the Message RAM; the data is provided to the Frame Synchronisation Entity.

The Frame Synchronisation Entity is the state machine that controls the time triggered communication. It synchronises itself to the reference messages on the CAN bus, controls the cycle time, and generates Time Triggers. It is divided into five blocks (see Figure 7), the Time Base Builder TBB, the Cycle Time Controller CTC, the Time Sched-

ule Organiser TSO, the Master State Administrator MSA, the Application Operation Monitor, and the Global Time Unit GTU.

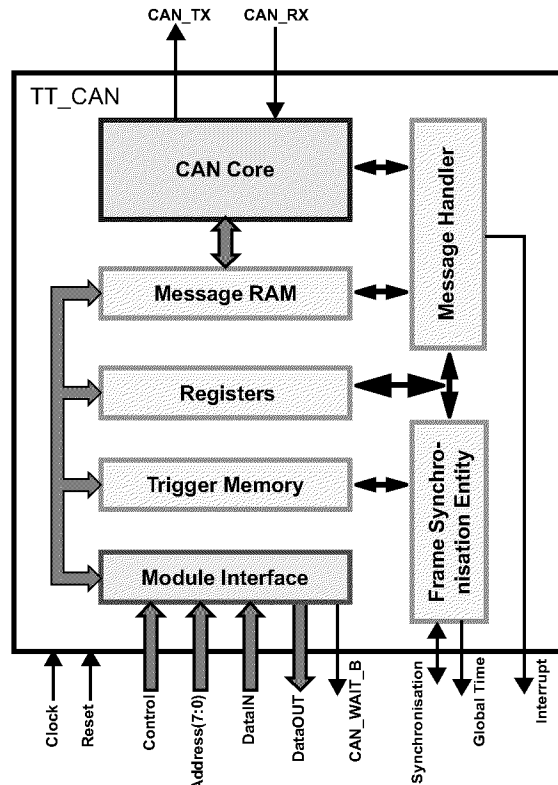


Figure 6: Block Diagram of the TT\_CAN

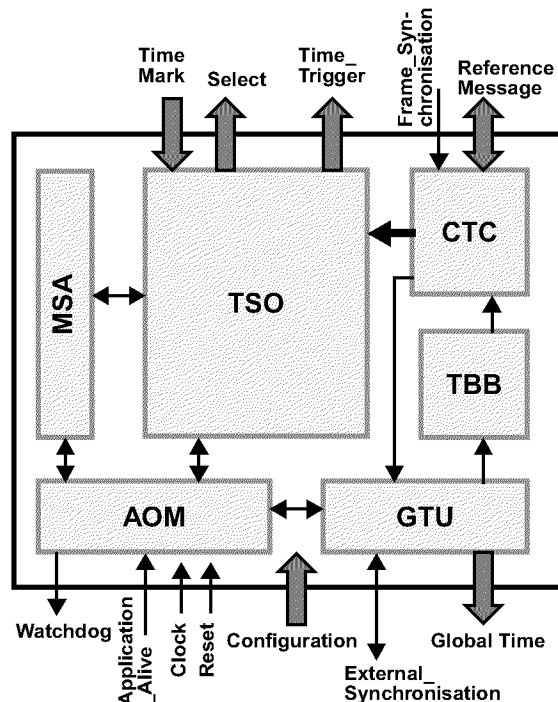


Figure 7: Frame Synchronisation Entity

Time Base Builder generates the local time from the node's system clock and the time unit ratio. In TTCAN level 1, the TUR is defined at configuration, in level 2, it is continuously adapted by the GTU.

The Cycle Time Controller gets the local time from the TBB, the Frame\_Synchronisation events from the CAN\_Core, and the reference messages from the Message Handler. It captures the Sync\_Mark and the Ref\_Mark to generate the cycle time and controls the sequence of the basic cycles in the matrix cycle. Cycle\_Count (part of the reference message) identifies the actual basic cycle inside the matrix cycle. Depending on whether the node itself is time master (transmitter of reference messages), Cycle\_Count is either generated from a cyclic counter or it is received in the reference message.

The Time Schedule Organiser maintains the message schedule inside a basic cycle and checks for scheduling errors. The schedule is defined by data in the Trigger Memory. The data consists of time mark (measured in cycle time), and function (trigger for transmission or check of reception), and is linked to a message in the Message RAM. The same time mark may be, selected by Cycle\_Count, defined for different messages at different basic cycles of the matrix cycle. Other time marks are defined for the Ref Trigger and the Watch Trigger. The TSO compares the time marks with the cycle time and activates the Time Triggers for messages with matching time marks. The function of the TSO depends on the actual operating state; transmissions are disabled when the node is not synchronised to the system. If the node is time master, the Ref Trigger causes the reference message to be transmitted. The Watch Trigger becomes active at the end of a basic cycle, when the expected start of a new basic cycle (completion of a reference message) does not occur. This event is causes the MSA to change the operating state.

The Master State Administrator controls the FSE's operating state. The operating state depends on whether the node is synchronised to the network, whether it is (trying to become) time master or whether it is a backup time master. The synchronisation

state differentiates between synchronising after the initialisation, the active mode, the loss of synchronisation, and the fault recovery. The function of the other blocks is monitored. In case of errors, transmissions are disabled and the master state is resigned

The Application Operation Monitor checks the function of the application program. The application controller has to serve the Application\_Alive input regularly. If the application program fails, the application watchdog causes the MSA to disable all transmissions, preventing invalid data to disturb the system.

The Global Time Unit (TTCAN level 2 only) generates the node's view of the global time and controls the drift correction of the local time. When the node is the first time master of the network, the node's local time is the global time. When the node is not operating as time master, the difference between local Ref\_Mark and Master\_Ref\_Mark received in the reference message is compared and defines the actual offset between the local time and the global time. The actual offset is updated at each start of a basic cycle; when the node becomes time master, the last offset is kept, avoiding a discontinuity in the global time. The Global\_Ref\_Mark (captured in global time) is provided as Master\_Ref\_Mark for reference messages to be transmitted.

The GTU compensates the drift between the local time and the global time by calibrating the local time. If the node itself is the time master, no calibration is done. Each time a reference message is completed, the actual length of the base cycle is measured in local time ( $\text{Ref\_Mark} - \text{previous Ref\_Mark}$ ) and in global time ( $\text{Master\_Ref\_Mark} - \text{previous Master\_Ref\_Mark}$ ). The difference between the two measured values divided by the length of the base cycle shows the factor by which the local time has to be calibrated in order to compensate the drift. The compensation is performed by adapting the TUR the TBB uses to generate the local time from the node's system clock. The calibration process is on hold when the node is not synchronised to the system and is (re-)started when it (re-)gains synchronisation.

Frequent significant changes in the measured drift indicate an unreliable local time



base. Time base errors are signalled to the MSA, causing it to stop all TTCAN operations.

In order to synchronise different TTCAN networks, or to provide a physical time base, the global time may be synchronised (via the time master) to an external clock, e.g. GPS.

The TTCAN implementation is done in two steps. In the first step, only level 1 is implemented, without the global system time and drift compensation of level2.

In the second step, after the evaluation of the TT\_CAN IP module in a TTCAN network, a global time unit will be added to the module.

## 6 TTCAN Network

The first TTCAN network is build using Bosch's CAN IP evaluation boards (see Figure 8). The boards have been developed for the analysis of the CAN IP modules A\_CAN, C\_CAN and CAN\_Gateway. The IP modules are synthesized into an FPGA (Field Programmable Gate Array); the boards provide storage for an application program to be run on a Motorola HC08AZ0 CPU and different CAN transceivers (high-speed and low-speed CAN buses). Up to three CAN transceivers are available for Gateway implementations. An emulator may be connected to P4/P5 for software development.

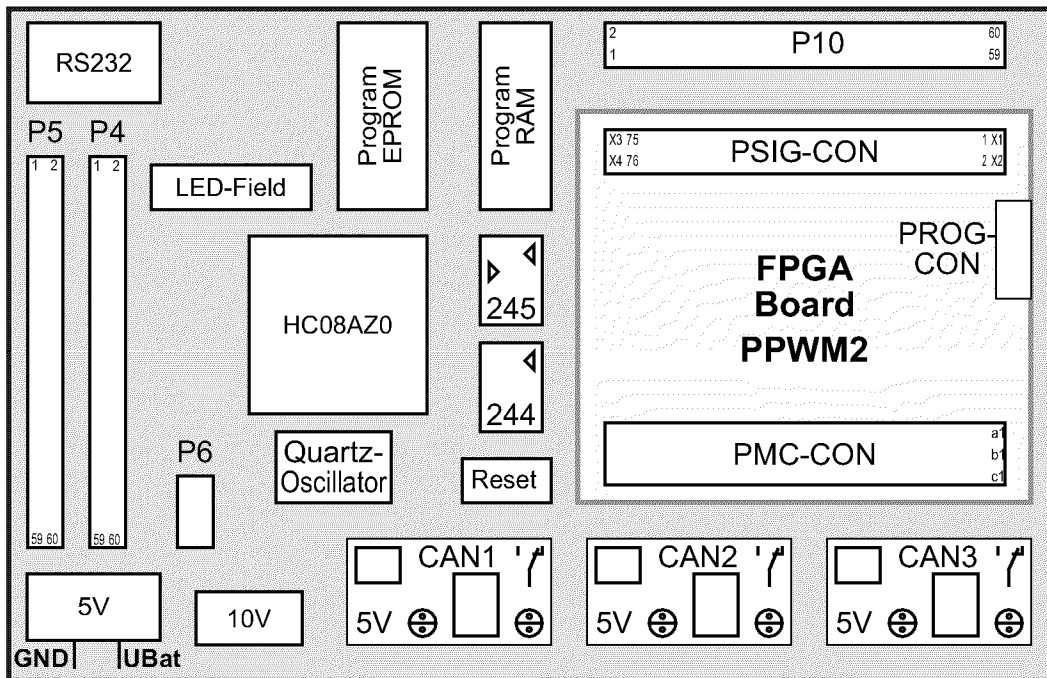


Figure 8: CAN IP Evaluation Board

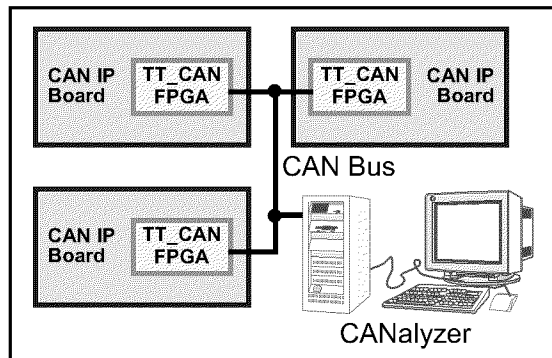


Figure 9: TTCAN Network

The TTCAN network for the evaluation of the first TT\_CAN IP module implementation consists of

(see Figure 9) three CAN IP evaluation boards acting as TTCAN nodes and one CANalyzer tool used to monitor the CAN bus traffic or to disrupt the time triggered message schedule.

The CANalyzer tool is a standard CAN network analysis tool, not modified for TTCAN.

The different application programs on the CAN evaluation boards control the TT\_CAN IP modules and provide initialisation data.

All three TTCAN nodes may become time master, their time master priority is defined by their reference message identifiers.

## 7 Summary

The TTCAN protocol level 1 is implemented in a CAN IP module and synthesized into an FPGA. The FPGA modules are used to evaluate the TTCAN protocol in different operation modes.

The first evaluated mode is the undisturbed operation, where the sequential time schedule of the cyclic message transfer is strictly maintained.

Clock drift between the TTCAN nodes causes a phase shift of the messages inside their time windows. Without the adaptive drift compensation of TTCAN level 2, the drift is compensated by the lengthening of the time windows. The amount by which the time windows are lengthened increases from the first to the last time window of a basic cycle.

Failure of the actual time master is emulated by resetting the time master or by disconnecting it from the CAN bus. The node with the next highest priority becomes time master. It releases the mastership when the first time master is reinitialised and restarts TTCAN operation.

Fault recovery is evaluated after disturbed reference messages and when the message schedule is disrupted by additional messages. The CAN bus disturbances and additional messages are provided by the CANalyzer tool.

The next step of the TTCAN protocol evaluation will be the implementation of the global time unit into the TT\_CAN IP module.

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## USING THE CONTROLLER AREA NETWORK FOR COMMUNICATION BETWEEN PROSTHESIS SENSORS AND CONTROL SYSTEMS

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### ABSTRACT

Advancements in electronics technology have yielded a wide variety of low-cost intelligent sensors and microprocessor-based control systems that can be incorporated into prostheses. The most efficient and reliable way to interconnect these components is through a communication bus. We have used the Prosthetic Device Communication Protocol (PDCP), based on the Controller Area Network (CAN), to develop a distributed control system for both upper and lower limb prostheses. The upper limb implementation is comprised of a master controller, a 16-channel myoelectric signal (MES) data acquisition (DAQ) module, and a modified Boston Digital Elbow (Liberating Technologies, Inc.). The lower limb implementation is comprised of a master controller, a 12-channel MES DAQ module, a 16-channel electromechanical sensor acquisition module, and an experimental knee prosthesis manufactured by Vanderbilt University. Bus utilization was, on average, 62% for the upper limb system and 73% for the lower limb system with no loss of data or perceivable latency. This contribution highlights the suitability of the CAN bus to support the data transfer required to control powered prostheses. It also supports the PDCP protocol as a higher-level protocol to facilitate interoperability between prosthesis control systems.

### INTRODUCTION

Upper limb myoelectric prostheses are in widespread clinical use, and a number of different companies manufacture and sell a variety of components. Furthermore, many research groups are developing new components including, but not limited to, smart electrodes, anthropomorphic terminal devices, sensory feedback devices, and actuated knees and ankles. These devices need to communicate if they are to be used together in a functioning prosthetic system.

Meetings were held between researchers and vendors at the 2005 and 2008 Myoelectric Controls Symposiums and at the 2007 and 2010 International Society for Prosthetics and Orthotics Conferences to discuss the creation of an open, standardized communication bus. The University of New Brunswick led the development effort and recently released a draft of a bus protocol that uses a Controller Area Network (CAN) bus. The protocol is called the *Prosthetic Device Communication Protocol (PDCP)* [1]. A CAN-based communication method allows

the number of wires necessary for data transmission to be dropped from at least two wires per sensor to a total of four wires for the entire system; specifically, two for the differential communication pair, one for power, and one for ground. CAN supports data transfer rates of up to 1 megabit per second and operates robustly in noisy electronic environments. In addition, a number of small, low-power, cost effective, and reliable CAN-capable microcontrollers have been developed for use in embedded systems and in the automotive industry.

The PDCP is a master/slave protocol that utilizes a unique 8-bit identifier for each electronics module present on the CAN bus. Every message sent across the bus is comprised of the identifier followed by a data payload of up to 8 bytes. This identifier acts as an 'address' and allows the master to communicate with a specific module or allows a module to communicate with the master.

The PCPD has been implemented on both upper and lower limb prosthetic components at the Center for Bionic Medicine (CBM) at the Rehabilitation Institute of Chicago. At CBM, we fit powered upper and lower limb prosthesis prototypes to amputee patients and have been working on development of advanced embedded controllers for both upper and lower limb prostheses. Because many of the same electronics system components can be used to support both upper and lower limb devices, we implemented the PDCP protocol to simplify the interoperability between our modular electronics devices.

### SYSTEM PROFILES

#### Lower Limb System

Myoelectric control for lower limb prostheses is an emerging field of research and development. Microprocessor-controlled variable damping knees and powered knee/ankles use state-based control to interpret signals measured from physical sensors embedded in or attached to the prosthesis. It has been shown that MESs may be interpreted by pattern recognition algorithms to decode information regarding the mode of activity that the patient is attempting to perform [2]. Preliminary experiments completed to determine if MESs added useful control information were accomplished using an instrumented passive prosthesis (Fig. 1a) with conventional wiring. We have modified a powered knee prosthesis manufactured by Vanderbilt University (VU) to use the PCDP to stream sensor information to, and accept commands from, a master

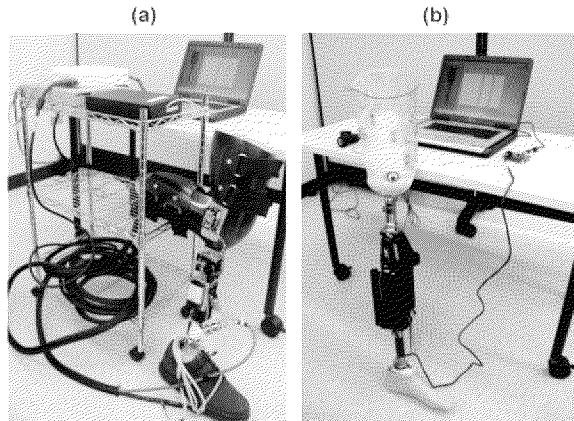


Figure 1: Data acquisition and control systems showing (a) an instrumented passive prosthesis connected to a laptop using conventional wiring and (b) a powered knee prosthesis connected to a laptop using a CAN bus.

control module. Thus, the overall system (Figure 1b) is now comprised of an MES DAQ module, a physical sensor module, the VU powered knee module, and a master control module that runs Control Algorithms for Prosthetic Systems (CAPS) software [3]. CAN communication is used to connect the modules, with conversion between CAN communication and (1) the computer's Universal Serial Bus (USB) input and (2) the VU powered knee's Serial Peripheral Interface (SPI) input (Figure 2).

#### MES DAQ Module

The MES DAQ module is comprised of 12 precision instrumentation amplifiers (Analog Devices AD8295) providing a gain of 50V/V as well as a second-order high-pass filter at 26 Hz. A second signal conditioning stage is made up of a second-order multiple feedback band-pass filter (Analog Devices AD8626) with a gain of 20V/V, a center frequency of 126 Hz, a low-frequency cutoff of 26 Hz, and a high-frequency cutoff of 387 Hz. The outputs of the instrumentation amplifiers are sampled by two 8-channel 16-bit analog-to-digital converters (ADCs) (LTC1859, Linear Technology) at a default sampling rate of 1 kHz. The digital outputs from the ADCs are collected by a PIC32MX795 32-bit microcontroller (Microchip Technology), which has been programmed to implement the

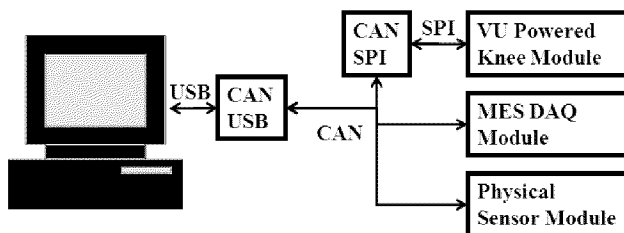


Figure 2: Lower limb distributed control system.

PDCP.

The MES DAQ module was assigned a unique system identifier, 0h50. A graphical user interface was created within CAPS to allow the user to specify parameters associated with the MES DAQ devices such as the sample rate, bit resolution (up to 16 bits per sample), software gain, and number of channels to be streamed across the CAN bus. The CAN bus allows a payload of at most 8 bytes of data to be sent within each message. Consequently, the data has been packaged such that samples from up to four channels are sent with each CAN message. Each data package uses the first byte as a sequence counter, so that statistics regarding missing data on the CAN bus can be tracked by CAPS and used for debugging purposes.

#### Physical Sensor Module

The physical sensor module was constructed at CBM to provide bridge excitation voltage to a six degree of freedom MCW-6-1K load cell (AMTI) and amplify the resulting strain gauge measurements. The module also houses a six degree of freedom inertial measurement unit manufactured by SparkFun Electronics (SEN-09431). Finally, four additional analog sensors, such as force sensitive resistors or potentiometers, may also be supported depending on the experimenter's needs. All signals are sampled by two 8-channel, 16-bit ADCs (LTC1859) at a default sampling rate of 500 Hz. The digital output from the ADCs are collected by a PIC32MX795 32-bit microcontroller (Microchip Technology, Inc.) that has been programmed to implement the PDCP. All digital signals are input to the PIC32 which has been programmed to implement the PDCP.

The physical sensor measurement module was assigned a unique system identifier, 0h40. The same parameters as described for the MES DAQ unit can be configured using the CAPS graphical user interface and the data is packaged in a similar manner.

#### VU Powered Knee Module

The powered knee prosthesis is equipped with a low-level control system with expected impedance parameters virtual stiffness,  $k_k$ , virtual equilibrium angle,  $\theta_{ek}$ , and virtual damping coefficient,  $b_k$ , as inputs so that a knee torque command,  $\tau_k$ , can be created according to equation 1:

$$\tau_k = k_k(\theta_k - \theta_{ek}) + b_k\dot{\theta}_k \quad (1)$$

where the subscript k indicates that the parameters or measurements are associated with the knee,  $\theta_k$  is the knee angle measurement from the prosthesis, and  $\dot{\theta}_k$  is knee velocity. All of the above impedance parameters are sent to the knee from CAPS over the CAN bus.

The VU powered knee prosthesis also contains several intrinsic physical sensors. The physical sensor data include torque applied at the knee motor (in Nm), angular velocity (in degrees/s), and the angle at the knee joint (in degrees).

The VU powered knee module was assigned a unique system identifier, 0h20. The knee impedance parameters are packed into a single CAN message that is sent at a default sampling rate of 40 Hz at 16-bit resolution. The knee physical sensor data are transmitted over the CAN bus with 16 bits of resolution at a frequency of 500 Hz

#### CAN-SPI Bridge Module

The VU powered knee physical sensor data and the knee impedance parameters are transmitted to and from the CAN bus via an SPI-to-CAN bridge module. This module, developed at CBM with the assistance of VU, packages the knee physical sensor information collected via the SPI bus into a CAN message compatible with the PDCP. Conversely, the CAN-SPI bridge unpacks the impedance parameters from the PDCP CAN messages and transmits those parameters to the knee intrinsic control system via SPI. A single PIC32MX795 microcontroller handles all of this data translation.

#### CAN-USB Bridge Module

The CAN-USB bridge module performs a similar function to the CAN-SPI module, but uses a PC-friendly USB protocol as opposed to an SPI protocol. The CAN-USB module is used to unpack CAN messages for transmission via USB to the PC for processing by CAPS. Knee control parameters are sent to this module via USB, packed into a PDCP compatible CAN message, and then transmitted over the CAN bus. This module, developed at CBM, consists of a single PIC32MX795 microcontroller that interprets the data in both directions.

#### Upper Limb System

The use of MES-controlled upper limb prostheses is commonplace at CBM. We continuously strive to improve our control system electronics, data collection methods, pattern recognition algorithms, system robustness, and ease of use for the patient. To improve upon wire management and interoperability for our upper limb systems, we have implemented the PDCP and a CAN bus on them as well. The upper limb control system consists of an MES DAQ module, LTI Boston Elbow, and PC, all connected via CAN bus, with conversion from CAN to analog signals for the Boston Elbow (Figure 3).

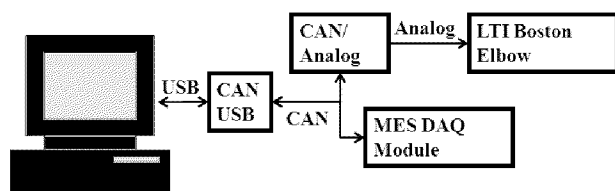


Figure 3: Upper limb distributed control system.

#### MES DAQ Module

The analog front-end of the MES DAQ module for the upper limb system is very different from our lower limb system due to the space constraints encountered with upper limb systems. The most distal level of amputation for an upper limb amputee considered here is wrist disarticulation, which requires mechanical and electronic packaging size to be no larger in diameter than that of a wrist. Using the wrist diameter of the LTI Boston Elbow as a size constraint, CBM implemented a single integrated circuit (IC) designed for biopotential data acquisition. This 8 x 8 mm IC (RHA2216, Intan Technologies) provides 16 fully differential input amplifiers, an internal bandpass filter, a mid-range gain of 200V/V, and an SPI for use with microcontrollers. For our application, the first order high-pass filter was set at 30 Hz and the third-order low-pass filter was set at 452 Hz. The multiplexed output of the IC is sampled by a single-channel, 16-bit ADC (AD7680, Analog Devices) at a rate of 1 kHz. A smaller 16-bit microcontroller (PIC24HJ128GP502, Microchip Technology) was used to collect the digital output of the ADC and transmit the data over the CAN bus according to the PDCP.

As was the case for the lower limb MES DAQ, the upper limb MES DAQ used the identifier 0h50. This allowed channel configuration via CAPS. If both an upper and lower limb MES DAQ module were present in the same system, they would be assigned separate identifier values.

#### LTI Boston Elbow

The upper limb device used in this system was a four degree of freedom (DOF) LTI Boston Elbow (Liberating Technologies, Inc.). This device was set up to use antagonistic analog input voltages in the range of 0–5 V to control each degree of freedom. The Boston Elbow input was modified so that CBM could input analog signals that were output commands from pattern recognition algorithms performed within CAPS. The analog voltage outputs to the Boston Elbow device represent percent of DOF speed, between 0% and 100%, corresponding to a 0–5 V Boston Elbow input.

#### CAN-Analog Bridge Module

This module consists of a microcontroller (PIC32MX795) that translates incoming CAN messages into outgoing analog voltage signals that simulate EMG signals in order to properly control the Boston elbow. A digital-to-analog converter (DAC) (MAX5307, Maxim Integrated Products) provides up to eight channels of simulated EMG to drive the four DOFs. The microcontroller provides the means of translating the control signals from CAPS, in the form of a CAN message, to the 0–5 V analog signals recognized by the Boston Elbow.

## RESULTS

The CAN-based PDCP was implemented in both lower and upper limb systems within our laboratory and used for real-time data acquisition and control of powered prostheses. Bus utilization is the percentage of bus bandwidth used during data transfer; high bus utilization means heavy traffic on the bus. Bus utilization is an important metric to consider for communication system designers: as the bus data transfer rate reaches its theoretical capacity, new information can no longer be transmitted due to lack of available bandwidth. Equation 2 is used to calculate bus utilization (bU):

$$bU = \frac{(nMsg * AvgBit) - (SBy * BStf)}{(Bcap) * \tau} \quad (2)$$

where nMsg is the total number of CAN messages received or transmitted by CAPS, AvgBit is the average number of bits per CAN message with a full data payload of 8 bytes (120.8 bits [4]), SBy is the cumulative number of bytes less than the full payload, BStf is the average number of bits possible per byte including the stuff bit (8.8 bits), Bcap is the CAN bus bit rate capacity of 1Mbit/s, and  $\tau$  is the total elapsed time in seconds.

Bus utilization with just the VU Powered Knee (6%) increased by 24% when the CBM physical sensor module was added to the bus and by an additional 33% when the MES DAQ module was added to the bus (Table I).

In the upper limb system, bus utilization was 61% with the MES DAQ module but increased slightly to 62% when the CAN-Analog bridge module was added (Table II).

Table I: Bus Utilization for Lower Limb System

| Module Added        | # of Channels         | Resolution         | Sample/Update Rate | Bus Utilization |
|---------------------|-----------------------|--------------------|--------------------|-----------------|
| VU Powered Knee     | 3 Inputs<br>3 Outputs | 16 bits<br>16 bits | 500 Hz<br>40 Hz    | 6%              |
| CBM Physical Sensor | 16                    | 12 bits            | 500 Hz             | 30%*            |
| MES DAQ             | 12                    | 16 bits            | 1 kHz              | 73%**           |

\*Includes operating VU Powered Knee Module

\*\*Includes operating VU Powered Knee Module and CBM Physical Sensor Module

Table II: Bus Utilization for Upper Limb System

| Module Added | # of Channels | Resolution | Sample/Update Rate | Bus Utilization |
|--------------|---------------|------------|--------------------|-----------------|
| MES DAQ      | 16            | 16 bits    | 1kHz               | 61%             |
| CAN-Analog   | 1             | 16 bits    | 40 Hz              | 62%*            |

\*Includes operating MES DAQ Module

## DISCUSSION

The CAN bus was a clear choice for this project due to a few major design goals: reduction in the amount of wiring needed for data acquisition and control, high data transfer rate, robust communication in electrically noisy environments, low cost, commercially available hardware, and widely available firmware application programming interface support.

CBM also recognized the effort of almost a decade of research and development of a bus-based communication standard for powered prostheses [5-7]. An industry standard for system communication would facilitate interoperability between devices and may allow the patient greater flexibility in choosing prosthetic components.

The results show that a large majority of the CAN bus may be utilized without data lost due to bus bandwidth restrictions. With an average bus utilization of 73%, a system designer can still transmit more data if needed. In other studies, CBM has utilized up to an estimated 93% of bus capacity before seeing data dropped due to bandwidth limits.

## CONCLUSION

We have shown that the use of the CAN bus with the PDCP is sufficient to support the bandwidth necessary for real-time control and data acquisition of both lower and upper limb powered prostheses in distributed control systems. Our hope is to continue to build upon our knowledge of the CAN bus, to continue to support and assist in the development of the PDCP, and to strive for an industry-accepted communication protocol.

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- [7] S. Banz, E. Mainardi and A. Davalli, "A CAN-based distributed control system for upper limb myoelectric prosthesis," *Proceedings of the 2005 ICSC Congress on Computational Intelligence Methods and Applications*, Istanbul, Turkey, 2005.



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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.             | CONFIRMATION NO.            |
|-----------------------------------------------------------------------|-------------|----------------------|---------------------------------|-----------------------------|
| 13/679,476                                                            | 11/16/2012  | Christopher P. Ricci | 6583-247                        | 2650                        |
| 111285                                                                | 7590        | 10/11/2013           |                                 |                             |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>WILLIAMS, JEFFERY L |                             |
|                                                                       |             |                      | ART UNIT<br>2437                | PAPER NUMBER                |
|                                                                       |             |                      | NOTIFICATION DATE<br>10/11/2013 | DELIVERY MODE<br>ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com

|                              |                                      |                                     |                                                  |
|------------------------------|--------------------------------------|-------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/679,476 | <b>Applicant(s)</b><br>RICCI ET AL. |                                                  |
|                              | <b>Examiner</b><br>JEFFERY WILLIAMS  | <b>Art Unit</b><br>2437             | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 4/20/13.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 5) ☒ Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-20 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 11/16/12 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 4) ☐ Other: \_\_\_\_\_.



**DETAILED ACTION**

Claims 1 – 20 are pending.

Any references to applicant's specification are made by way of applicant's U.S. pre-grant printed patent publication.

The present application is being examined under the pre-AIA first to invent provisions.

***Claim Rejections - 35 USC § 112***

The following is a quotation of 35 U.S.C. 112(b):

(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

**Claims 1 – 20 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.**

Regarding claims 1 – 20, the elements of "...computational module selector...", "...plurality of processing modules ...", "...first processing modlue ...", "...second processing module ...", "...arbitration module...", "...health check module ...", "...displayed object movement module ...", "...media filter ...", "...network selector...",

1 “...diagnostic module...”, “...remote control module...”, “...media controller...”,  
2 “...installation supervisor...”, “...network security module...”, “... network controller...”,  
3 “...unified communications presence reporting module...”, and “...social networking  
4 module...”, are limitations that invokes 35 U.S.C. 112, sixth paragraph. However, the  
5 written description fails to disclose the corresponding structure, material, or acts for the  
6 claimed function. The examiner notes that applicant disclosure only broadly recites  
7 general elements such as software, hardware, or logic (e.g. Specification, par. 374-  
8 376). Means-plus-function recitations, however, must be adequately disclosed in the  
9 form of specific computer algorithms or hardware structural features that transform a  
10 general purpose computing device into a specific purpose computing device.

11 Applicant may:

12 (a) Amend the claim so that the claim limitation will no longer be interpreted  
13 as a limitation under 35 U.S.C. 112, sixth paragraph; or

14 (b) Amend the written description of the specification such that it expressly  
15 recites what structure, material, or acts perform the claimed function without introducing  
16 any new matter (35 U.S.C. 132(a)).

17 If applicant is of the opinion that the written description of the specification  
18 already implicitly or inherently discloses the corresponding structure, material, or acts so  
19 that one of ordinary skill in the art would recognize what structure, material, or acts  
20 perform the claimed function, applicant should clarify the record by either:

21 (a) Amending the written description of the specification such that it expressly  
22 recites the corresponding structure, material, or acts for performing the claimed function

1 and clearly links or associates the structure, material, or acts to the claimed function,  
2 without introducing any new matter (35 U.S.C. 132(a)); or

3 (b) Stating on the record what the corresponding structure, material, or acts,  
4 which are implicitly or inherently set forth in the written description of the specification,  
5 perform the claimed function. For more information, see 37 CFR 1.75(d) and MPEP §§  
6 608.01(o) and 2181.

7  
8 Regarding claim 20, the recitation of "instructions" to perform the "selector" of  
9 claim 1 is indefinite because the "selector" of claim 1 does not inherently represent any  
10 function or method step. Thus, the scope of any "performance" of the selector of claim  
11 1 is indefinite.

12  
13 Regarding claim 21, the recitation of "steps" to perform the "selector" of claim 1 is  
14 indefinite because the "selector" of claim 1 does not inherently represent any function or  
15 method step. Thus, the scope of any "steps" of the selector of claim 1 is indefinite.

16  
17  
18 ***Claim Rejections - 35 USC § 101***

19  
20 35 U.S.C. 101 reads as follows:

21 Whoever invents or discovers any new and useful process, machine, manufacture, or  
22 composition of matter, or any new and useful improvement thereof, may obtain a patent  
23 therefor, subject to the conditions and requirements of this title.  
24  
25

**Claim 20 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.**

Specifically claim 20 is rejected as comprising a method that fails to be tied to a specific machine or cause the transformation of matter into another state or thing. The examiner points out that the recited "steps to perform" the computational module of claim 1 are not explicitly recited as performed by the computational module and, thus, fail to be tied to any specific machine. Furthermore, a consideration of the other weighting factors against eligibility reveals that the claims comprise a mere statement of a general concept that is disembodied. The examiner respectfully suggests that the applicant recite method limitations explicitly comprising the use of hardware.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1 – 5, 8 – 13, 19, and 20 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Yakes et al. (Yakes), US 2003/0158638 A1A1.**

1           Regarding claim 1, as best understood in light of the above rejections, Yakes  
2 discloses:

3           *a computational module selector to select a computational module form among*  
4 *plural computation modules in communication with the computational module selector to*  
5 *perform a selected task, operation, and/or function (e.g. Yakes, fig. 2:14, 16 - CPU).*

6 Herein, Yakes discloses a cpu with a control program, which selects between and  
7 operates a plurality of programmed instructions, i.e. modules.

8  
9           Regarding claim 2, Yakes discloses:

10          *a plurality of processing modules, a first processing module being in an active*  
11 *mode whereby the first processing module is in primary control of at least most vehicle*  
12 *functions and a second processing module being in a standby mode whereby the*  
13 *second processing module is ready to assume primary control of at least most vehicle*  
14 *functions, wherein the first and second processing modules are in wireless*  
15 *communication with one another, and wherein a state of the second processing module*  
16 *is maintained substantially in synchronicity with a state of the first processing module to*  
17 *a enable a stateful failover from the first processing module to the second processing*  
18 *module (e.g. Yakes, fig. 2:14; par. 184, 185). Herein, the CPU may execute at least*  
19 *one module (i.e. primary control). Furthermore, information transfer for at least some of*  
20 *the modules is accomplished wirelessly.*

21  
22          Regarding claim 3, Yakes discloses:

1        *wherein the vehicle comprises an arbitration module to arbitrate hand-off conflicts*  
2        *between duplicated first and second processing modules and wherein the arbitration*  
3        *module selects one of the first and second processing modules to currently possess*  
4        *and/or own a token, the token indicating which processing module is an active*  
5        *processing module and/or which processing module is a standby processing module*  
6        (e.g. Yakes, fig. 2:14, 16 - CPU). CPU's arbitrate the execution of tasks such as by  
7        semaphore.

8  
9        Regarding claim 4, Yakes discloses:

10       *wherein the vehicle further comprises a health check module to determine a*  
11       *corresponding state of health of each of the duplicated first and second processing*  
12       *modules to perform at least one of critical and non-critical tasks, functions, and*  
13       *operations and wherein the health check module performs a check and/or test, in*  
14       *response wherein the health check module performs a check and/or test, in response to*  
15       *an internally generated interrupt and/or request to determine a selected processing*  
16       *module's ability to perform critical and/or non-critical vehicle tasks, functions, and/or*  
17       *operations, assign a score to the selected processing module based on the check*  
18       *and/or test results, and compare the score to one or more thresholds and/or to a score*  
19       *of a different processing module to determine a state of health to determine a state of*  
20       *health of the selected processing module* (e.g. Yakes, par. 336).

21  
22       Regarding claim 5, Yakes discloses:

1        *wherein the vehicle further comprises a displayed object movement module to*  
2        *move displayed objects from a source input/output system to a target input/output*  
3        *system, the source and target input/output systems corresponding to different vehicle*  
4        *occupants and wherein the displayed object movement module selects the and wherein*  
5        *the displayed object movement module selects the target input/output system from*  
6        *among plural input/output systems on board the vehicle based on input from a user of*  
7        *the source input/output system (e.g. Yakes, par. 357).*

8  
9        Regarding claim 8, Yakes discloses:

10       *and wherein the diagnostic module provides the warning and/or error signal to*  
11       *the vehicle occupant and interactively communicates a likely cause of the warning*  
12       *and/or error signal to the occupant and receives a command from the occupant to*  
13       *contact one or more of an emergency service provider, an emergency responder, and a*  
14       *remotely located diagnostic service (e.g. Yakes, par. 91).*

15  
16       Regarding claim 9, Yakes discloses:

17       *and wherein the remote control module is associated with one or more of the*  
18       *vehicle owner, a law enforcement authority, a lender associated with a loan having the*  
19       *vehicle as collateral, and a vehicle manufacturer and wherein the requested vehicle*  
20       *function, is executed or caused to be executed notwithstanding a contrary command*  
21       *from the vehicle operator (e.g. Yakes, par. 281).*

1           Regarding claim 10, Yakes discloses:

2           *and wherein the media controller, in a dependent mode, provides common*  
3           *content synchronously to each of the input/output systems and, in an independent*  
4           *mode, provides different content to different ones of the input/output systems (e.g.*  
5           *Yakes, par. 184).*

6  
7           Regarding claim 11, Yakes discloses:

8           *and wherein the newly installed software and/or hardware and/or other*  
9           *component is one or more of an on-board sensor, a processing module or component*  
10           *thereof, a software application, a circuit board, an expansion module or component*  
11           *thereof, a critical or non-critical device, and a cellular upgrade module (e.g. Yakes, fig.*  
12           *2).*

13  
14           Regarding claim 12, Yakes discloses:

15           *wherein the computational module is selected from among plural computational*  
16           *modules, and wherein the plural computational modules comprise one or more vehicle*  
17           *processing devices and one or more occupant computational devices, the one or more*  
18           *occupant computational devices comprising one or more of a mobile phone, personal*  
19           *digital assistant, tablet computer, and laptop computer (e.g. Yakes, fig. 2; par. 297).*

20  
21           Regarding claim 13, Yakes discloses:



wherein the computational module is selected from among plural computational modules, and wherein the plural computational modules comprise multiple software applications corresponding to different versions, releases, and/or vendors of a common type of software application (e.g. Yakes, fig. 2). The software modules comprise different types of functions (i.e. different versions).

Regarding claims 19 and 20, they comprise essentially similar limitations as claim above, and they are rejected, at least, for the same reasons.

## Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

**See Notice of References Cited.**

A shortened statutory period for reply is set to expire **3** months (not less than 90 days) from the mailing date of this communication.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JEFFERY WILLIAMS whose telephone number is (571)272-7965. The examiner can normally be reached on 8:30-5:00.

Art Unit: 2437

1           If attempts to reach the examiner by telephone are unsuccessful, the examiner's  
2 supervisor, Eleni Shiferaw can be reached on (571)272-3867. The fax phone number  
3 for the organization where this application or proceeding is assigned is 571-273-8300.

4           Information regarding the status of an application may be obtained from the  
5 Patent Application Information Retrieval (PAIR) system. Status information for  
6 published applications may be obtained from either Private PAIR or Public PAIR.  
7 Status information for unpublished applications is available through Private PAIR only.  
8 For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should  
9 you have questions on access to the Private PAIR system, contact the Electronic  
10 Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a  
11 USPTO Customer Service Representative or access to the automated information  
12 system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

13  
14 /Jeffery Williams/  
15 Primary Examiner, Art Unit 2437  
16

|                                   |                                       |  |                                                            |             |
|-----------------------------------|---------------------------------------|--|------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/679,476 |  | Applicant(s)/Patent Under<br>Reexamination<br>RICCI ET AL. |             |
|                                   | Examiner<br>JEFFERY WILLIAMS          |  | Art Unit<br>2437                                           | Page 1 of 1 |

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|   | I | US-                                              |                 |                   |                |
|   | J | US-                                              |                 |                   |                |
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|   | O |                                                  |                 |         |      |                |
|   | P |                                                  |                 |         |      |                |
|   | Q |                                                  |                 |         |      |                |
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\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

## Electronic Acknowledgement Receipt

|                                             |                                       |
|---------------------------------------------|---------------------------------------|
| <b>EFS ID:</b>                              | 17165630                              |
| <b>Application Number:</b>                  | 13828960                              |
| <b>International Application Number:</b>    |                                       |
| <b>Confirmation Number:</b>                 | 1085                                  |
| <b>Title of Invention:</b>                  | ON BOARD VEHICLE NETWORK SECURITY     |
| <b>First Named Inventor/Applicant Name:</b> | Christopher P. Ricci                  |
| <b>Customer Number:</b>                     | 111285                                |
| <b>Filer:</b>                               | Douglas W. Swartz/Robert Roe-Pachirat |
| <b>Filer Authorized By:</b>                 | Douglas W. Swartz                     |
| <b>Attorney Docket Number:</b>              | 6583-247-CIP-5                        |
| <b>Receipt Date:</b>                        | 18-OCT-2013                           |
| <b>Filing Date:</b>                         | 14-MAR-2013                           |
| <b>Time Stamp:</b>                          | 13:13:29                              |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)           |

### Payment information:

|                        |    |
|------------------------|----|
| Submitted with Payment | no |
|------------------------|----|

### File Listing:

| Document Number | Document Description | File Name                 | File Size(Bytes)/<br>Message Digest             | Multi Part /.zip | Pages (if appl.) |
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| 1               |                      | 6583-247-CIP-5_IDS_01.pdf | 363623<br>5b029b401ccb17010bc1f4ae499c82f72448d | yes              | 8                |

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|--------------|-----------------------------------------------------|---------------------------------------------------------|------------------------------------------|-----|----|
|              | Document Description                                |                                                         | Start                                    | End |    |
|              | Transmittal Letter                                  |                                                         | 1                                        | 4   |    |
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| Warnings:    |                                                     |                                                         |                                          |     |    |
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| 2            | Non Patent Literature                               | Cadillac_2013_XTS_Full-Size_Luxury_Sedan.pdf            | 377339                                   | no  | 4  |
|              |                                                     |                                                         | d908f2c931cf26ae47faca108f44d7e5f5e5b916 |     |    |
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|              |                                                     |                                                         | d8fa1b5275c96dcf9a0f99087cd113a42562b0dd |     |    |
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| Information: |                                                     |                                                         |                                          |     |    |
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|              |                                                     |                                                         | 0039078325a8ea4762147171bdb4e77c565a3616 |     |    |
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Ford Ex 1002 Page 333 of 1178

|                              |                       |                                                              |                                           |    |    |
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| Information:                 |                       |                                                              |                                           |    |    |
| Total Files Size (in bytes): |                       |                                                              | 11694702                                  |    |    |

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**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

|                                               |   |                                 |
|-----------------------------------------------|---|---------------------------------|
| In Re the Application of:                     | ) | Group Art Unit: 2432            |
| Christopher Ricci                             | ) | Confirmation No.: 1085          |
| Serial No.: 13/828,960                        | ) | Examiner: Gilberto Barron Jr.   |
| Filed: March 14, 2013                         | ) |                                 |
| Atty. File No.: 6583-247-CIP-5                | ) | <u>INFORMATION DISCLOSURE</u>   |
| Entitled: "On Board Vehicle Network Security" | ) | <u>STATEMENT</u>                |
|                                               | ) | <i>Electronically Submitted</i> |
|                                               | ) |                                 |

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Commissioner:

The references cited on attached Form PTO/SB08 are being called to the attention of the Examiner.

- ☒ Copies of the cited non-patent and/or foreign references are enclosed herewith.
- ☐ Copies of the cited U.S. patents and/or patent applications are enclosed herewith.
- ☒ Copies of the cited U.S. patents/unpublished patent applications/patent application publications are not enclosed in accordance with 37 C.F.R. § 1.98(a).
- ☐ Copies of the cited references are not enclosed, in accordance with 37 C.F.R. § 1.98(d), because the references were cited by or submitted to the U.S. Patent and Trademark Office in prior application Serial No. \_\_\_\_\_ filed \_\_\_\_\_, which is relied upon for an earlier filing date under 35 U.S.C. § 120.
- ☐ To the best of applicants' belief, the pertinence of the foreign-language references is believed to be summarized in the attached English abstracts and/or in the figures, although applicants do not necessarily vouch for the accuracy of the translation.
- ☒ Examiner's attention is drawn to the following related applications:
- Serial No. 13/679,459 filed 11/16/12 (Attorney's Ref. No. 6583-228)
  - Serial No. 13/679,857 filed 11/16/12 (Attorney's Ref. No. 6583-231)
  - Serial No. 13/679,878 filed 11/16/12 (Attorney's Ref. No. 6583-232)
  - Serial No. 13/679,875 filed 11/16/12 (Attorney's Ref. No. 6583-233)
  - Serial No. 13/679,676 filed 11/16/12 (Attorney's Ref. no. 6583-234)
  - Serial No. 13/679,441 filed 11/16/12 (Attorney's Ref. No. 6583-244)
  - Serial No. 13/679,864 filed 11/16/12 (Attorney's Ref. No. 6583-245)



- Serial No. 13/679,476 filed 11/16/12 (Attorney's Ref. No. 6583-247)
- Serial No. 13/828,513 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP)
- Serial No. 13/828,651 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-2)
- Serial No. 13/828,758 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-3)
- Serial No. 13/828,860 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-4)
- Serial No. 13/829,058 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-6)
- Serial No. 13/829,157 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-7)
- Serial No. 13/829,505 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-8)
- Serial No. 13/829,605 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-9)
- Serial No. 13/829,718 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-10)
- Serial No. 13/829,799 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-11)
- Serial No. 13/829,862 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-12)
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- Serial No. 13/830,133 filed 03/14/13 (Attorney's Ref. No. 6583-247-CIP-15)
- Serial No. 13/840,240 filed 03/15/13 (Attorney's Ref. No. 6583-314)
- Serial No. 13/678,773 filed 11/16/12 (Attorney's Ref. No. 6583-315)
- Serial No. 13/679,887 filed 11/16/12 (Attorney's Ref. No. 6583-316)

☐ Other: \_\_\_\_\_

Submission of the above information is not intended as an admission that any item is citable under the statutes or rules to support a rejection, that any item disclosed represents analogous art, or that those skilled in the art would refer to or recognize the pertinence of any reference without the benefit of hindsight, nor should an inference be drawn as to the pertinence of the references based on the order in which they are presented. Submission of this statement should not be taken as an indication that a search has been conducted, or that no better art exists.

It is respectfully requested that the cited information be expressly considered during the prosecution of this application and the references made of record therein.

## FEES

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | <p><b>37 CFR 1.97(b):</b> No fee is believed due in connection with this submission, because the information disclosure statement submitted herewith is satisfied by one of the following conditions ("X" indicates satisfaction):</p> <p><input type="checkbox"/> Within three months of the filing date of a national application other than a continued prosecution application under 37 CFR 1.53(d), or</p> <p><input type="checkbox"/> Within three months of the date of entry of the national stage as set forth in § 1.491 in an international application, or</p> <p><input checked="" type="checkbox"/> Before the mailing date of a first Office Action on the merits, or</p> <p><input type="checkbox"/> Before the mailing of a first Office action after the filing of a request for continued examination under 37 CFR 1.114.</p> <p>Although no fee is believed due, if any fee is deemed due in connection with this submission, please charge such fee to Deposit Account 19-1970.</p>                                                                                                                                        |
| <input type="checkbox"/>            | <p><b>37 CFR 1.97(c):</b> The information disclosure statement transmitted herewith is being filed after all the above conditions (37 CFR 1.97(b)), but before the mailing date of any one of the following conditions:</p> <p style="margin-left: 40px;">(1) a final action under 37 C.F.R. 1.113, or</p> <p style="margin-left: 40px;">(2) a notice of allowance under 37 C.F.R. 1.311, or</p> <p style="margin-left: 40px;">(3) an action that otherwise closes prosecution in the application.</p> <p>This Information Disclosure Statement is accompanied by:</p> <p><input type="checkbox"/> A Certification (below) as specified by 37 C.F.R. 1.97(e). Although no fee is believed due, if any fee is deemed due in connection with this submission, please charge such fee to Deposit Account 19-1970.</p> <p style="text-align: center;">OR</p> <p><input type="checkbox"/> Please charge Deposit Account 19-1970 in the amount of \$180.00 for the fee set forth in 37 C.F.R. 1.17(p) for submission of an information disclosure statement. Please credit any overpayment or charge any underpayment to Deposit Account 19-1970.</p> |
| <input type="checkbox"/>            | <p><b>37 CFR 1.97(d):</b> This Information Disclosure Statement is being submitted after the period specified in 37 CFR 1.97(c).</p> <p><input type="checkbox"/> This information Disclosure Statement includes a Certification (below) as specified by 37 C.F.R. 1.97(e)</p> <p style="text-align: center;">AND</p> <p><input type="checkbox"/> Applicants hereby requests consideration of the reference(s) disclosed herein. Please charge Deposit Account 19-1970 in the amount of \$180.00 under 37 C.F.R. 1.17(p). Please credit any overpayment or charge any underpayment to Deposit Account 19-1970. Election to pay the fee should not be taken as an indication that applicant(s) cannot execute a certification.</p>                                                                                                                                                                                                                                                                                                                                                                                                                |

**Certification (37 C.F.R. 1.97(e))**  
(Applicable only if checked)

☐ The undersigned certifies that:

☐ Each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement. 37 C.F.R. 1.97(e)(1).

☐ A copy of the communication from the foreign patent office is enclosed.

OR

☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the undersigned after making reasonable inquiry, no item of information contained in this Information Disclosure Statement was known to any individual designated in 37 C.F.R. 1.56(c) more than three months prior to the filing of this statement. 37 C.F.R. 1.97(e)(2).

Respectfully submitted,

SHERIDAN ROSS P.C.

By: Douglas W. Swartz/  
Douglas W. Swartz  
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Date: October 17, 2013

|                                                                                                                                          |   |    |   |                          |                   |
|------------------------------------------------------------------------------------------------------------------------------------------|---|----|---|--------------------------|-------------------|
| Substitute for form 1449/PTO<br><br><b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><i>(Use as many sheets as necessary)</i> |   |    |   | <b>Complete if Known</b> |                   |
|                                                                                                                                          |   |    |   | Application Number       | 13/828,960        |
|                                                                                                                                          |   |    |   | Filing Date              | March 14, 2013    |
|                                                                                                                                          |   |    |   | First Named Inventor     | Christopher Ricci |
|                                                                                                                                          |   |    |   | Art Unit                 | 2496              |
|                                                                                                                                          |   |    |   | Examiner Name            | Amir Mehrmanesh   |
| Sheet                                                                                                                                    | 1 | of | 3 | Attorney Docket Number   | 6583-247-CIP-5    |

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| Examiner Initials*    | Cite No. <sup>1</sup> | Document Number<br>Number-kind Code <sup>2</sup> (if known) | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, Columns, Lines, Where<br>Relevant Passages or Relevant<br>Figures Appear |
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|                    |  |                 |  |
|--------------------|--|-----------------|--|
| Examiner Signature |  | Date Considered |  |
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|                                                                                                                                          |   |    |   | Application Number       | 13/828,960        |
|                                                                                                                                          |   |    |   | Filing Date              | March 14, 2013    |
|                                                                                                                                          |   |    |   | First Named Inventor     | Christopher Ricci |
|                                                                                                                                          |   |    |   | Art Unit                 | 2496              |
|                                                                                                                                          |   |    |   | Examiner Name            | Amir Mehrmanesh   |
| Sheet                                                                                                                                    | 2 | of | 3 | Attorney Docket Number   | 6583-247-CIP-5    |

|  |    |              |            |                    |  |
|--|----|--------------|------------|--------------------|--|
|  | 33 | 2014/0088798 | 03/27/2014 | Himmelstein        |  |
|  | 34 | 2014/0120829 | 05/01/2014 | Bhamidipati et al. |  |
|  | 35 | 2014/0125802 | 05/08/2014 | Beckert et al.     |  |

| FOREIGN PATENT DOCUMENTS |                       |                                                                                                                |                                |                                                 |                                                                           |                |
|--------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------|---------------------------------------------------------------------------|----------------|
| Examiner Initials*       | Cite No. <sup>1</sup> | Foreign Patent Document<br>Country Code <sup>3</sup> ; Number <sup>4</sup> ; Kind Code <sup>5</sup> (if known) | Publication Date<br>MM-DD-YYYY | Name of Patentee or Applicant of Cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear | T <sup>6</sup> |

| NON-PATENT LITERATURE DOCUMENTS |                       |                                                                                                                                                                                                                                                                                                                                                                                   |
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|                                 | 36                    | "A8: Technology as standard," Screen-shots from Audi.co.uk, 2014 [retrieved on 4/16/2014], 1 page. Retrieved from: <a href="http://www.audi.co.uk/new-cars/a8/a8/technology-as-standard/mmi-touch.html">www.audi.co.uk/new-cars/a8/a8/technology-as-standard/mmi-touch.html</a>                                                                                                   |
|                                 | 37                    | "Audi A8 MMI Touch," Audi of America, Jan. 7, 2011, [retrieved on 4/16/2014], 2 pages. Retrieved from: <a href="http://www.youtube.com/watch?v=O2nZ-WHo9IA">www.youtube.com/watch?v=O2nZ-WHo9IA</a>                                                                                                                                                                               |
|                                 | 38                    | DIAZ, "Audi New MMI Touch Input System Makes Perfect Sense," Gizmodo.com, Dec. 1, 2009 [retrieved on 4/16/2014], 12 pages. Retrieved from: <a href="http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense">http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense</a>                                                            |
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|                                 | 40                    | International Preliminary Report on Patentability for International (PCT) Patent Application No. PCT/US2012/065510, mailed May 30, 2014 (Attorney's Ref. No. 6583-244-PCT) 14 pages                                                                                                                                                                                               |
|                                 | 41                    | International Preliminary Report on Patentability for International (PCT) Patent Application No. PCT/US2012/065613, mailed May 30, 2014 (Attorney's Ref. No. 6583-247-PCT) 8 pages                                                                                                                                                                                                |
|                                 | 42                    | International Search Report and Written Opinion for International (PCT) Patent Application No. PCT/US14/19209, mailed Apr. 25, 2014 (Attorney's Ref. No. 6583-247-CIP-13-PCT)                                                                                                                                                                                                     |
|                                 | 43                    | Official Action for U.S. Patent Application No. 13/679,857, mailed Jun. 27, 2014 (Attorney's Ref. No. 6583-231) 5 pages                                                                                                                                                                                                                                                           |
|                                 | 44                    | Official Action for U.S. Patent Application No. 13/679,875, mailed Apr. 07, 2014 (Attorney's Ref. No. 6583-233) 7 pages RESTRICTION REQUIREMENT                                                                                                                                                                                                                                   |
|                                 | 45                    | Official Action for U.S. Patent Application No. 13/679,441, mailed Jan. 16, 2014 (Attorney's Ref. No. 6583-244) 6 pages                                                                                                                                                                                                                                                           |

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|                                                                                                                                          |   |    |   | Application Number       | 13/828,960        |
|                                                                                                                                          |   |    |   | Filing Date              | March 14, 2013    |
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|                                                                                                                                          |   |    |   | Art Unit                 | 2496              |
|                                                                                                                                          |   |    |   | Examiner Name            | Amir Mehrmanesh   |
| Sheet                                                                                                                                    | 3 | of | 3 | Attorney Docket Number   | 6583-247-CIP-5    |

|  |    |                                                                                                                                |
|--|----|--------------------------------------------------------------------------------------------------------------------------------|
|  | 46 | Official Action for U.S. Patent Application No. 13/679,441, mailed May 09, 2014 (Attorney's Ref. No. 6583-244) 6 pages         |
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|  | 49 | Official Action for U.S. Patent Application No. 13/829,718, mailed Apr. 10, 2014 (Attorney's Ref. No. 6583-247-CIP-10) 7 pages |
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|  | 51 | Official Action for U.S. Patent Application No. 13/678,773, mailed Dec. 30, 2013 (Attorney's Ref. No. 6583-315) 9 pages        |
|  | 52 | Notice of Allowance for U.S. Patent Application No. 13/678,773, mailed Apr. 02, 2014 (Attorney's Ref. No. 6583-315) 5 pages    |
|  | 53 | Official Action for U.S. Patent Application No. 13/679,887, mailed Jun. 30, 2014 (Attorney's Ref. No. 6583-316) 6 pages        |

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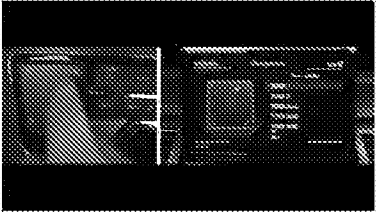
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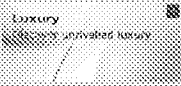
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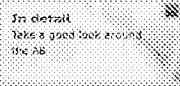
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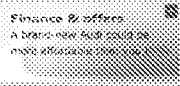
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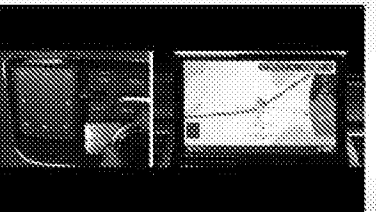
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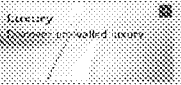
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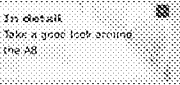
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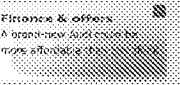
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Matthew Hong via Google+ 2 years ago

I knew multitouch technology was coming to cars. They did it right by splitting the input from display

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Andre McPhail 2 years ago

Looks cool but it really needs voice commands.

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ibrahim ertaş via Google+ 1 year ago

Audi A8



agm11009 3 years ago

Damn I want a new Audi lol I have a 2002 a6 nd I can't wait to buy my new A5 or S5

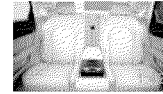


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\$300,000 car.. Most not worth it if u buy it in singapore..



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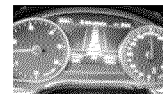
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## Audi New MMI Touch Input System Makes Perfect Sense (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>)



Jesus Diaz (<http://jesusdiaz.kinja.com>)

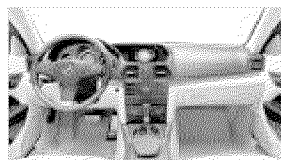
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Filed to: [CARS \(/TAG/CARS\)](#) 12/01/09 2:00pm (<http://gizmodo.com/5416342/audi->  
(<http://jesusdiaz.kinja.com>)



At last, someone in the auto industry gets it *right*. Instead of using awkward wheels or joysticks, like the [Mercedes's MyCommand](http://gizmodo.com/5095486/mercedes-web+connected-mycomand-takes-on-bmw-idrive) (<http://gizmodo.com/5095486/mercedes-web+connected-mycomand-takes-on-bmw-idrive>) or the [BMW iDrive](http://gizmodo.com/5070122/bmw-idrive-40-remixes-xbox-360-and-ipod-into-simpler-control-system) (<http://gizmodo.com/5070122/bmw-idrive-40-remixes-xbox-360-and-ipod-into-simpler-control-system>), the new Audi MMI touch system just uses a touchpad for some direct finger-drawing action.

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While other systems require the driver to focus away from the road—either by selecting letters from endless menus or on a touchscreen keyboard—the new Audi MMI touch allows for *blind typing*: The driver just *writes* naturally with a finger on the touchpad. The pad is strategically located next to the steering wheel and in front of the gear shift, so the writing can be done in a comfortable position, without having to focus on any screen.

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The 2011 Audi A8, unveiled last night in Miami, is loaded with gadgets — everything from handwriting recognition, terrain-predicting transmission... [Read...](#) (<http://jalopnik.com/5416115/2011-audi-a8-go-go-gadget-sedan>)

The MMI system—which recognizes Latin, Cyrillic, Chinese, Cantonese, Japanese, and Korean characters—also has a rotary pushbutton for old school people, as well as voice control, but only the touch system allows the driver to enter commands while talking on the cellphone or playing music. You gotta love those Audi smartypants. [[Autospies \(http://autospies.com/news/2011-Audi-A8-MMI-Touch-Changing-The-Way-We-Use-Navigation-Systems-50086/\)](http://autospies.com/news/2011-Audi-A8-MMI-Touch-Changing-The-Way-We-Use-Navigation-Systems-50086/) and [Jalopnik \(http://jalopnik.com/5416115/2011-audi-a8-go+go-gadget-sedan\)](http://jalopnik.com/5416115/2011-audi-a8-go+go-gadget-sedan)]

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12/01/09 2:02pm

**Wheema** started this thread



**Wheema** (<http://wheema.kinja.com>) ▸ Jesus Diaz

12/01/09 2:02pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>)  
(<http://wheema.kinja.com>)

sound bloody dangerous - I really don't think this will be usable whilst driving

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12/01/09 2:04pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>)  
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@[Wheema](#): Did you read the article at all?

★ [Reply \(/posts/490804366/reply\)](#)



**OCEntertainment** (<http://oцентertainment.kinja.com>) ▸ BergenCountyJC is rocking i...

12/01/09 2:11pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>)  
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@[BergenCountyJC](#) can't beat MW2: While I see the point, I can still see this being just as dangerous. I'm a little paranoid about mistyped data. So I would be constantly checking to make sure it registered an "s" correctly, and not as a "5". I might eventually get used to it, but not after at least some period of checking it to make sure it's good enough, during which my driving would be more distracted.

Buttons are simple. You know when you've pressed them most of the time. As soon as you start getting into character recognition touchy-screens, you run the risk of unnecessary complexity.

It's not without its pros, but it could also be its own kind of dangerous.

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**Wheema** (<http://wheema.kinja.com>) ▸ BergenCountyJC is rocking in the free world

12/01/09 2:16pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>)

(<http://wheema.kinja.com>)

@BergenCountyJC err yes it still does 2 major things which make it dangerous:

1. It takes a hand off the wheel for an extended period of time reducing control.
2. It is something else to concentrate on whilst driving a 2 ton speeding lump of metal. I'm sure eventually it would be usable with only a little distraction but at least for a few weeks it you will still have a significant amount of your concentration to get it to do anything.

To me a proper voice command system is always a better choice than this.

★ [Reply \(/posts/490804399/reply\)](#)



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12/01/09 2:40pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>)

(<http://bergencountyjc.kinja.com>)

@Wheema: Point made. I would think that an important feature as was mentioned along with the scribbling of letters and numbers, would be a voice repeating any characters that might be interchanged with another such as S & 5.

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12/01/09 2:05pm

Noobs-R-Us started this thread



**Noobs-R-Us** (<http://noobs-r-us-old.kinja.com>) ▸ Jesus Diaz

12/01/09 2:05pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>)

(<http://noobs-r-us-old.kinja.com>)

Why don't they just use a touchscreen? this is just bloody stupid. Have they not gotten the memo from Steve Jobs?

★ [Reply \(/posts/490804372/reply\)](#)



**JustinRoss** (<http://justinross.kinja.com>) ▸ Noobs-R-Us

12/01/09 2:11pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>)

(<http://justinross.kinja.com>)

@Noobs-R-Us: Probably so they don't have to worry about what's on the screen.

That's the problem with a lot of today's in-car systems; you have to look at a screen to see what's going on, which isn't safe when it's the driver doing the looking.

★ [Reply \(/posts/490804385/reply\)](#)



**Noobs-R-US** (<http://noobs-r-us-old.kinja.com>) ▸ JustinRoss

12/01/09 2:14pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect>

(<http://noobs-r-us-old.kinja.com>)

@rootyb: But that's alot better than using a joystick or buttons or a touch pad. The best and easiest solution is to use a touch screen.

★ [Reply \(/posts/490804397/reply\)](#)



**Account-HowToDelete? NotToConvert** (<http://account-howtodele...>)

12/01/09 2:23pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input->

(<http://account-howtodelete- nottocon-old.kinja.com>)

@Noobs-R-Us: Try blind typing on the iPhone or any touch screen for that mater. Touch screens requires your attention, which is suposed to be on road

★ [Reply \(/posts/490804414/reply\)](#)



**Noobs-R-US** (<http://noobs-r-us-old.kinja.com>) ▸ Account-HowToDelete?\_NotToConvert

12/01/09 2:30pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfec>

(<http://noobs-r-us-old.kinja.com>)

@rrwack: Look, it's very simple. You use speech recognition for anything that requires typing and a touchscreen for everything else. See how simple that is? The best is when you combine the two. For example, to look up a street address, you say it. If the computer is confused it can show a list of possible choices, you can either select the correct one by touching it or have the compter read out the choices for you to pick.

Not only that but this system still requires you to remove your hand from the wheel.

★ [Reply \(/posts/490804420/reply\)](#)

Show 18 more replies in this thread (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense?comment=17217148#comments>)

12/02/09 4:50am

**DarianHamjam** started this thread



**DarianHamjam** (<http://darianhamjam-old.kinja.com>) ▸ Jesus Diaz

12/02/09 4:50am (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-pe>

(<http://darianhamjam-old.kinja.com>)

car companies need to get their head out of their ass. Theres this thing that been popular for awhile now. Its called a captive multitouch screen.

★ [Reply \(/posts/490804565/reply\)](#)



**Ninety-9** (<http://ninety-9.kinja.com>) ▸ DarianHamjam

12/02/09 2:34pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sens>)  
(<http://ninety-9.kinja.com>)

@DarianHamjam: The problem with any sort of touch interface, including multitouch is that you have to look at the screen. The key is making something that's intuitive, single-hand operational, and provides feedback without changing eye focus.

What has me concerned is what is the point of inputting characters??? Are car companies seriously looking into a way to integrate texting? I mean, I can't think of any reason I would need to command my car with letters, so I'm assuming that this is either designed in calling someone who's name starts with 'O' or there's some sort of plan to connect your Twitter account with your Audi?

In other news, I'm going to encrypt my radio settings in traditional Chinese so that no one can dare change it.

★ [Reply \(/posts/490804576/reply\)](#)



**mrbofus** (<http://mrbofus.kinja.com>) ▸ DarianHamjam

12/02/09 6:52pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sens>)  
(<http://mrbofus.kinja.com>)

@DarianHamjam: what's a captive multitouch screen?

★ [Reply \(/posts/490804583/reply\)](#)

12/01/09 2:30pm

Clancycoop started this thread



**Clancycoop** (<http://clancycoop-old.kinja.com>) ▸ Jesus Diaz

12/01/09 2:30pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfec>)  
(<http://clancycoop-old.kinja.com>)

It is amazing how far behind many luxury car companies' interfaces are, despite the amount of work and research that goes into the rest of the vehicle. It is good to see a solid step in the right direction.

I believe that advanced car tech has yet to hit a point where it is truly accessible to everyone. Dealers still charge egregious prices for simple tech like bluetooth integration and 3.5mm jacks.

★ [Reply \(/posts/490804424/reply\)](#)



**The5thElephant** (<http://the5thelephant.kinja.com>) ▸ Clancycoop

12/01/09 9:26pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfec>)  
(<http://the5thelephant.kinja.com>)

@[Clancycoop](#): I completely agree. I feel like I'm stepping into the 90s every time I get in a car.

They should at least use a laptop style trackpad for navigation in cars with those awfully slow touchscreens. Not to mention how badly the interfaces are designed, both functionally and aesthetically.

★ [Reply \(/posts/490804538/reply\)](#)

12/01/09 4:16pm

Cosmo hears it started this thread



[Cosmo hears it \(http://cosmo22.kinja.com\)](#) ▸ Jesus Diaz

12/01/09 4:16pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sens>)

(<http://cosmo22.kinja.com>)

My A6's buttons smudge like crazy, this will take it to another level but I'll still buy it.

★ [Reply \(/posts/490804506/reply\)](#)



[cruzer555 \(http://cruzer555-old.kinja.com\)](#) ▸ Cosmo hears it

12/01/09 6:23pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect>)

(<http://cruzer555-old.kinja.com>)

@[Cosmo hears it](#): Too bad it's only on the a8 for now...

★ [Reply \(/posts/490804520/reply\)](#)



[Cosmo hears it \(http://cosmo22.kinja.com\)](#) ▸ cruzer555

12/02/09 1:46am (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sens>)

(<http://cosmo22.kinja.com>)

@[cruzer555](#): Like all new features, it shows up on the flagship model first. Can't really afford an A8 atm, maybe in a few years it'll show up on the other models or I'll make some \$ LOL

★ [Reply \(/posts/490804549/reply\)](#)



[cruzer555 \(http://cruzer555-old.kinja.com\)](#) ▸ Cosmo hears it

12/02/09 3:10pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect>)

(<http://cruzer555-old.kinja.com>)

@[Cosmo hears it](#): Yeah, I know it... The a8 costs big bucks. Maybe an s4? :)

★ [Reply \(/posts/490804578/reply\)](#)



[Cosmo hears it \(http://cosmo22.kinja.com\)](#) ▸ cruzer555

12/02/09 9:48pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sen>)

(<http://cosmo22.kinja.com>)

@[cruzer555](#): Nah, I could never get myself to buy an S4...it's more expensive than an A4, but still not an RS4.

★ [Reply \(/posts/490804585/reply\)](#)



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Show 1 more replies in this thread (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense?comment=17222720#comments>)

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12/01/09 4:43pm

Furgs started this thread

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**Furgs** (<http://furgs-old.kinja.com>) ▸ Jesus Diaz

12/01/09 4:43pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense?comment=17222720#comments>)  
(<http://furgs-old.kinja.com>)

Too bad their inboard navigation system is shit. Reference Top Gear.

★ [Reply \(/posts/490804511/reply\)](/posts/490804511/reply)

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**cruzer555** (<http://cruzer555-old.kinja.com>) ▸ Furgs

12/01/09 6:24pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense?comment=17222720#comments>)  
(<http://cruzer555-old.kinja.com>)

@**Furgs**: It's just as good as any other built in one. It's not like you can get a garmin flush mounted in your dashboard...

★ [Reply \(/posts/490804521/reply\)](/posts/490804521/reply)

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**ernie\_** ([http://ernie\\_.kinja.com](http://ernie_.kinja.com)) ▸ Furgs

12/01/09 7:57pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense?comment=17222720#comments>)  
([http://ernie\\_.kinja.com](http://ernie_.kinja.com))

@**Furgs**: Always makes me wonder why companies like Microsoft, Google, or Apple doesn't help design the internals of a car's navigation/media system. After all they're the pros at it!

EDIT: Just remembered something about Apple designing the interior of a Jaguar a while back.

EDIT2: Oh yeah... and SYNC from Microsoft... okay never mind my point is moot.

★ [Reply \(/posts/490804534/reply\)](/posts/490804534/reply)

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**Cosmo hears it** (<http://cosmo22.kinja.com>) ▸ ernie\_

12/02/09 1:48am (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense?comment=17222720#comments>)  
(<http://cosmo22.kinja.com>)

@**ipodrulz**: VW was working with Google on a Google Earth Street view for their cars. Giz reported it a year ago

★ [Reply \(/posts/490804552/reply\)](/posts/490804552/reply)

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**Cosmo hears it** (<http://cosmo22.kinja.com>) ▸ Furgs

12/02/09 1:48am (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense?comment=17222720#comments>)  
(<http://cosmo22.kinja.com>)

@**Furgs**: It;s actually really good, the Lambo just didn't have a map of Romania.

12/01/09 2:16pm

★ [Reply \(/posts/490804554/reply\)](#)  
**MinorityBabble** started this thread



**MinorityBabble** (<http://thisaintsweettea.kinja.com>) ▶ Jesus Diaz

12/01/09 2:16pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfe>)  
 (<http://thisaintsweettea.kinja.com>)

Voice recognition would seem like an easier, safer option than drawing letters on a touch pad. Sure, you have to stop talking to the people in the car for a moment, or, you might have to turn down the music for a moment, but really... Wouldn't the passenger (unless it's a woman! Am-I-right, guys?) be the person to take care of inputting whatever it is you need to find/lookup/etc.. anyway?

This seems just as silly as the others to me.

★ [Reply \(/posts/490804401/reply\)](#)



**chareverie** (<http://chareverie-old.kinja.com>) ▶ MinorityBabble

12/01/09 3:33pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect>)  
 (<http://chareverie-old.kinja.com>)

@Voyou Charmant: I agree, voice recognition would seem easier, especially since it's improved a lot.

★ [Reply \(/posts/490804492/reply\)](#)



**porsche931** (<http://porsche931-old.kinja.com>) ▶ MinorityBabble

12/01/09 3:39pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-pe>)  
 (<http://porsche931-old.kinja.com>)

@Voyou Charmant: In my car we would be completely screwed, if i'm driving (i'm left handed) and the wife is the passenger (right handed) how could either of us type comfortably

★ [Reply \(/posts/490804495/reply\)](#)



**dopefish** (<http://dopefish-old.kinja.com>) ▶ MinorityBabble

12/01/09 9:30pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-s>)  
 (<http://dopefish-old.kinja.com>)

@Voyou Charmant: Voice recognition has been standard with the Audi MMI for a couple years now. The touch is just an additional feature which is why it has come under so much attention.

★ [Reply \(/posts/490804540/reply\)](#)

12/01/09 4:08pm

**jimothy** started this thread



**jimothy** (<http://jimothy.kinja.com>) ▶ Jesus Diaz

12/01/09 4:08pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>)  
 (<http://jimothy.kinja.com>)

Well that's just dandy, but really, who speaks Latin anymore? Geez, a little market research, Audi!

★ [Reply \(/posts/490804504/reply\)](#)



**McFucklestein** (<http://mcfucklestein-old.kinja.com>) ▸ jimothy

12/01/09 4:48pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-per>

(<http://mcfucklestein-old.kinja.com>)

@[jimothy](#): Do you 'speak' on a touch pad? He meant the Latin character alphabets used in English, Spanish, German, etc., as opposed to the Cyrillic alphabets used in Russian, Belarusian, and Ukrainian, as well as the other alphabets mentioned.

★ [Reply \(/posts/490804512/reply\)](#)



**jimothy** (<http://jimothy.kinja.com>) ▸ McFucklestein

12/01/09 9:02pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>

(<http://jimothy.kinja.com>)

@[TJ](#): I know. I was playing dumb. Apparently, too convincingly.

★ [Reply \(/posts/490804536/reply\)](#)



**McFucklestein** (<http://mcfucklestein-old.kinja.com>) ▸ jimothy

12/01/09 11:12pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-per>

(<http://mcfucklestein-old.kinja.com>)

@[jimothy](#): Yeah, I just saw all of the other posts that said the same thing. My bad.

★ [Reply \(/posts/490804547/reply\)](#)

12/01/09 5:08pm

**The Chad** started this thread



**The Chad** (<http://thetaxigalt.kinja.com>) ▸ Jesus Diaz

12/01/09 5:08pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sei>

(<http://thetaxigalt.kinja.com>)

no lefty love?

★ [Reply \(/posts/490804518/reply\)](#)



**donwonton** (<http://donwonton-old.kinja.com>) ▸ The Chad

12/01/09 6:57pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfec>

(<http://donwonton-old.kinja.com>)

@[The Chad](#): It must be tough driving a manual.

★ [Reply \(/posts/490804528/reply\)](#)



**ernie\_** ([http://erniek\\_.kinja.com](http://erniek_.kinja.com)) ▸ donwonton

([http://erniek\\_.kinja.com](http://erniek_.kinja.com)) 12/01/09 7:56pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense>)

@[donwonton](#): Whoa! That problem never dawned on me! All lefties should just move across the pond!

★ [Reply \(/posts/490804533/reply\)](#)



[The Chad \(http://thetaxigalt.kinja.com\)](#) ▶ donwonton

12/01/09 9:42pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sei>)  
(<http://thetaxigalt.kinja.com>)

@[donwonton](#): I love driving my manual. But I don't have to write out "second gear" to shift.

★ [Reply \(/posts/490804543/reply\)](#)



[donwonton \(http://donwonton-old.kinja.com\)](#) ▶ ernie\_

12/01/09 10:17pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfe>)  
(<http://donwonton-old.kinja.com>)

@[ipodrulz](#): He lefty.

★ [Reply \(/posts/490804545/reply\)](#)

12/01/09 2:39pm

**Rick Lyon** started this thread



[Rick Lyon \(http://rick-lyon-old.kinja.com\)](#) ▶ Jesus Diaz

12/01/09 2:39pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-s>)  
(<http://rick-lyon-old.kinja.com>)

"The MMI system—which recognizes Latin, Cyrillic, Chinese, Cantonese, Japanese, and Korean characters—" What a shame that it doesn't recognize English or German.

★ [Reply \(/posts/490804434/reply\)](#)



[Iowa11 \(http://iowa11.kinja.com\)](#) ▶ Rick Lyon

12/01/09 2:52pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-sense?>)  
(<http://iowa11.kinja.com>)

@[Rick Lyon](#): Who speaks English anymore?

★ [Reply \(/posts/490804446/reply\)](#)



[Sibuna \(http://sibuna-old.kinja.com\)](#) ▶ Rick Lyon

12/01/09 3:07pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-perfect-ser>)  
(<http://sibuna-old.kinja.com>)

@[Rick Lyon](#): We = Latin characters :D

★ [Reply \(/posts/490804467/reply\)](#)



[McFucklestein \(http://mcfucklestein-old.kinja.com\)](#) ▶ Rick Lyon

12/01/09 4:58pm (<http://gizmodo.com/5416342/audi-new-mmi-touch-input-system-makes-per>)

(<http://mcfucklestein-old.kinja.com>)

@[Rick Lyon](#): Screw English, why doesn't it recognize American?

★ [Reply \(/posts/490804516/reply\)](#)

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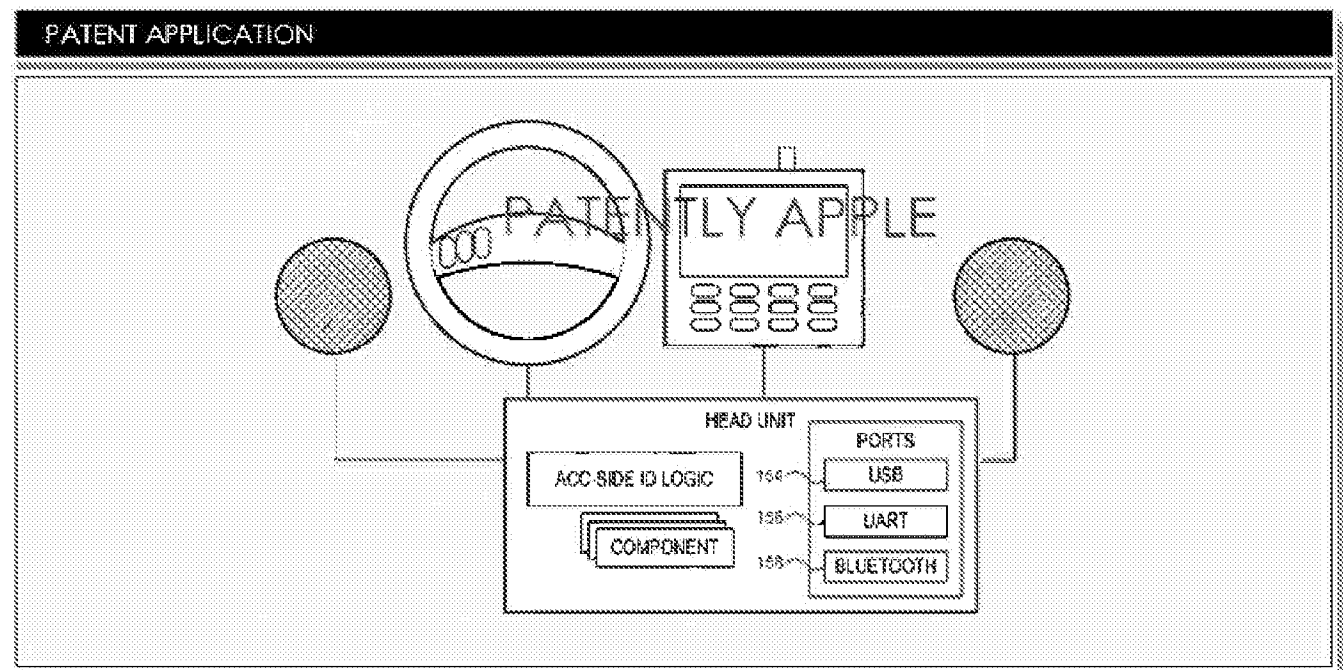
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December 12, 2013

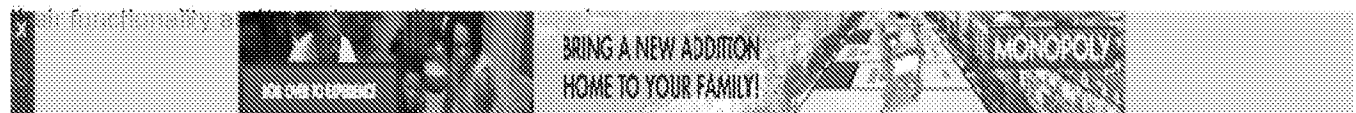
### Apple Invents In-Vehicle Holistic ID for "iOS in the Car"



On December 12, 2013, the US Patent & Trademark Office published a patent application from Apple that reveals a new aspect to their forthcoming "iOS in the Car" product that will be supported by more than 18 car companies by the end of 2014. The invention generally relates to providing an in-vehicle infotainment system with a logical holistic ID methodology for coordinating multiple services with multiple devices automatically and seamlessly throughout the vehicle.

## Apple's Patent Background

Portable electronic devices, such as smart phones, tablet computers, media players, and the like, have become ubiquitous. Various accessories have been created to interoperate with portable electronic devices to extend



**Ford Ex. 1002 Page 358 of 1178**

Examples of accessories include chargers, speaker docks, in-vehicle docks that provide options for controlling the portable device using the vehicle's console, workout equipment, health monitoring accessories (e.g., heart rate, blood pressure or glucose meters), and so on. Accessories can be designed to interoperate with multiple portable electronic devices that may differ in their form factor and capabilities (e.g., processing power; firmware version; battery life, presence or absence of cameras, microphones, or other components). In addition to variability in "internal" components, accessories can also incorporate a variety of communication interfaces for purposes of communicating with portable devices.

To provide a reliably pleasant experience for a user operating a portable device in conjunction with an accessory, it can be desirable to verify that the accessory will operate correctly with a particular portable device. However, the sheer variety of possible accessories, as well the number of different portable devices to which a particular accessory can be connected and the number of possible communication interfaces, makes such verification difficult.

## Apple Invents Holistic ID of an Electronic Device

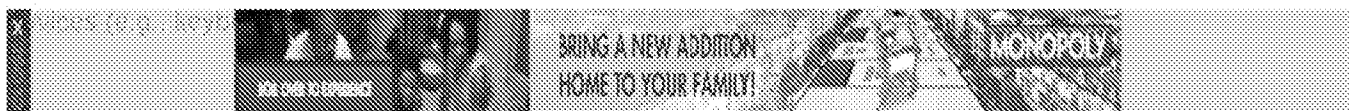
Apple's invention generally relates to communicating data between electronic devices and in particular to holistic identification of one device to another.

Certain embodiments of Apple's invention provide a holistic identification process that can facilitate reliable interoperation between accessories and host devices (including portable devices), particularly where the accessory includes multiple components and/or multiple communication interfaces.

The process can be executed as part of initializing communication when the accessory connects to a host on a first communication channel via a first interface. At that time, the accessory can provide identification information that includes information about every communication interface it is capable of using to communicate with the host (e.g., USB, Wi-Fi, Bluetooth, UART, and any other interfaces).

The accessory can subsequently establish a second (or third, etc.) connection to the host via any of its interfaces, and the host can recognize that the second connection is to the same accessory. Based on this, the host can use the initial identification information when communicating with the accessory over the second connection. When the accessory has established multiple connections to the host, the host can select an optimal routing for particular communications. Further, if one connection becomes disconnected, the host can continue to communicate with the accessory as long as at least one connection is available. Routing and re-routing of communications to various interfaces can be made transparent to the user.

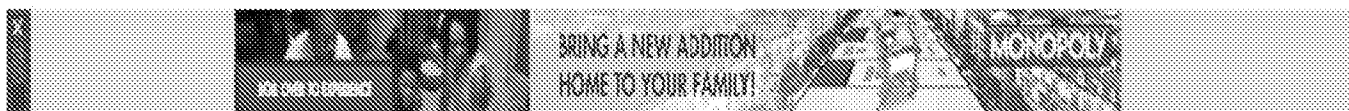
In some embodiments, the identification information provided by the accessory can also include information about various components that the accessory has available for use in interacting with the host device. For example, the accessory can provide information about its display device(s), speakers, and/or user-operable input



The accessory can also define "bundles" or groupings of components based on a common purpose or common physical location. The host device can use this information to tailor its interaction with the accessory, e.g., by routing particular information to specific accessory components or by responding differently to input signals from the accessory depending on which component was the source of the input signal.

Obtaining complete identification of all available communication interfaces and/or components from the accessory at the outset of interoperation can enhance the ability of the host device to interoperate with the accessory in a coordinated manner.

## Holistic ID for an In-Vehicle Infotainment System





## FIG. 1



Apple's patent FIG. 1 shows a host device 100 (an iPad) and an accessory 102. The host device 100 can be a handheld device such as a media player, smart phone, or personal digital assistant; a tablet computer; a laptop computer; or any other electronic device capable of communicating with accessory devices.

Accessory 102 can be any accessory capable of interacting with host device, such as a speaker dock or speaker system, a media console, **an automobile head unit**, or the like.

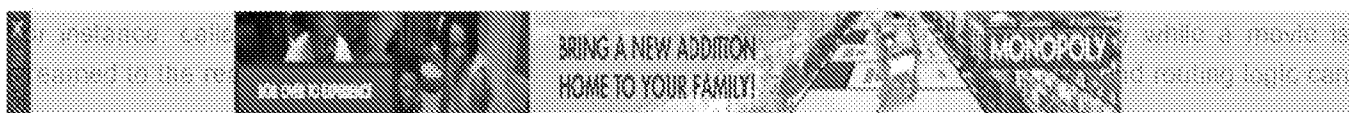
In the example shown, the accessory is a multi-component, multifunction device such as an **entertainment and information system provided in a motor vehicle**. A head unit (#112) coordinates the operation of various components. The components can include, for example, front speakers (#114); rear speakers (#116); a front console unit (#118) with a display (#120) and input controls (#122); a rear console unit (#124) with its own display (#126) and input controls (#128); and additional controls (#130) mounted in steering wheel (#132).

The accessory can provide support for a number of services. For example, the accessory can present navigation information to a driver on the front display while presenting a movie or other entertainment on rear display. In some embodiments, the accessory can provide different audio streams to different speakers. Thus, for example, audio associated with a movie being presented on rear display can be provided using rear speakers while a different audio stream (e.g., from a radio station) can be provided to the driver and any front-seat passengers using front speakers.

In the example shown, the accessory has a plug connector (#134) located within or near front console unit that can be inserted into receptacle connector (#110) to provide electrical and mechanical connections between the accessory and host device. In some embodiments, the electrical connections can include both power and data connections which will allow the accessory to deliver power to the host device and/or to receive power from host device.

While a direct connection between connectors is one option, it is to be understood that some embodiments can use an indirect connection, e.g., via a cable or adapter. In some embodiments, the host device and accessory may be capable of communicating wirelessly, e.g., using radio-frequency communication technology such as Wi-Fi or Bluetooth, near-field communication technology, infrared communication or the like, in addition to or instead of a wired signal path as provided by both connectors (110 and 134).

In order to optimize information delivery, it can be useful for control and routing logic (#168) to have "holistic" information about the accessory, such as information indicating what components are available to interoperate with host device for what purposes, and via what ports or interfaces. For example, if the control and routing logic is aware that display (#120) is positioned to present information to a driver of a vehicle while the second display is positioned to present media content to rear-seat passengers, then control and routing logic can implement routing rules to make sure content is delivered appropriately.



continue to deliver media content to the rear display and speakers (possibly at reduced volume) while providing audio from the phone call to front speakers.

Holistic identification information can also be useful when control and the routing logic receive information from the accessory. For example, input from rear-seat controls (#128) can be interpreted as controlling media being streamed to the rear seat (e.g., play, pause, asset selection), while input from steering-wheel controls can be interpreted as controlling a different operation, e.g., initiating or terminating a phone call or controlling a different media stream that is being delivered to the front seat.

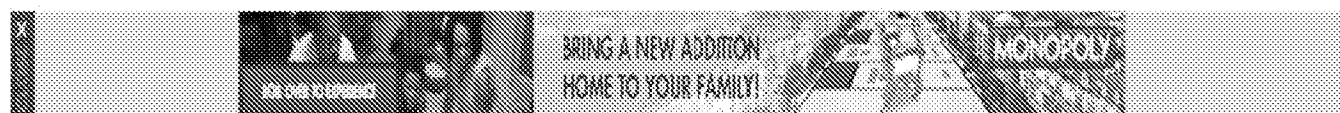
To facilitate interoperation, the host device and accessory can negotiate an operating agreement that defines the functionality they will mutually support and that also specifies the various components and capabilities of the accessory. In some embodiments, the agreement is negotiated when the host device and accessory establish a connection, and negotiating the agreement can be part of a device identification process.

For example, the head unit of the accessory device can include accessory-side identification logic (#170) that makes use of component descriptors (#172) for each component of the accessory. A "component" can be, for example, a specific port (communication interface) or a particular input/output device that can interact with host device and the descriptors can include information about each component. In the embodiment of FIG. 1, examples of components can include the front console display, front console keyboard, front speakers, steering wheel controls, rear display, rear controls, and rear speakers, as well as USB port (#154), UART port (#156) and the Bluetooth port (#158).

In some instances, component descriptors can also include "bundle" descriptors that identify groups of components as being related into a logical unit having a particular purpose. Thus, for example, the rear display, rear controls and rear speakers can be further identified as components of a bundle whose purpose is, e.g., "passenger entertainment." The component and bundle descriptors can be defined, e.g., within the accessory firmware stored in the head unit, and provided to the host device by accessory-side identification logic during an identification process.

## Patent Credits

Apple credits Shailesh, Edwin Foo, Jason Yew and Gregg Golembeski as the inventors of this patent application which was originally filed in Q4 2012 and published today by the US Patent Office. This is a very detailed patent. For those wishing to investigate it further, see [Apple's patent Application 20130332632](#).





Patently Apple

**NOTICE**

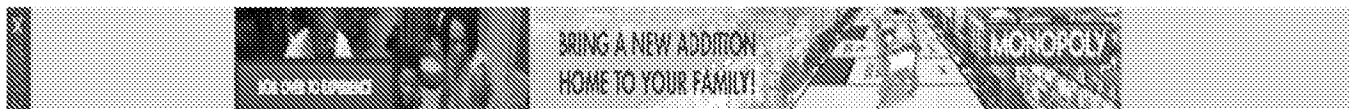
Patently Apple presents a detailed summary of patent applications with associated graphics for journalistic news purposes as each such patent application is revealed by the U.S. Patent & Trade Office. Readers are cautioned that the full text of any patent application should be read in its entirety for full and accurate details. Revelations found in patent applications shouldn't be interpreted as rumor or fast-tracked according to rumor timetables. **About Making Comments on our Site:** Patently Apple reserves the right to post, dismiss or edit any comments.

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**Ford Ex. 1002 Page 364 of 1178**

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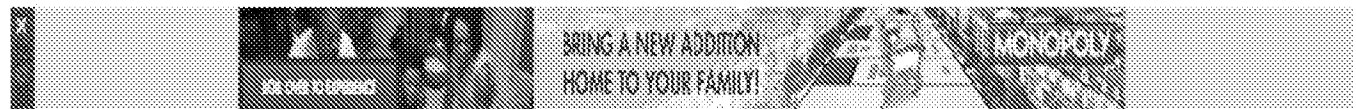
 

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From the INTERNATIONAL BUREAU

**PCT**

NOTIFICATION CONCERNING  
TRANSMITTAL OF COPY OF INTERNATIONAL  
PRELIMINARY REPORT ON PATENTABILITY  
(CHAPTER I OF THE PATENT COOPERATION  
TREATY)  
(PCT Rule 44bis.1(c))

To:

WILSON, Tadd, F.  
Sheridan Ross P.C.  
1560 Broadway  
Suite 1200  
Denver, CO 80202  
ETATS-UNIS D'AMERIQUE

|                                                                              |                                                                                             |                                                                                 |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Date of mailing ( <i>day/month/year</i> )<br><b>30 May 2014 (30.05.2014)</b> |                                                                                             |                                                                                 |
| Applicant's or agent's file reference<br><b>6583-244-PCT</b>                 |                                                                                             | <b>IMPORTANT NOTICE</b>                                                         |
| International application No.<br><b>PCT/US2012/065510</b>                    | International filing date ( <i>day/month/year</i> )<br><b>16 November 2012 (16.11.2012)</b> | Priority date ( <i>day/month/year</i> )<br><b>16 November 2011 (16.11.2011)</b> |
| Applicant<br><b>FLEXTRONICS AP , LLC</b>                                     |                                                                                             |                                                                                 |

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Authorized officer

Lingfei Bai

Facsimile No. +41 22 338 82 70

e-mail: [pat02.pct@wipo.int](mailto:pat02.pct@wipo.int)**Ford Ex. 1002 Page 366 of 1178**

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

|                                                                                                                                         |                                                                                             |                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Applicant's or agent's file reference<br><b>6583-244-PCT</b>                                                                            | <b>FOR FURTHER ACTION</b>                                                                   | See item 4 below                                                                |
| International application No.<br><b>PCT/US2012/065510</b>                                                                               | International filing date ( <i>day/month/year</i> )<br><b>16 November 2012 (16.11.2012)</b> | Priority date ( <i>day/month/year</i> )<br><b>16 November 2011 (16.11.2011)</b> |
| International Patent Classification (8th edition unless older edition indicated)<br><b>See relevant information in Form PCT/ISA/237</b> |                                                                                             |                                                                                 |
| Applicant<br><b>FLEXTRONICS AP , LLC</b>                                                                                                |                                                                                             |                                                                                 |

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------|--------------------------|------------|----------|--------------------------|-------------|--------------------------------------------------------------------------------------------------|-------------------------------------|------------|----------------------------|-------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------|-------------------------|--------------------------|-------------|--------------------------------------------------|--------------------------|--------------|-------------------------------------------------------|
| 1.                                  | This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 <i>bis</i> .1(a).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| 2.                                  | <p>This REPORT consists of a total of 13 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| 3.                                  | <p>This report contains indications relating to the following items:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 5%; text-align: center;"><input checked="" type="checkbox"/></td> <td style="width: 25%;">Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> | <input checked="" type="checkbox"/>                                                                                                                             | Box No. I | Basis of the report | <input type="checkbox"/> | Box No. II | Priority | <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability | <input checked="" type="checkbox"/> | Box No. IV | Lack of unity of invention | <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement | <input type="checkbox"/> | Box No. VI | Certain documents cited | <input type="checkbox"/> | Box No. VII | Certain defects in the international application | <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |
| <input checked="" type="checkbox"/> | Box No. I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Basis of the report                                                                                                                                             |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Priority                                                                                                                                                        |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability                                                                |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input checked="" type="checkbox"/> | Box No. IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Lack of unity of invention                                                                                                                                      |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input checked="" type="checkbox"/> | Box No. V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. VI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Certain documents cited                                                                                                                                         |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. VII                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Certain defects in the international application                                                                                                                |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. VIII                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Certain observations on the international application                                                                                                           |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| 4.                                  | The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                                     |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |

|                                                                                                                                                                          |                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;">The International Bureau of WIPO<br/>34, chemin des Colombettes<br/>1211 Geneva 20, Switzerland</p> <p>Facsimile No. +41 22 338 82 70</p> | <p>Date of issuance of this report<br/><b>20 May 2014 (20.05.2014)</b></p> <p>Authorized officer<br/><br/><div style="text-align: center;">Lingfei Bai</div></p> <p>e-mail: pt02.pct@wipo.int</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To: TADD F. WILSON  
SHERIDAN ROSS P.C.  
1560 BROADWAY  
SUITE 1200  
DENVER, CO 80202

PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year)

06 MAY 2013

Applicant's or agent's file reference  
6583-244-PCT

## FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US 12/65510

International filing date (day/month/year)

16 November 2012 (16.11.2012)

Priority date (day/month/year)

16 November 2011 (16.11.2011)

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - G01M 17/00 (2013.01); G06F 7/00 (2013.01)

USPC - 701/31.5

Applicant FLEXTRONICS AP, LLC

## 1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US  
Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450, Alexandria, Virginia 22313-1450  
Facsimile No. 571-273-3201

Date of completion of this opinion

29 March 2013 (29.03.2013)

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300  
PCT OSP: 571-272-7774



WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITYInternational application No.  
PCT/US 12/65510

## Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

- ☒ the international application in the language in which it was filed.
- ☐ a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

a. (means)

- ☐ on paper
- ☐ in electronic form

b. (time)

- ☐ in the international application as filed
- ☐ together with the international application in electronic form
- ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 12/65510

**Box No. IV Lack of unity of invention**

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
- ☐ paid additional fees
  - ☐ paid additional fees under protest and, where applicable, the protest fee
  - ☐ paid additional fees under protest but the applicable protest fee was not paid
  - ☒ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

- ☐ complied with
- ☒ not complied with for the following reasons:

**Reasons for Lack of Unity of Invention:**

This application contains the following inventions or groups of inventions that are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group 1: Claims 1-30, 41-70, 81-90, and 101-110 directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising receiving a signal at a vehicle communication system from a device, automatically determining if the signal originates from inside the vehicle and if the signal does not originate from inside the vehicle, rejecting the signal, but if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device.

Group 2: Claims 31-40, 71-80, 91-100 and 111-120 directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising a vehicle communication system to receive a request for a function/application, determine one or more of available resources, available devices and available sources, determine load/cloud service/multimedia service, select/command a device or source to provide/activate the function/application/cloud service/multimedia service.

The inventions listed as Groups 1 - 2 do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical feature of the Group 1 invention is directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising receiving a signal at a vehicle communication system from a device, automatically determining if the signal originates from inside the vehicle and if the signal does not originate from inside the vehicle, rejecting the signal, but if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device.

The special technical feature of the Group 2 invention is directed to a method, system and computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method comprising a vehicle communication system to receive a request for a function/application, determine one or more of available resources, available devices and available sources, determine load/cloud service/multimedia service, select/command a device or source to provide/activate the function/application/cloud service/multimedia service.

The only common technical feature shared by the above groups is a vehicle communication system.

However, this shared technical feature does not represent a contribution over prior art, because the shared technical feature is anticipated/made obvious by reference US 7,548,815 B2 to Watkins et al. (Published on 16 June 2009) that discloses a vehicle communication system in Abstract, col 8, ln 10-18 (Vehicle system module 290 contains one or more processors, one or more memory devices, and one or more connection ports. In one embodiment, VSM 290 includes a software switch for scanning received information such as, for example, real-time traffic updates and location information to identify that data has been received. VSM 290 is coupled to a vehicle communication network 212, and therefore to any other device that is also coupled to vehicle communication network 212).

As the above technical feature of vehicle communication system as taught by Watkins et al was known, this cannot be considered a special technical feature that would otherwise unify the groups.

4. Consequently, this opinion has been established in respect of the following parts of the international application:

- ☐ all parts
- ☒ the parts relating to claims Nos. Claims 1-30, 41-70, 81-90, and 101-110

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 12/65510

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

## 1. Statement

|                               |        |                             |     |
|-------------------------------|--------|-----------------------------|-----|
| Novelty (N)                   | Claims | 1-30, 41-70, 81-90, 101-110 | YES |
|                               | Claims | None                        | NO  |
| Inventive step (IS)           | Claims | None                        | YES |
|                               | Claims | 1-30, 41-70, 81-90, 101-110 | NO  |
| Industrial applicability (IA) | Claims | 1-30, 41-70, 81-90, 101-110 | YES |
|                               | Claims | None                        | NO  |

## 2. Citations and explanations:

Claims 1, 16, 41-47, 49, 50, 56, 81-90, and 101-110 lack an inventive step under PCT Article 33(3) as being obvious over US 2010/0097239 A1 to Campbell et al. (hereinafter Campbell) in view of US 2010/0090817 A1 to Yamaguchi et al. (hereinafter Yamaguchi).

Regarding claim 1, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); and providing access to a vehicle bus (para [0069]). Campbell does not expressly disclose that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

Regarding claim 16, Campbell discloses a computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method for providing a universal bus, the computer-executable instructions comprising: instructions to receive a signal at a vehicle communication system from a device (para [0069]); instructions to automatically determine if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); and instructions to provide access to a vehicle bus (para [0069]). Campbell does not expressly disclose that said computer-executable instructions comprise if the signal originates from inside the vehicle, instructions to communicatively connect the vehicle communication system to the device, and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 12/65510

**Supplemental Box**

**In case the space in any of the preceding boxes is not sufficient.**

Continuation of:

Box V. 2. Citations and explanations:

Regarding claim 41, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); and receiving a message from a first device (para [0070]); and providing the message to a second device (para [0070]). Campbell does not expressly disclose that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device and verifying that the message originated from inside the vehicle and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicatable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

Regarding claim 42, in the combination of Campbell and Yamaguchi, Campbell further discloses that the message is directed to the second device (para [0070]).

Regarding claim 43, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising accessing signal data in a signal data database to retrieve address information from the second device (para [0141]).

Regarding claim 44, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising accessing signal data in a signal data database to retrieve address information for the first device (para [0141]).

Regarding claim 45, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising comparing an address for the first device in the message with the retrieved address information (para [0070]).

Regarding claim 46, in the combination of Campbell and Yamaguchi, Campbell further discloses that if the address for the first device in the message is the same as the retrieved address information, the message is verified (para [0070]).

Regarding claim 47, in the combination of Campbell and Yamaguchi, Campbell further discloses that the message is sent through the vehicle communication system to the second device (para [0070]).

Regarding claim 49, in the combination of Campbell and Yamaguchi, Campbell further discloses that the vehicle communication system includes at least one wireless LAN component (para [0064]).

Regarding claim 50, in the combination of Campbell and Yamaguchi, Campbell further discloses that the first device communicates to the second device through the at least one wireless LAN component (para [0064]).

Regarding claim 56, Campbell discloses a computer readable medium having stored thereon computer-executable instructions, the computer executable instructions causing a processor to execute a method for providing a universal bus, the computer-executable instructions comprising: instructions to receive a message from a first device (para [0070]); and instructions to provide the message to a second device (para [0070]). Campbell does not expressly disclose that said computer-executable instructions comprise instructions to verify that the message originated from inside the vehicle. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65510

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V. 2. Citations and explanations:

Regarding claim 81, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); and providing access to a vehicle bus (para [0069]), determining one or more of available resources, available devices, and available sources (para [0137]); determining cloud services connected to the available resources, available devices, and available sources (para [0083]); receiving input on a user interface of the vehicle, wherein the input requests a cloud service (para [0131]); routing the input to a device (para [0131]); receiving, from the device, data from the cloud service (para [0083]); and providing the data on the display of the vehicle (para [0132]). Campbell does not expressly disclose that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicatable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

Regarding claim 82, in the combination of Campbell and Yamaguchi, Campbell further discloses that a vehicle communication system sends signal data to a processor to determine the available resources, available devices, and available sources and the cloud services (para [0053]).

Regarding claim 83, in the combination of Campbell and Yamaguchi, Campbell further discloses that the vehicle communication system determines which cloud sources are available through the device (para [0083]).

Regarding claim 84, in the combination of Campbell and Yamaguchi, Campbell further discloses that the processor determines which cloud sources are available through a server (para [0083]).

Regarding claim 85, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising presenting the cloud services information on a touch sensitive display (para [0041]).

Regarding claim 86, in the combination of Campbell and Yamaguchi, Campbell further discloses that the device is a computing system (para [0116]).

Regarding claim 87, in the combination of Campbell and Yamaguchi, Campbell further discloses that the cloud service is for the provision of data or for the execution of an application (para [0083]).

Regarding claim 88, in the combination of Campbell and Yamaguchi, Campbell further discloses that the input is received on the touch sensitive display (para [0041]).

Regarding claim 89, in the combination of Campbell and Yamaguchi, Campbell further discloses that the input is analyzed to determine a correct source for the cloud service (para [0083]).

Regarding claim 90, in the combination of Campbell and Yamaguchi, Campbell further discloses that based on the analysis, the vehicle communication system routes the input to the correct device (para [0083]).

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65510

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V. 2. Citations and explanations:

Regarding claim 101, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); determining one or more of available resources, available devices, and available sources (para [0137]); determining multimedia sources associated with the available resources, available devices, and available sources (para [0055]); receiving input on a user interface of the vehicle, wherein the input multimedia (para [0055]); routing the input to an available resource, available device, and available source (para [0087]); receiving a multimedia stream from an available resource, available device, and available source (para [0088]); and presenting the multimedia stream on an output of the vehicle (para [0070]). Campbell does not expressly disclose that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]).

Regarding claim 102, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising caching the multimedia stream (para [0061]).

Regarding claim 103, in the combination of Campbell and Yamaguchi, Campbell further discloses that two or more multimedia streams are received from two or more sources (para [0064]).

Regarding claim 104, in the combination of Campbell and Yamaguchi, Campbell further discloses that all of the two or more multimedia streams are cached (para [0061]).

Regarding claim 105, in the combination of Campbell and Yamaguchi, Campbell further discloses that determining multimedia sources associated with the available resources, available devices, and available sources comprises canvassing the available resources, available devices, and available sources for multimedia available at those available resources, available devices, and available sources (para [0137]).

Regarding claim 106, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising: consolidating the multimedia (para [0117]); and presenting the multimedia on a vehicle touch sensitive display (para [0132]).

Regarding claim 107, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising determining if safety parameters are met for presentation of the multimedia stream (para [0099]).

Regarding claim 108, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising if safety parameters are met for presentation of the multimedia stream, presenting the multimedia stream (para [0099]).

Regarding claim 109, in the combination of Campbell and Yamaguchi, Campbell further discloses further comprising if safety parameters are not met for presentation of the multimedia stream, recording the multimedia stream (para [0099]).

Regarding claim 110, in the combination of Campbell and Yamaguchi, Campbell further discloses that the multimedia stream is recorded in local storage (para [0116]).

Claims 2-9, 11-15, 17-19, 48, 51-55, and 57-60 lack an inventive step under PCT Article 33(3) as being obvious over Campbell in view of Yamaguchi, and further in view of US 2010/0144284 A1 to Chutorash et al. (hereinafter Chutorash).

Regarding claim 2, Campbell and Yamaguchi disclose the method of claim 1.

Campbell and Yamaguchi do not expressly disclose that the vehicle communication system include a communication system in communication with two or more transceivers.

However, Chutorash discloses that the vehicle communication system include a communication system in communication with two or more transceivers (para [0053]).

It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that the vehicle communication system include a communication system in communication with two or more transceivers, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the vehicle communication system include a communication system in communication with two or more transceivers, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65510

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V. 2. Citations and explanations:

Regarding claim 3, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that two or more of the transceivers are BLUETOOTH transceivers (para [0045]).

Regarding claim 4, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that two or more antennas for the vehicle communication system are separated but positioned within the vehicle (para [0033]).

Regarding claim 5, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the communication system analyzes the signal (para [0075]).

Regarding claim 6, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that the analysis includes one or more of:

determining signal characteristics (para [0027]);  
determining location information;  
determining person information;  
determining movement information (para [0062]); and  
determining sensor information.

Regarding claim 7, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that the communication system resolves the analysis to determine if the signal originated inside the vehicle (para [0060]).

Regarding claim 8, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the vehicle communication system includes at least one wireless LAN component (para [0064]).

Regarding claim 9, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the device communicates with the at least one wireless LAN component (para [0064]).

Regarding claim 11, Campbell discloses a vehicle communication system (para [0007]), comprising: a communication system (para [0040]) comprising: two or more communication modules (para [0065]); a signal processor (para [0053]); wherein the signal processor is operable to: receive a signal at the vehicle communication system from a device (para [0069]); automatically determine if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); and provide access to a vehicle bus (para [0069]). Campbell does not expressly disclose that said signal processor is operable to if the signal originates from inside the vehicle, communicatively connect the vehicle communication system to the device and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]). The combination of Campbell and Yamaguchi discloses the foregoing, but does not expressly disclose that said vehicle communication system comprises two or more BLUETOOTH transceivers. However, Chutorash discloses that said vehicle communication system comprises: two or more BLUETOOTH transceivers (para [0045], [0053]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that said vehicle communication system comprises two or more BLUETOOTH transceivers, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said vehicle communication system comprises two or more BLUETOOTH transceivers, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

Regarding claim 12, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the vehicle communication system includes at least one wireless LAN component (para [0064]), and wherein at least one device connects through the wireless LAN component (para [0064]).

Regarding claim 13, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the communication system further comprises a signal data database (para [0141]).

Regarding claim 14, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the communication system further comprises a translator (para [0120]).

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 12/65510

**Supplemental Box**

**In case the space in any of the preceding boxes is not sufficient.**

Continuation of:

Box V. 2. Citations and explanations:

Regarding claim 15, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that the signal processor is further operable to: determine signal characteristics (para [0027]); determine location information; determine person information; determine movement information (para [0062]); determine sensor information; and resolve the signal characteristics, location information, person information, movement information, and sensor information to determine if the signal originated inside the vehicle (para [0060]).

Regarding claim 17, in the combination of Campbell and Yamaguchi, Campbell further discloses that the vehicle communication system includes: at least one wireless LAN component (para [0064]), and wherein at least one device connects through the wireless LAN component (para [0064]); a communication system (para [0040]) comprising: two or more communication modules (para [0065]); a signal processor (para [0053]). Campbell and Yamaguchi do not expressly disclose that the vehicle communication system includes two or more BLUETOOTH transceivers. However, Chutorash discloses that the vehicle communication system includes: two or more BLUETOOTH transceivers (para [0045], [0053]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that the vehicle communication system includes two or more BLUETOOTH transceivers, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the vehicle communication system includes two or more BLUETOOTH transceivers, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

Regarding claim 18, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the communication system further comprises: a signal data database (para [0141]); and a translator (para [0120]).

Regarding claim 19, in the combination of Campbell, Yamaguchi, and Chutorash, Chutorash further discloses that the signal processor executes instructions to: determine signal characteristics (para [0027]); determine location information; determine person information; determine movement information (para [0062]); determine sensor information; and resolve the signal characteristics, location information, person information, movement information, and sensor information to determine if the signal originated inside the vehicle (para [0060]).

Regarding claim 48, Campbell and Yamaguchi disclose the method of claim 41. Campbell and Yamaguchi do not expressly disclose that verifying the message comprises determining signal characteristics; determining location information; determining person information; determining movement information; determining sensor information; and resolving the signal characteristics, location information, person information, movement information, and sensor information to determine if the message originated inside the vehicle. However, Chutorash discloses that verifying the message comprises: determining signal characteristics (para [0027]); determining location information; determining person information; determining movement information (para [0062]); determining sensor information; and resolving the signal characteristics, location information, person information, movement information, and sensor information to determine if the message originated inside the vehicle (para [0060]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that verifying the message comprises determining signal characteristics; determining location information; determining person information; determining movement information; determining sensor information; and resolving the signal characteristics, location information, person information, movement information, and sensor information to determine if the message originated inside the vehicle, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from verifying the message comprises determining signal characteristics; determining location information; determining person information; determining movement information; determining sensor information; and resolving the signal characteristics, location information, person information, movement information, and sensor information to determine if the message originated inside the vehicle, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

Regarding claim 51, Campbell discloses a vehicle communication system (para [0007]), comprising: a communication system (para [0040]) comprising: two or more communication modules (para [0065]); a signal processor (para [0053]); wherein the signal processor is operable to: receiving a message from a first device (para [0070]); and providing the message to a second device (para [0070]). Campbell does not expressly disclose that the signal processor is operable to verifying that the message originated from inside the vehicle. However, Yamaguchi discloses that the signal processor is operable to: verifying that the message originated from inside the vehicle ("determine whether the electronic portable key is located in an interior wireless communicable area formed inside the vehicle or an exterior wireless communicable area formed outside the vehicle" para [0008]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that the signal processor is operable to verifying that the message originated from inside the vehicle, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the signal processor is operable to verifying that the message originated from inside the vehicle, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]). The combination of Campbell and Yamaguchi discloses the foregoing, but does not expressly disclose that said vehicle communication system comprises two or more BLUETOOTH transceivers. However, Chutorash discloses that said vehicle communication system comprises: two or more BLUETOOTH transceivers (para [0045], [0053]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that said vehicle communication system comprises two or more BLUETOOTH transceivers, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said vehicle communication system comprises two or more BLUETOOTH transceivers, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

Regarding claim 52, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the message is directed to the second device (para [0070]).

Regarding claim 53, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses further comprising: accessing signal data in a signal data database to retrieve address information from the second device (para [0141]), and accessing signal data in a signal data database to retrieve address information for the first device (para [0141]).

--Please See Continuation Sheet--



**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65510

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V. 2. Citations and explanations:

Regarding claim 54, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses further comprising comparing an address for the first device in the message with the retrieved address information (para [0070]), wherein if the address for the first device in the message is the same as the retrieved address information, the message is verified (para [0070]).

Regarding claim 55, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the message is sent through the vehicle communication system to the second device (para [0070]).

Regarding claim 57, in the combination of Campbell and Yamaguchi, Campbell further discloses that the vehicle communication system includes: at least one wireless LAN component (para [0064]), and wherein at least one device connects through the wireless LAN component (para [0064]); a communication system (para [0040]) comprising: two or more communication modules (para [0065]); a signal processor (para [0053]). Campbell and Yamaguchi do not expressly disclose that the vehicle communication system includes two or more BLUETOOTH transceivers. However, Chutorash discloses that the vehicle communication system includes: two or more BLUETOOTH transceivers (para [0045], [0053]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that the vehicle communication system includes two or more BLUETOOTH transceivers, as disclosed by Chutorash, because Campbell, Yamaguchi, and Chutorash are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the vehicle communication system includes two or more BLUETOOTH transceivers, because such systems and methods configure a wireless control system of a vehicle (Chutorash para [0004]).

Regarding claim 58, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the communication system further comprises: a signal data database (para [0141]); and a translator (para [0120]).

Regarding claim 59, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses further comprising: instructions to access signal data in a signal data database to retrieve address information from the second device (para [0141]), instructions to access signal data in a signal data database to retrieve address information for the first device (para [0141]); and instructions to compare an address for the first device in the message with the retrieved address information (para [0070]), wherein if the address for the first device in the message is the same as the retrieved address information, the message is verified (para [0070]).

Regarding claim 60, in the combination of Campbell, Yamaguchi, and Chutorash, Campbell further discloses that the vehicle communication system includes at least one wireless LAN component (para [0064]), and wherein the first device communicates to the second device through the at least one wireless LAN component (para [0064]).

Claims 21-30 and 61-70 lack an inventive step under PCT Article 33(3) as being obvious over Campbell in view of Yamaguchi and US 2009/0278750 A1 to Man et al. (hereinafter Man).

Regarding claim 21, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); receiving a request for a function (para [0090]); determining one or more of available resources, available devices, and available sources (para [0137]); selecting a device or source to provide the function (para [0068]); commanding the device or source to provide the function (para [0108]); and receiving the function (para [0109]). Campbell does not expressly disclose that the method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]). The combination of Campbell and Yamaguchi discloses the foregoing, but does not expressly disclose that said method comprises determining load. However, Man discloses that said method comprises: determining load (para [0019]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that said method comprises determining load, as disclosed by Man, because Campbell, Yamaguchi, and Man are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises determining load, because such systems and methods provide relatively high performance multi-band antennas for operation in EDGE, CDMA and/or WCDMA systems (Man para [0008]).

Regarding claim 22, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the vehicle communication system includes a communication system in communication with one or more devices (para [0040]).

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65510

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V. 2. Citations and explanations:

Regarding claim 23, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the device is a computing system (para [0116]).

Regarding claim 24, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the function is one of playing of multimedia data (para [0055]), provisioning of access to the internet (para [0059]), or providing access to e-mail (para [0070]).

Regarding claim 25, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that determining the load comprises one of: determining a number of input/output messages sent between a device and vehicle communication system (para [0045]); or analyzing information sent to the vehicle communication system by the device (para [0070]).

Regarding claim 26, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the selection of the device or source is based both on availability and load (para [0137]).

Regarding claim 27, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that a first device requests the function (para [0090]).

Regarding claim 28, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that a second device provides the function (para [0108]).

Regarding claim 29, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the request for the function is received by the vehicle communication system (para [0090]).

Regarding claim 30, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that a device provides the function for the vehicle communication system (para [0090]).

Regarding claim 61, Campbell discloses a method, comprising: receiving a signal at a vehicle communication system from a device (para [0069]); automatically determining if the signal originates from inside the vehicle ("determination is made as to whether there is a connection to the vehicle control system (step 1306) (e.g., a connection between the component to be trained and the vehicle control system). If so, a determination as to whether a connection may be made between the vehicle control system and a phone or other outside device is made (step 1308)" para [0088]); receiving a request for an application (para [0083]); determining one or more of available resources, available devices, and available sources (para [0137]); activating function on a device or source to execute the application (para [0139]); receiving, from the device, application user interface information or data at the vehicle to be displayed on a display associated with the vehicle (para [0131]); and displaying the application on the display (para [0132]). Campbell does not expressly disclose that the method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, and if the signal does not originate from inside the vehicle, rejecting the signal. However, Yamaguchi discloses that said method comprises: if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device ("determine whether the electronic portable key is located in an interior wireless communicatable area formed inside the vehicle or an exterior wireless communicatable area formed outside the vehicle" para [0008]) and if the signal does not originate from inside the vehicle, rejecting the signal ("The control unit limits the operations of the vehicle that can be performed in accordance with the communicatable area in which the sub-key is located when determining that the sub-key is not in the lent state" para [0008]-[0009]). It would have been obvious to one having ordinary skill in the art to modify the system and method of Campbell so as that said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, as disclosed by Yamaguchi, because Campbell and Yamaguchi are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises if the signal originates from inside the vehicle, communicatively connecting the vehicle communication system to the device, because such systems and methods provide a vehicle electronic portable key system that improves the level of security (Yamaguchi para [0007]). The combination of Campbell and Yamaguchi discloses the foregoing, but does not expressly disclose that said method comprises determining load. However, Man discloses that said method comprises: determining load (para [0019]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell and Yamaguchi so as that said method comprises determining load, as disclosed by Man, because Campbell, Yamaguchi, and Man are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from said method comprises determining load, because such systems and methods provide relatively high performance multi-band antennas for operation in EDGE, CDMA and/or WCDMA systems (Man para [0008]).

Regarding claim 62, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses further comprising: commanding the vehicle communication system to perform functions for the application (para [0135]).

Regarding claim 63, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses further comprising receiving input on the display (para [0125]).

Regarding claim 64, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses further comprising based on the input received on the display, executing an application function on the device (para [0139]).

Regarding claim 65, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the vehicle communication system includes a communication system in communication with one or more devices (para [0040]).

Regarding claim 66, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the device is a computing system (para [0116]).

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65510

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V. 2. Citations and explanations:

Regarding claim 67, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that determining the load comprises one of: determining a number of input/output messages sent between a device and vehicle communication system (para [0045]); or analyzing information sent to the vehicle communication system by the device (para [0070]).

Regarding claim 68, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the selection of the device or source is based both on availability and load (para [0137]).

Regarding claim 69, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that the request for the application is received by the vehicle communication system (para [0083]).

Regarding claim 70, in the combination of Campbell, Yamaguchi, and Man, Campbell further discloses that a device provides the application for the vehicle communication system (para [0139]).

Claims 10 and 20 lack an inventive step under PCT Article 33(3) as being obvious over Campbell in view of Yamaguchi and Chutorash, and further in view of US 2011/0105097 A1 to Tadayon et al. (hereinafter Tadayon).

Regarding claim 10, Campbell, Yamaguchi, and Chutorash disclose the method of claim 9.

Campbell, Yamaguchi, and Chutorash do not expressly disclose that the analysis is weighted to resolve the determination of if the signal originated inside the vehicle. However, Tadayon discloses that the analysis is weighted to resolve the determination of if the signal originated inside the vehicle (para [0069]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell, Yamaguchi, and Chutorash so as that the analysis is weighted to resolve the determination of if the signal originated inside the vehicle, as disclosed by Tadayon, because Campbell, Yamaguchi, Chutorash, and Tadayon are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the analysis is weighted to resolve the determination of if the signal originated inside the vehicle, because such systems and methods limit/disable the use of some of mobile device features which could cause distraction to the user when the user is engaged in another activity (Tadayon para [0010]).

Regarding claim 20, Campbell, Yamaguchi, and Chutorash disclose the computer readable medium of claim 19.

Campbell, Yamaguchi, and Chutorash do not expressly disclose that the signal characteristics, location information, person information, movement information, and sensor information is weighted to resolve the determination of if the signal originated inside the vehicle. However, Tadayon discloses that the signal characteristics, location information, person information, movement information, and sensor information is weighted to resolve the determination of if the signal originated inside the vehicle (para [0069]). It would have been obvious to one having ordinary skill in the art to modify the systems and methods of Campbell, Yamaguchi, and Chutorash so as that the signal characteristics, location information, person information, movement information, and sensor information is weighted to resolve the determination of if the signal originated inside the vehicle, as disclosed by Tadayon, because Campbell, Yamaguchi, Chutorash, and Tadayon are directed to systems and methods for vehicle communication. Furthermore, users of such systems and methods benefit from the signal characteristics, location information, person information, movement information, and sensor information is weighted to resolve the determination of if the signal originated inside the vehicle, because such systems and methods limit/disable the use of some of mobile device features which could cause distraction to the user when the user is engaged in another activity (Tadayon para [0010]).

Claims 1-30, 41-70, 81-90, and 101-110 have industrial applicability as defined by PCT Article 33(4), because the subject matter can be made or used in industry.

From the INTERNATIONAL BUREAU

**PCT**

NOTIFICATION CONCERNING  
TRANSMITTAL OF COPY OF INTERNATIONAL  
PRELIMINARY REPORT ON PATENTABILITY  
(CHAPTER I OF THE PATENT COOPERATION  
TREATY)  
(PCT Rule 44bis.1(c))

To:

SWARTZ, Douglas, W.  
Sheridan Ross P.C.  
1560 Broadway  
Suite 1200  
Denver, CO 80202  
ETATS-UNIS D'AMERIQUE

|                                                                              |                                                                                             |                                                                                 |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Date of mailing ( <i>day/month/year</i> )<br><b>30 May 2014 (30.05.2014)</b> |                                                                                             |                                                                                 |
| Applicant's or agent's file reference<br><b>6583-247-PCT</b>                 |                                                                                             | <b>IMPORTANT NOTICE</b>                                                         |
| International application No.<br><b>PCT/US2012/065613</b>                    | International filing date ( <i>day/month/year</i> )<br><b>16 November 2012 (16.11.2012)</b> | Priority date ( <i>day/month/year</i> )<br><b>16 November 2011 (16.11.2011)</b> |
| Applicant<br><b>FLEXTRONICS AP, LLC</b>                                      |                                                                                             |                                                                                 |

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO  
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Authorized officer

Yukari Nakamura

Facsimile No. +41 22 338 82 70

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# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

|                                                                                                                                         |                                                                                             |                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Applicant's or agent's file reference<br><b>6583-247-PCT</b>                                                                            | <b>FOR FURTHER ACTION</b>                                                                   | See item 4 below                                                                |
| International application No.<br><b>PCT/US2012/065613</b>                                                                               | International filing date ( <i>day/month/year</i> )<br><b>16 November 2012 (16.11.2012)</b> | Priority date ( <i>day/month/year</i> )<br><b>16 November 2011 (16.11.2011)</b> |
| International Patent Classification (8th edition unless older edition indicated)<br><b>See relevant information in Form PCT/ISA/237</b> |                                                                                             |                                                                                 |
| Applicant<br><b>FLEXTRONICS AP, LLC</b>                                                                                                 |                                                                                             |                                                                                 |

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------|--------------------------|------------|----------|--------------------------|-------------|--------------------------------------------------------------------------------------------------|--------------------------|------------|----------------------------|-------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------|-------------------------|--------------------------|-------------|--------------------------------------------------|--------------------------|--------------|-------------------------------------------------------|
| 1.                                  | This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 <i>bis</i> .1(a).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| 2.                                  | <p>This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| 3.                                  | <p>This report contains indications relating to the following items:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 5%; text-align: center;"><input checked="" type="checkbox"/></td> <td style="width: 25%;">Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> | <input checked="" type="checkbox"/>                                                                                                                             | Box No. I | Basis of the report | <input type="checkbox"/> | Box No. II | Priority | <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability | <input type="checkbox"/> | Box No. IV | Lack of unity of invention | <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement | <input type="checkbox"/> | Box No. VI | Certain documents cited | <input type="checkbox"/> | Box No. VII | Certain defects in the international application | <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |
| <input checked="" type="checkbox"/> | Box No. I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Basis of the report                                                                                                                                             |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Priority                                                                                                                                                        |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability                                                                |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Lack of unity of invention                                                                                                                                      |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input checked="" type="checkbox"/> | Box No. V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. VI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Certain documents cited                                                                                                                                         |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. VII                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Certain defects in the international application                                                                                                                |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>            | Box No. VIII                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Certain observations on the international application                                                                                                           |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| 4.                                  | The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |

|                                                                                                                                                                          |                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;">The International Bureau of WIPO<br/>34, chemin des Colombettes<br/>1211 Geneva 20, Switzerland</p> <p>Facsimile No. +41 22 338 82 70</p> | <p>Date of issuance of this report<br/><b>20 May 2014 (20.05.2014)</b></p> <p>Authorized officer<br/><br/><b>Yukari Nakamura</b></p> <p>e-mail: pt07.pct@wipo.int</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To: DOUGLAS W. SWARTZ  
SHERIDAN ROSS P.C.  
1560 BROADWAY  
SUITE 1200  
DENVER, CO 80202

PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year)

15 FEB 2013

Applicant's or agent's file reference  
6583-247-PCT

## FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US 12/65613

International filing date (day/month/year)

16 November 2012 (16.11.2012)

Priority date (day/month/year)

16 November 2011 (16.11.2011)

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - B60T 8/172 (2013.01)

USPC - 701/1

Applicant FLEXTRONICS AP, LLC

## 1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US  
Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450, Alexandria, Virginia 22313-1450  
Facsimile No. 571-273-3201

Date of completion of this opinion

19 January 2013 (19.01.2013)

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300  
PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2011)

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65613

**Box No. I      Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of:
  - ☒ the international application in the language in which it was filed.
  - ☐ a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
  - a. (means)
    - ☐ on paper
    - ☐ in electronic form
  - b. (time)
    - ☐ in the international application as filed
    - ☐ together with the international application in electronic form
    - ☐ subsequently to this Authority for the purposes of search
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US 12/65613

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

|                               |        |             |     |
|-------------------------------|--------|-------------|-----|
| Novelty (N)                   | Claims | <u>1-20</u> | YES |
|                               | Claims | <u>None</u> | NO  |
| Inventive step (IS)           | Claims | <u>None</u> | YES |
|                               | Claims | <u>1-20</u> | NO  |
| Industrial applicability (IA) | Claims | <u>1-20</u> | YES |
|                               | Claims | <u>None</u> | NO  |

**2. Citations and explanations:**  
(PLEASE SEE SUPPLEMENTAL BOX)



**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 12/65613

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V.2 - Citations and explanations:

Claims 1-13, 18-20 lack an inventive step under PCT Article 33(3) as being obvious over US 2006/0042846 A1 to Kojori et al. (hereinafter 'Kojori') in view of US 6,484,082 B1 to Millsap et al. (hereinafter 'Millsap') and US 2011/0106375 A1 to Gurusamy Sundaram et al. (hereinafter 'Gurusamy')

As to claim 1, Kojori teaches a vehicle, comprising at least one of: (a) a plurality of processing modules, a first processing module being in an active mode whereby the first processing module is in primary control of at least most vehicle functions and a second processing module being in a standby mode whereby the second processing module is ready to assume primary control of at least most vehicle functions ("one computer unit could be operational while the other is on standby if the arbitration method employed could meet the critically requirements established for the vehicle computer system," para [0027]); (b) an arbitration module to arbitrate hand-off conflicts between duplicated first and second processing modules (para [0027]); (c) a health check module to determine a corresponding state of health of each of the duplicated first and second processing modules to perform at least one of critical and non-critical tasks, functions, and operations ("system health," para [0029]). Kojori fails to explicitly teach such a vehicle further comprising: (d) a displayed object movement module to move displayed objects from a source input/output system to a target input/output system, the source and target input/output systems corresponding to different vehicle occupants; (e) a media filter to apply a selected rule to filter third party sourced signals received by a vehicle processing module for presentation to a vehicle occupant via a corresponding input/output system; (f) a network selector to select one of plural communication networks local to the vehicle for transmitting a selected signal; (g) a diagnostic module to receive a warning and/or error signal from a vehicle component and select a destination for the signal, the possible destinations including a vehicle input/output system to present the warning and/or error to a vehicle occupant, an emergency service provider, an emergency responder, and a remotely located diagnostic service to diagnose a cause of the warning and/or error signal; (i) a media controller to receive a media stream from a remote node, identify which of a plurality of vehicle input/output systems are disabled due to operator command and/or as a result of a rule, and, when enabled, provide the media stream to an input/output system associated with an associated vehicle occupant; (k) a computational module selector to select a computational module to perform a selected task, operation, and/or function. However, Millsap teaches (d) a displayed object movement module to move displayed objects from a source input/output system to a target input/output system, the source and target input/output systems corresponding to different vehicle occupants (col 11, ln 33 to col 12, ln 3); (e) a media filter to apply a selected rule to filter third party sourced signals received by a vehicle processing module for presentation to a vehicle occupant via a corresponding input/output system (col 11, ln 33 to col 12, ln 3); (f) a network selector to select one of plural communication networks local to the vehicle for transmitting a selected signal (col 5, ln 56 to col 6, ln 10); (g) a diagnostic module to receive a warning and/or error signal from a vehicle component and select a destination for the signal, the possible destinations including a vehicle input/output system to present the warning and/or error to a vehicle occupant, an emergency service provider, an emergency responder, and a remotely located diagnostic service to diagnose a cause of the warning and/or error signal ("diagnostics virtual network," col 8, ln 53 to col 9, ln 29); (i) a media controller to receive a media stream from a remote node, identify which of a plurality of vehicle input/output systems are disabled due to operator command and/or as a result of a rule, and, when enabled, provide the media stream to an input/output system associated with an associated vehicle occupant (col 11, ln 33 to col 12, ln 3); (k) a computational module selector to select a computational module to perform a selected task, operation, and/or function ("The activation of a virtual network to perform a particular control task," col 5, ln 34-55). Kojori and Millsap fail to explicitly teach such a vehicle further comprising: (h) a remote control module to receive a request from a remote source to command a vehicle function, authenticate the requestor, and, when successfully authenticated and when privileged to request the performance of the vehicle function, execute or cause execution of the request; (j) an installation supervisor to determine, for a newly installed software and/or hardware and/or other component, whether the newly installed component satisfies defined functional and/or source or reuse requirements and/or restrictions for the component and/or license restrictions, and, when satisfied, create data structures in the component and/or a memory in the vehicle to bind the component to the current vehicle and thereby prevent the component from communicating with a processing module in a different vehicle; (l) a network security module to isolate a component encountering a security breach and/or isolate a primary processing module from one or more other components in a local vehicle network; (m) a media controller to detect movement of a computational device from an authorized station to an unauthorized station and restrict, relative to wireless connection to the authorized station, an operation and/or function of the computational device when wirelessly connected to the unauthorized station; (n) a network controller to cache automatically streaming media in response to a vehicle state change, function, and/or operation; (o) a unified communications presence reporting module to determine whether a vehicle occupant is present and/or by what communication channel to contact the occupant based on a requirement of a law applicable to a current location of the vehicle; and (p) a social networking module to enable processing modules of different vehicles to wirelessly connect to exchange vehicle information. However, Gurusamy teaches such a vehicle further comprising: (h) a remote control module to receive a request from a remote source to command a vehicle function, authenticate the requestor, and, when successfully authenticated and when privileged to request the performance of the vehicle function, execute or cause execution of the request ("user authentication," para [0032], [0039]); (j) an installation supervisor to determine, for a newly installed software and/or hardware and/or other component, whether the newly installed component satisfies defined functional and/or source or reuse requirements and/or restrictions for the component and/or license restrictions, and, when satisfied, create data structures in the component and/or a memory in the vehicle to bind the component to the current vehicle and thereby prevent the component from communicating with a processing module in a different vehicle (software stack also handles application security, rights management, copy protection, security against virus attacks etc. The application programs stored in the secured layers have controlled access," para [0029]); (l) a network security module to isolate a component encountering a security breach and/or isolate a primary processing module from one or more other components in a local vehicle network (para [0029]); (m) a media controller to detect movement of a computational device from an authorized station to an unauthorized station and restrict, relative to wireless connection to the authorized station, an operation and/or function of the computational device when wirelessly connected to the unauthorized station ("rights management," para [0029]); (n) a network controller to cache automatically streaming media in response to a vehicle state change, function, and/or operation (para [0003], [0021]); (o) a unified communications presence reporting module to determine whether a vehicle occupant is present and/or by what communication channel to contact the occupant based on a requirement of a law applicable to a current location of the vehicle ("determine that a user is not present in the vehicle," para [0069]-[0071]); and (p) a social networking module to enable processing modules of different vehicles to wirelessly connect to exchange vehicle information (para [0021]). It would have been obvious to one of ordinary skill in the art to combine the vehicle computer system of Kojori with the support for networking, media streaming, and diagnostics of Millsap and Gurusamy, because Kojori, Millsap and Gurusamy are directed to systems and methods for in-vehicle computers.

(PLEASE SEE NEXT SUPPLEMENTAL BOX)

Form PCT/ISA/237 (Supplemental Box) (July 2011)

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65613

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V.2 - Citations and explanations:

As to claim 2, the vehicle of claim 1 is discussed above. Further, Kojori teaches such a vehicle wherein the vehicle comprises (a), wherein the first and second processing modules are in wireless communication with one another, and wherein a state of the second processing module is maintained substantially in synchronicity with a state of the first processing module to enable a stateful failover from the first processing module to the second processing module (para [0027]-[0028]).

As to claim 3, the vehicle of claim 1 is discussed above. Further, Kojori teaches such a vehicle wherein the vehicle comprises (b) and wherein the health check module selects one of the first and second processing modules to currently possess and/or own a token, the token indicating which processing module is an active processing module and/or which processing module is a standby processing module ("Depending upon the failure arbitration method employed, one computer unit could be operational while the other is on standby if the arbitration method employed could meet the criticality requirements established for the vehicle computer system," para [0027]).

As to claim 4, the vehicle of claim 1 is discussed above. Further, Kojori teaches such a vehicle wherein the vehicle comprises (c) and wherein the health check module performs a check and/or test, in response to an internally generated interrupt and/or request to determine a selected processing module's ability to perform critical and/or non-critical vehicle tasks, functions, and/or operations, assign a score to the selected processing module based on the check and/or test results, and compare the score to one or more thresholds and/or to a score of a different processing module to determine a state of health of the selected processing module ("vehicle computer can also perform trend or prognostic health monitoring algorithms of parameters collected by the EEMC for preventative maintenance activities," para [0030]).

As to claim 5, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (d) and wherein the displayed object movement module selects the target input/output system from among plural input/output systems on board the vehicle based on input from a user of the source input/output system ("Audio subsystem 220 is capable of handling several sources of input and output, decoding digital audio, multichannel sound, etc. Further, audio subsystem 220 enables in-vehicle computer 104 to recognize the user and his/her commands for providing personalized features and services to the user," para [0036]).

As to claim 6, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (e) and wherein the selected rule is one or more of a white list, blacklist, user preference, sensed occupant context, and/or governing federal, state, provincial, and/or local law and/or regulation applicable to a current sensed spatial location of the vehicle ("The vehicle's response may include one or more of the following: (a) preventing the user from going outside the bounds (e.g., preventing the user from exceeding a specified speed limit); (b) alerting the user that he is attempting to go (or is going) outside the bounds (e.g., with an alarm or a computer voice alert); (c) alert a third party about the user's actions (e.g., alert a parent of the user; e.g., alert authorities)," para [0019]).

As to claim 7, the vehicle of claim 1 is discussed above. Further, Millsap teaches such a vehicle wherein the vehicle comprises (f) and wherein the network selector selects one of plural communication networks local to the vehicle for transmitting a selected signal based on one or more of network/node status, signal/noise ratio, type of signal, available and/or unavailable bandwidth, network performance parameter(s), and quality of service (col 12, ln 4-41).

As to claim 8, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (g) and wherein the diagnostic module provides the warning and/or error signal to the vehicle occupant and interactively communicates a likely cause of the warning and/or error signal to the occupant and receives a command from the occupant to contact one or more of an emergency service provider, an emergency responder, and a remotely located diagnostic service ("these inputs may also be transmitted in real-time to various monitoring agencies which may then provide assistance, control, information or services to the user and external agencies such as road transport authorities etc.," para [0022]).

As to claim 9, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (h) and wherein the remote control module is associated with one or more of the vehicle owner, a law enforcement authority, a lender associated with a loan having the vehicle as collateral, and a vehicle manufacturer and wherein the requested vehicle function, is executed or caused to be executed notwithstanding a contrary command from the vehicle operator ("alert a third party about the user's actions (e.g., alert a parent of the user; e.g., alert authorities)," para [0019]; para [0157]-[0159]).

As to claim 10, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (i) and wherein the media controller, in a dependent mode, provides common content synchronously to each of the input/output systems and, in an independent mode, provides different content to different ones of the input/output systems ("In some embodiments, the same speaker system can simultaneously output two different audio tracks to two different people," para [0176]).

As to claim 11, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (j) and wherein the newly installed software and/or hardware and/or other component is one or more of an on-board sensor, a processing module or component thereof, a software application, a circuit board, an expansion module or component thereof, a critical or non-critical device, and a cellular upgrade module ("program module," para [0013], [0020], [0027]).

As to claim 12, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (k), wherein the computational module is selected from among plural computational modules, and wherein the plural computational modules comprise one or more vehicle processing devices and one or more occupant computational devices, the one or more occupant computational devices comprising one or more of a mobile phone, personal digital assistant, tablet computer, and laptop computer (para [0013], [0033]).

(PLEASE SEE NEXT SUPPLEMENTAL BOX)

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US 12/65613

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box V.2 - Citations and explanations:

As to claim 13, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (k), wherein the computational module is selected from among plural computational modules, and wherein the plural computational modules comprise multiple software applications corresponding to different versions, releases, and/or vendors of a common type of software application ("the software might be in the form of a collection of separate programs, a program module with a larger program or a portion of a program module," para [0013]).

As to claim 18, the vehicle of claim 1 is discussed above. Further, Gurusamy teaches such a vehicle wherein the vehicle comprises (p) (para [0021]).

As to claim 19, Kojori, Millsap and Gurusamy teach a non-transient, tangible computer readable medium comprising processor executable instructions to perform one or more of operations (a)-(p) referenced in claim 1.

As to claim 20, Kojori, Millsap and Gurusamy teach a method comprising steps to perform one or more of the operations (a)-(p) referenced in claim 1.

Claims 14-16 lack an inventive step under PCT Article 33(3) as being obvious over Kojori, Millsap and Gurusamy in view of US 7,891,004 B1 to Gelvin et al. (hereinafter 'Gelvin').

As to claim 14, Kojori, Millsap and Gurusamy teach the vehicle of claim 1, but fail to explicitly teach such a vehicle wherein the vehicle comprises (1) and wherein the network security module filters and/or prohibits communications between the isolated one of the component and/or processing module with other network components. However, Gelvin teaches such a vehicle wherein the vehicle comprises (1) and wherein the network security module filters and/or prohibits communications between the isolated one of the component and/or processing module with other network components ("isolation must be provided between essential vehicle systems and any unauthorized local or remote access attempts," col 2, ln 32-39). It would have been obvious to one of ordinary skill in the art to combine the vehicle computer systems of Kojori, Millsap, and Gurusamy with the support for isolating specific modules of Gelvin, because Kojori, Millsap, Gurusamy and Gelvin are directed to systems and methods for modular in-vehicle computer systems.

As to claim 15, Kojori, Millsap and Gurusamy teach the vehicle of claim 1, but fail to explicitly teach such a vehicle wherein the vehicle comprises (m) and wherein the media controller permits a first function and/or operation to be performed by the computational device when wirelessly connected to the authorized station but not when wirelessly connected to the unauthorized station ("blocking coupling with unauthorized devices," Claim 32). It would have been obvious to one of ordinary skill in the art to combine the vehicle computer systems of Kojori, Millsap, and Gurusamy with the support for authorized of Gelvin, because Kojori, Millsap, Gurusamy and Gelvin are directed to systems and methods for wireless vehicle communication.

As to claim 16, Kojori, Millsap and Gurusamy teach the vehicle of claim 1, but fail to explicitly teach such a vehicle wherein the vehicle comprises (n) and wherein the network controller caches automatically streaming media in response to the vehicle state changing from a parked state to an unparked state ("when connectivity is established with another transmitter the record download begins again where it left off," col 27, ln 19-35). It would have been obvious to one of ordinary skill in the art to combine the vehicle computer systems of Kojori, Millsap, and Gurusamy with the support for caching and resuming data streams of Gelvin, because Kojori, Millsap, Gurusamy and Gelvin are directed to systems and methods for in-vehicle computers used for network communication.

Claim 17 lacks an inventive step under PCT Article 33(3) as being obvious over Kojori, Millsap and Gurusamy in view of US 2008/0140278 A1 to Breed.

As to claim 17, Kojori, Millsap and Gurusamy teach the vehicle of claim 1, but fail to explicitly teach such a vehicle wherein the vehicle comprises (o) and wherein the unified communications presence reporting module determines that the vehicle occupant is the operator of the vehicle and that the vehicle operator is not present by a selected communication channel when the vehicle is in motion. However, Breed teaches such a vehicle wherein the vehicle comprises (o) and wherein the unified communications presence reporting module determines that the vehicle occupant is the operator of the vehicle and that the vehicle operator is not present by a selected communication channel when the vehicle is in motion ("obtaining information from various sensors about the occupant(s) in the passenger compartment of the vehicle, e.g., the number of occupants, their type and their motion, if any," para [0538]). It would have been obvious to one of ordinary skill in the art to combine the vehicle computer systems of Kojori, Millsap, and Gurusamy with the support for occupant sensing of Breed, because Kojori, Millsap, Gurusamy and Breed are directed to systems and methods for in-vehicle computer systems with attributes tailored to specific detected occupants.

Claims 1-20 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

APR 29 2014

To:  
Sheridan Ross P.C.  
1560 Broadway  
Suite 1200  
Denver, CO 80202  
USA

## PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT AND  
THE WRITTEN OPINION OF THE INTERNATIONAL  
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

|                                                       |                                                                             |
|-------------------------------------------------------|-----------------------------------------------------------------------------|
| Applicant's or agent's file reference<br>6583-247-CIP | Date of mailing<br>(day/month/year) <b>25 APR 2014</b>                      |
| International application No.<br>PCT/US14/19209       | International filing date<br>(day/month/year) 28 February 2014 (28.02.2014) |
| Applicant<br>FLEXTRONICS AP, LLC                      |                                                                             |

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

**Filing of amendments and statement under Article 19:**

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

**When?** The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

**Where?** Directly to the International Bureau of WIPO, 34 chemin des Colombettes  
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70.

**For more detailed instructions,** see *PCT Applicant's Guide*, International Phase, paragraphs 9.004-9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

For details about the applicable time limits, Office by Office, see [www.wipo.int/pct/en/texts/time\\_limits.html](http://www.wipo.int/pct/en/texts/time_limits.html) and the *PCT Applicant's Guide*, National Chapters.

|                                                                                                                                                                                        |                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Name and mailing address of the ISA/ US<br>Mail Stop PCT, Attn: ISA/US<br>Commissioner for Patents<br>P.O. Box 1450<br>Alexandria, Virginia 22313-1450<br>Facsimile No. (571) 273-3201 | Authorized officer<br><br>John Nguyen<br><br>Telephone No. 571-272-6952 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|

Form PCT/ISA/220 (July 2010)

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|                                                       |                                                                                                              |                                                                                  |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Applicant's or agent's file reference<br>6583-247-CIP | <b>FOR FURTHER ACTION</b><br><small>see Form PCT/ISA/220 as well as, where applicable, item 5 below.</small> |                                                                                  |
| International application No.<br>PCT/US14/19209       | International filing date ( <i>day/month/year</i> )<br>28 February 2014 (28.02.2014)                         | (Earliest) Priority Date ( <i>day/month/year</i> )<br>14 March 2013 (14.03.2013) |
| Applicant<br>FLEXTRONICS AP, LLC                      |                                                                                                              |                                                                                  |

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the Report**

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed.  
☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 Rule 43.6 *bis(a)*

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (See Box No. III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant.  
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant.  
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 20  
☒ as suggested by the applicant.  
☐ as selected by this Authority, because the applicant failed to suggest a figure.  
☐ as selected by this Authority, because this figure better characterizes the invention.  
b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (April 2007)

| <b>INTERNATIONAL SEARCH REPORT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | International application No.<br><br>PCT/US14/19209                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |   |                                                                |      |
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| <b>A. CLASSIFICATION OF SUBJECT MATTER</b><br>IPC: <b>G06F 7/00</b> ( 2006.01); <b>B60K 5/00</b> ( 2006.01)<br><br>USPC:       701/36;180/232<br>According to International Patent Classification (IPC) or to both national classification and IPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |   |                                                                |      |
| <b>B. FIELDS SEARCHED</b><br><br>Minimum documentation searched (classification system followed by classification symbols)<br>U.S. : 701/36; 180/232<br><br>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched<br><br>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |   |                                                                |      |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <th style="width: 10%; padding: 5px;">Category *</th> <th style="width: 60%; padding: 5px;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 30%; padding: 5px;">Relevant to claim No.</th> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">US 2007/0057781 A1 (Breed) 15 March 2007, see entire document.</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-24</td> </tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                               | Category *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Relevant to claim No. | X | US 2007/0057781 A1 (Breed) 15 March 2007, see entire document. | 1-24 |
| Category *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Relevant to claim No.                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |   |                                                                |      |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | US 2007/0057781 A1 (Breed) 15 March 2007, see entire document.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1-24                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |   |                                                                |      |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |   |                                                                |      |
| <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; border: none;">           * Special categories of cited documents:<br/><br/>           "A" document defining the general state of the art which is not considered to be of particular relevance<br/><br/>           "E" earlier application or patent published on or after the international filing date<br/><br/>           "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)<br/><br/>           "O" document referring to an oral disclosure, use, exhibition or other means<br/><br/>           "P" document published prior to the international filing date but later than the priority date claimed         </td> <td style="width: 50%; vertical-align: top; border: none;">           "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention<br/><br/>           "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone<br/><br/>           "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art<br/><br/>           "&amp;" document member of the same patent family         </td> </tr> </table> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                               | * Special categories of cited documents:<br><br>"A" document defining the general state of the art which is not considered to be of particular relevance<br><br>"E" earlier application or patent published on or after the international filing date<br><br>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)<br><br>"O" document referring to an oral disclosure, use, exhibition or other means<br><br>"P" document published prior to the international filing date but later than the priority date claimed | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention<br><br>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone<br><br>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art<br><br>"&" document member of the same patent family |                       |   |                                                                |      |
| * Special categories of cited documents:<br><br>"A" document defining the general state of the art which is not considered to be of particular relevance<br><br>"E" earlier application or patent published on or after the international filing date<br><br>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)<br><br>"O" document referring to an oral disclosure, use, exhibition or other means<br><br>"P" document published prior to the international filing date but later than the priority date claimed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention<br><br>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone<br><br>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art<br><br>"&" document member of the same patent family |                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |   |                                                                |      |
| Date of the actual completion of the international search<br>22 April 2014 (22.04.2014)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Date of mailing of the international search report<br><div style="font-size: 1.2em; font-weight: bold; text-align: center;">25 APR 2014</div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |   |                                                                |      |
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US<br>Commissioner for Patents<br>P.O. Box 1450<br>Alexandria, Virginia 22313-1450<br>Facsimile No. (571) 273-3201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Authorized officer<br><br>John Nguyen<br><br>Telephone No. 571-272-6952                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |   |                                                                |      |

Form PCT/ISA/210 (second sheet) (April 2007)

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:  
Sheridan Ross P.C.  
1560 Broadway  
Suite 1200  
Denver, CO 80202  
USA

# PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

|                                                                                                                                                                            |                                                                             |                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------|
| Applicant's or agent's file reference<br>6583-247-CIP                                                                                                                      |                                                                             | Date of mailing<br>(day/month/year) <b>25 APR 2014</b>       |
| <b>FOR FURTHER ACTION</b><br>See paragraph 2 below                                                                                                                         |                                                                             |                                                              |
| International application No.<br>PCT/US14/19209                                                                                                                            | International filing date (day/month/year)<br>28 February 2014 (28.02.2014) | Priority date (day/month/year)<br>14 March 2013 (14.03.2013) |
| International Patent Classification (IPC) or both national classification and IPC<br>IPC: <b>G06F 7/00</b> ( 2006.01); <b>B60K 5/00</b> ( 2006.01)<br>USPC: 701/36;180/232 |                                                                             |                                                              |
| Applicant<br>FLEXTRONICS AP, LLC                                                                                                                                           |                                                                             |                                                              |

1. This opinion contains indications relating to the following items:

- ☒ Box No. I      Basis of the opinion
- ☐ Box No. II      Priority
- ☐ Box No. III      Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV      Lack of unity of invention
- ☒ Box No. V      Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI      Certain documents cited
- ☐ Box No. VII      Certain defects in the international application
- ☐ Box No. VIII      Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

|                                                                                                                                                                                        |                                                                  |                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------|
| Name and mailing address of the ISA/ US<br>Mail Stop PCT, Attn: ISA/US<br>Commissioner for Patents<br>P.O. Box 1450<br>Alexandria, Virginia 22313-1450<br>Facsimile No. (571) 273-3201 | Date of completion of this opinion<br>22 April 2014 (22.04.2014) | Authorized officer<br>John Nguyen<br>Telephone No. 571-272-6952 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------|

Form PCT/ISA/237 (cover sheet) (April 2007)

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US14/19209

**Box No. I Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ on paper

☐ in electronic form

c. time of filing/furnishing

☐ contained in the international application as filed.

☐ filed together with the international application in electronic form.

☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                 |             |                    |            |  |                    |           |                     |                    |            |  |                    |           |                               |                    |            |  |                    |           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------|--------------------|------------|--|--------------------|-----------|---------------------|--------------------|------------|--|--------------------|-----------|-------------------------------|--------------------|------------|--|--------------------|-----------|
| <b>WRITTEN OPINION OF THE<br/>INTERNATIONAL SEARCHING AUTHORITY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | International application No.<br>PCT/US14/19209 |             |                    |            |  |                    |           |                     |                    |            |  |                    |           |                               |                    |            |  |                    |           |
| <b>Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                 |             |                    |            |  |                    |           |                     |                    |            |  |                    |           |                               |                    |            |  |                    |           |
| <p>1. Statement</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 40%; vertical-align: top;">           Novelty (N)         </td> <td style="width: 20%; vertical-align: top;">           Claims <u>NONE</u> </td> <td style="width: 40%; text-align: right; vertical-align: bottom;"> <u>YES</u> </td> </tr> <tr> <td></td> <td style="vertical-align: top;">           Claims <u>1-24</u> </td> <td style="text-align: right; vertical-align: bottom;"> <u>NO</u> </td> </tr> <tr> <td style="vertical-align: top;">           Inventive step (IS)         </td> <td style="vertical-align: top;">           Claims <u>NONE</u> </td> <td style="text-align: right; vertical-align: bottom;"> <u>YES</u> </td> </tr> <tr> <td></td> <td style="vertical-align: top;">           Claims <u>1-24</u> </td> <td style="text-align: right; vertical-align: bottom;"> <u>NO</u> </td> </tr> <tr> <td style="vertical-align: top;">           Industrial applicability (IA)         </td> <td style="vertical-align: top;">           Claims <u>1-24</u> </td> <td style="text-align: right; vertical-align: bottom;"> <u>YES</u> </td> </tr> <tr> <td></td> <td style="vertical-align: top;">           Claims <u>NONE</u> </td> <td style="text-align: right; vertical-align: bottom;"> <u>NO</u> </td> </tr> </table> |                                                 | Novelty (N) | Claims <u>NONE</u> | <u>YES</u> |  | Claims <u>1-24</u> | <u>NO</u> | Inventive step (IS) | Claims <u>NONE</u> | <u>YES</u> |  | Claims <u>1-24</u> | <u>NO</u> | Industrial applicability (IA) | Claims <u>1-24</u> | <u>YES</u> |  | Claims <u>NONE</u> | <u>NO</u> |
| Novelty (N)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Claims <u>NONE</u>                              | <u>YES</u>  |                    |            |  |                    |           |                     |                    |            |  |                    |           |                               |                    |            |  |                    |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Claims <u>1-24</u>                              | <u>NO</u>   |                    |            |  |                    |           |                     |                    |            |  |                    |           |                               |                    |            |  |                    |           |
| Inventive step (IS)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Claims <u>NONE</u>                              | <u>YES</u>  |                    |            |  |                    |           |                     |                    |            |  |                    |           |                               |                    |            |  |                    |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Claims <u>1-24</u>                              | <u>NO</u>   |                    |            |  |                    |           |                     |                    |            |  |                    |           |                               |                    |            |  |                    |           |
| Industrial applicability (IA)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Claims <u>1-24</u>                              | <u>YES</u>  |                    |            |  |                    |           |                     |                    |            |  |                    |           |                               |                    |            |  |                    |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Claims <u>NONE</u>                              | <u>NO</u>   |                    |            |  |                    |           |                     |                    |            |  |                    |           |                               |                    |            |  |                    |           |
| <p>2. Citations and explanations:</p> <p>Please See Continuation Sheet</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                 |             |                    |            |  |                    |           |                     |                    |            |  |                    |           |                               |                    |            |  |                    |           |

Form PCT/ISA/237 (Box No. V) (April 2007)

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US14/19209

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

**V. 2. Citations and Explanations:**

Claims 1-24 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Claims 1-24 lacks novelty under PCT Article 33(2), as being anticipated by Breed (U.S. Pub No. 20070057781).

Regarding claims 1, 9, 17, as best understood, Breed discloses a method, a non-transient, tangible computer readable medium, a vehicle comprising: a microprocessor executable displayed object movement module operable to receive a selected target vehicle display and/or target vehicle occupant to receive a currently displayed object on a source vehicle display of a source vehicle occupant and forward the currently displayed object, in substantial real time, to the selected target vehicle display of the target vehicle occupant and/or a portable computational device associated with the target vehicle occupant and currently located within the vehicle (See paragraph 0016, 0017).

Regarding claims 2, 10, 18, Breed discloses the displayed object is one or more of streaming video, a web page, an icon, a window, and an application and wherein the currently displayed object is directed by a media controller on board the vehicle to the selected target vehicle display of the target vehicle occupant, and/or a computational device associated with the target vehicle occupant and currently located within the vehicle and is not transmitted by a network component located physically outside of the vehicle (See 0017 for remote transmission, 0222, 0784, 0806, 0965).

Regarding claims 3, 11, 19, Breed discloses the selected target vehicle display and/or target vehicle occupant is selected by the source vehicle occupant by one or more of a

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US14/19209

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

gesture received by the source vehicle display, the gesture indicating a position and/or orientation of the target vehicle display and/or target vehicle occupant relative to the source vehicle display, a selection, received by the source vehicle display, of the target vehicle display, and a selection, received by the source vehicle display, of an identifier associated with the target vehicle occupant and wherein the displayed object is one or more of streaming video, a web page, an icon, a window, and an application (See paragraph 0222, 1012).

Regarding claims 4, 12, 20, Breed discloses gestures used (See paragraph 1011) wherein the selected target vehicle display and/or target vehicle occupant is selected by the source vehicle occupant by the gesture being received by the source vehicle display and wherein the gesture indicates a vector originating substantially at a seating position of the source vehicle occupant and pointing towards a seating position of the target vehicle occupant (See paragraph 0989).

Regarding claims 5, 13, 21, Breed discloses the selected target vehicle display and/or target vehicle occupant is selected by the source vehicle occupant by the selection, received by the source vehicle display, of the target vehicle display and wherein the selection is made by the source vehicle occupant selecting a seating position of the target vehicle occupant on a displayed seating diagram of the vehicle (See 0989).

Regarding claims 6, 14, 22, Breed discloses The vehicle of claim 1, wherein the source vehicle occupant selects multiple target vehicle occupants and wherein the displayed object is provided, substantially simultaneously, to the selected multiple target vehicle occupants (See paragraph 0981).

Regarding claims 7, 15, 23, Breed discloses the displayed object movement module determines whether the target vehicle display is activated and, when not activated, causes the target vehicle display to be activated to receive the displayed object (See paragraph 0977).

Regarding claims 8, 16, 24, Breed discloses the displayed object movement module determines whether the target vehicle display is activated and, when not activated, causes the displayed object to be transmitted to the computational device associated with the target vehicle occupant (See paragraph 0993, 0776, 0946, 0949).



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
|-----------------|-------------|----------------------|---------------------|------------------|

13/679,857

11/16/2012

Christopher P. Ricci

6583-231

3691

111285 7590  
Sheridan Ross P.C.  
1560 Broadway  
Suite 1200  
Denver, CO 80202

06/27/2014

EXAMINER

MITCHELL, NATHAN A

ART UNIT

PAPER NUMBER

2646

NOTIFICATION DATE

DELIVERY MODE

06/27/2014

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com

|                              |                                      |                                              |                                                  |
|------------------------------|--------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/679,857 | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                              | <b>Examiner</b><br>NATHAN MITCHELL   | <b>Art Unit</b><br>2646                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11/16/2012.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims\*

- 5) ☒ Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 6) ☒ Claim(s) 1-15 is/are allowed.
- 7) ☒ Claim(s) 16-20 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 11/16/2012 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some\*\*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)  
Paper No(s)/Mail Date \_\_\_\_\_
- 3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 4) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. The present application is being examined under the pre-AIA first to invent provisions.

#### ***Claim Rejections - 35 USC § 101***

2. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 16-20 are rejected under 35 U.S.C. 101 because the broadest reasonable interpretation of “computer readable medium” encompasses non-statutory subject matter such as transitory signals.

#### ***Allowable Subject Matter***

3. Claims 1-15 are allowed. Prior art of record fails to disclose the totality of the claimed subject matter.

#### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHAN MITCHELL whose telephone number is (571)270-3117. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lester Kincaid can be reached on (571)272-7922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2646

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NATHAN MITCHELL/  
Primary Examiner, Art Unit 2646

|                                   |                                       |  |                                                                  |             |
|-----------------------------------|---------------------------------------|--|------------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/679,857 |  | Applicant(s)/Patent Under Reexamination<br>RICCI, CHRISTOPHER P. |             |
|                                   | Examiner<br>NATHAN MITCHELL           |  | Art Unit<br>2646                                                 | Page 1 of 1 |

#### U.S. PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name                  | Classification |
|---|---|--------------------------------------------------|-----------------|-----------------------|----------------|
| * | A | US-2002/0105968 A1                               | 08-2002         | Pruzan et al.         | 370/465        |
| * | B | US-2008/0090522 A1                               | 04-2008         | OYAMA, Shigeki        | 455/41.2       |
| * | C | US-7,493,140 B2                                  | 02-2009         | Michmerhuizen et al.  | 455/552.1      |
| * | D | US-2011/0184789 A1                               | 07-2011         | Kirsch, David M.      | 705/14.1       |
| * | E | US-8,432,260 B2                                  | 04-2013         | Talty et al.          | 340/10.51      |
| * | F | US-2013/0190978 A1                               | 07-2013         | Kato et al.           | 701/36         |
| * | G | US-8,532,574 B2                                  | 09-2013         | Kirsch, David M.      | 455/41.2       |
| * | H | US-2013/0288606 A1                               | 10-2013         | Kirsch, David Michael | 455/41.3       |
| * | I | US-2013/0295901 A1                               | 11-2013         | Abramson et al.       | 455/418        |
| * | J | US-2014/0066014 A1                               | 03-2014         | Nicholson et al.      | 455/411        |
| * | K | US-2014/0120829 A1                               | 05-2014         | BHAMIDIPATI et al.    | 455/3.06       |
|   | L | US-                                              |                 |                       |                |
|   | M | US-                                              |                 |                       |                |

#### FOREIGN PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Country | Name | Classification |
|---|---|--------------------------------------------------|-----------------|---------|------|----------------|
|   | N |                                                  |                 |         |      |                |
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|   | R |                                                  |                 |         |      |                |
|   | S |                                                  |                 |         |      |                |
|   | T |                                                  |                 |         |      |                |

#### NON-PATENT DOCUMENTS

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|-------------------------------------------------------------------------------------------|
|   | U |                                                                                           |
|   | V |                                                                                           |
|   | W |                                                                                           |
|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.





# UNITED STATES PATENT AND TRADEMARK OFFICE

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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.              | CONFIRMATION NO.            |
|-----------------------------------------------------------------------|-------------|----------------------|----------------------------------|-----------------------------|
| 13/679,875                                                            | 11/16/2012  | Christopher P. Ricci | 6583-233                         | 2857                        |
| 111285                                                                | 7590        | 04/07/2014           |                                  |                             |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>RABOVIANSKI, JIVKA A |                             |
|                                                                       |             |                      | ART UNIT<br>2426                 | PAPER NUMBER                |
|                                                                       |             |                      | NOTIFICATION DATE<br>04/07/2014  | DELIVERY MODE<br>ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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|                              |                                      |                                              |                                                  |
|------------------------------|--------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/679,875 | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                              | <b>Examiner</b><br>JIVKA RABOVIANSKI | <b>Art Unit</b><br>2426                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11/16/2012.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims\*

- 5) ☒ Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☐ Claim(s) \_\_\_\_ is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☒ Claim(s) 1-20 are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some\*\*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                                                               |                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                                              | 3) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)<br>Paper No(s)/Mail Date ____. | 4) <input type="checkbox"/> Other: ____.                                                |

1. The present application is being examined under the pre-AIA first to invent provisions.

**DETAILED ACTION**

2. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1 - 10, drawn to method for determining a signal originates inside a vehicle, classified in 725, subclass 14.

II. Claims 11 - 20, drawn to vehicle communication system for determining a signal originates inside a vehicle, classified in class 725 subclass 59.

Inventions I and II are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct if they do not overlap in scope and are not obvious variants, and if it is shown that at least one subcombination is separately usable. In the instant case, subcombination II has separate utility such as the media is from different sources such as Internet, disc RF frequency and so on. See MPEP § 806.05(d).

The examiner has required restriction between subcombinations usable together. Where applicant elects a subcombination and claims thereto are subsequently found allowable, any claim(s) depending from or otherwise requiring all the limitations of the allowable subcombination will be examined

for patentability in accordance with 37 CFR 1.104. See MPEP § 821.04(a).

Applicant is advised that if any claim presented in a continuation or divisional application is anticipated by, or includes all the limitations of, a claim that is allowable in the present application, such claim may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application.

3. Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and examination burden if restriction were not required because one or more of the following reasons apply:

- (a) the inventions have acquired a separate status in the art in view of their different classification;

- (b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;

- (c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries);

- (d) the prior art applicable to one invention would not likely be applicable to another invention;

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined even though the requirement may be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected invention.

If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the

evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

***Contact***

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jivka Rabovianski whose telephone number is (571)270-1845. The examiner can normally be reached on Monday-Friday from 8:30-5:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nasser Moazzami can be reached on (571) 272-4195. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number: 13/679,875

Page 6

Art Unit: 2426

/JIVKA RABOVIANSKI/

Primary Examiner, Art Unit 2426

March 31, 2014



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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.          | CONFIRMATION NO. |
|-----------------------------------------------------------------------|-------------|----------------------|------------------------------|------------------|
| 13/679,441                                                            | 11/16/2012  | Christopher P. Ricci | 6583-244                     | 8362             |
| 111285                                                                | 7590        | 01/16/2014           |                              |                  |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>CAMBY, RICHARD M |                  |
|                                                                       |             |                      | ART UNIT                     | PAPER NUMBER     |
|                                                                       |             |                      | 3661                         |                  |
|                                                                       |             |                      | NOTIFICATION DATE            | DELIVERY MODE    |
|                                                                       |             |                      | 01/16/2014                   | ELECTRONIC       |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com



|                              |                                      |                                              |                                                  |
|------------------------------|--------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/679,441 | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                              | <b>Examiner</b><br>RICHARD CAMBY     | <b>Art Unit</b><br>3661                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12/5/13.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims\*

- 5) ☒ Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-20 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some\*\*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)  
Paper No(s)/Mail Date \_\_\_\_.
- 3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 4) ☐ Other: \_\_\_\_.

The present application is being examined under the pre-AIA first to invent provisions.

### **DETAILED ACTION**

#### ***Claim Rejections - 35 USC § 101***

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 16-20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter because the "computer readable medium of claim 16 needs to be – non-transitory-- in order to be statutory.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5 and 8-20 are rejected under pre-AIA 35 U.S.C. 102b as being anticipated by Breed et al. '957.

The patent to Breed et al. discloses a method for operating a vehicle including a processor and memory that automatically determines a person is in the vehicle in a certain area by receiving sensor data as disclosed in figure 1 and paragraphs 128, 141 and 146. It is determined if the person can be identified and they are identified automatically by feature data in storage as disclosed in Figure 22 and paragraphs 468,

Art Unit: 3661

469, 437 and 702. Hand gestures are used in 3 dimensional space as are voice data as disclosed in paragraph 277.

***Claim Rejections - 35 USC § 103***

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6 and 7 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Breed et al. '957 in view of Kanevsky et al. '386.

Breed lacks the disclosure of allowing the driver to create gestures. The PG Pub to Kanevsky et al. '386 discloses in figure 1 and 3 and paragraphs 22, 34 and 36 that gestures can be created and stored. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the user of the device of Breed et al. with the ability to create gestures as taught by Kanevsky et al in order for the device to learn user specific commands.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RICHARD CAMBY whose telephone number is (571)272-6958. The examiner can normally be reached on Tues-Fri 9:00 a.m.-7:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas G. Black can be reached on (571) 272-6956. The fax phone

Art Unit: 3661

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RICHARD CAMBY/  
Primary Examiner, Art Unit 3661

|                                   |                                       |                                                                     |             |
|-----------------------------------|---------------------------------------|---------------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/679,441 | Applicant(s)/Patent Under<br>Reexamination<br>RICCI, CHRISTOPHER P. |             |
|                                   | Examiner<br>RICHARD CAMBY             | Art Unit<br>3661                                                    | Page 1 of 1 |

**U.S. PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name            | Classification |
|---|---|--------------------------------------------------|-----------------|-----------------|----------------|
| * | A | US-2008/0051957                                  | 02-2008         | Breed et al.    | 701/036        |
| * | B | US-2006/0047386                                  | 03-2006         | Kanevsky et al. | 701/036        |
|   | C | US-                                              |                 |                 |                |
|   | D | US-                                              |                 |                 |                |
|   | E | US-                                              |                 |                 |                |
|   | F | US-                                              |                 |                 |                |
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|   | I | US-                                              |                 |                 |                |
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|   | K | US-                                              |                 |                 |                |
|   | L | US-                                              |                 |                 |                |
|   | M | US-                                              |                 |                 |                |

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|   | N |                                                  |                 |         |      |                |
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|   | T |                                                  |                 |         |      |                |

**NON-PATENT DOCUMENTS**

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|-------------------------------------------------------------------------------------------|
|   | U |                                                                                           |
|   | V |                                                                                           |
|   | W |                                                                                           |
|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.          | CONFIRMATION NO. |
|-----------------------------------------------------------------------|-------------|----------------------|------------------------------|------------------|
| 13/679,441                                                            | 11/16/2012  | Christopher P. Ricci | 6583-244                     | 8362             |
| 111285                                                                | 7590        | 05/09/2014           |                              |                  |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>CAMBY, RICHARD M |                  |
|                                                                       |             |                      | ART UNIT                     | PAPER NUMBER     |
|                                                                       |             |                      | 3661                         |                  |
|                                                                       |             |                      | NOTIFICATION DATE            | DELIVERY MODE    |
|                                                                       |             |                      | 05/09/2014                   | ELECTRONIC       |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com

|                              |                                      |                                              |                                                  |
|------------------------------|--------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/679,441 | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                              | <b>Examiner</b><br>RICHARD CAMBY     | <b>Art Unit</b><br>3661                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 4/28/14.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims\*

- 5) ☒ Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-20 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some\*\*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                                                               |                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                                              | 3) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)<br>Paper No(s)/Mail Date ____. | 4) <input type="checkbox"/> Other: ____.                                                |

The present application is being examined under the pre-AIA first to invent provisions.

## **DETAILED ACTION**

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the claims at issue are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).



The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit <http://www.uspto.gov/forms/>. The filing date of the application will determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to <http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp>.

Claims 1-20 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-17, 19 and 20 of copending Application No. 13/679,234. Although the claims at issue are not identical, they are not patentably distinct from each other because the metes and bounds of the claims of the application would obviously have been construed from those of the patent by one having ordinary skill in the art at the time the invention was made.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

Art Unit: 3661

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RICHARD CAMBY whose telephone number is (571)272-6958. The examiner can normally be reached on Tues-Fri 9:00 a.m.-7:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas G. Black can be reached on (571) 272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3661

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RICHARD CAMBY/  
Primary Examiner, Art Unit 3661



# UNITED STATES PATENT AND TRADEMARK OFFICE

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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.             | CONFIRMATION NO.            |
|-----------------------------------------------------------------------|-------------|----------------------|---------------------------------|-----------------------------|
| 13/679,476                                                            | 11/16/2012  | Christopher P. Ricci | 6583-247                        | 2650                        |
| 111285                                                                | 7590        | 05/20/2014           |                                 |                             |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>WILLIAMS, JEFFERY L |                             |
|                                                                       |             |                      | ART UNIT<br>2495                | PAPER NUMBER                |
|                                                                       |             |                      | NOTIFICATION DATE<br>05/20/2014 | DELIVERY MODE<br>ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com

|                              |                                      |                                     |                                                  |
|------------------------------|--------------------------------------|-------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/679,476 | <b>Applicant(s)</b><br>RICCI ET AL. |                                                  |
|                              | <b>Examiner</b><br>JEFFERY WILLIAMS  | <b>Art Unit</b><br>2495             | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 4/20/13.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 5) ☒ Claim(s) 1 – 6, 8 – 18, and 21 – 23 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1 – 6, 8 – 18, and 21 – 23 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 11/16/12 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some \*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                                                                          |                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                                              | 3) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>1/28/14, 10/17/13</u> | 4) <input type="checkbox"/> Other: _____                                                |

**DETAILED ACTION**

This action is in response to the communication filed on 4/20/13.

All objections and rejections not set forth below have been withdrawn.

Claims 1 – 6, 8 – 18, and 21 – 23 are pending.

Any references to applicant's specification are made by way of applicant's U.S. pre-grant printed patent publication.

The present application is being examined under the pre-AIA first to invent provisions.

***Claim Rejections - 35 USC § 112***

The following is a quotation of 35 U.S.C. 112(b):

(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

**Claims 1 – 6, 8 – 18, and 21 – 23 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.**

Regarding claims 1 – 6, 8 – 18, and 21 – 23, the elements of "...computational module selector...", "...plurality of processing modules ...", "...first processing module

1 ...”, “...second processing module ...”, “...arbitration module...”, “...health check  
2 module ...”, “...displayed object movement module ...”, “...media filter module ...”,  
3 “...diagnostic module...”, “...remote control module...”, “...media controller module ...”,  
4 “...installation supervisor module ...”, “...network security module...”, “... network  
5 controller...”, “...unified communications presence reporting module...”, and “...social  
6 networking module...” (e.g. claims 1 – 6, 8 – 18, and 21 – 22), “...computational module  
7 selector to select...”, “...plural computation modules...to perform...”, “...network  
8 selector module to select...”, “...network controller module to cache...”, “social  
9 networking module to enable”, and “processing modules ... to connect to exchange...”  
10 (e.g. claim 23), are limitations that invokes 35 U.S.C. 112, sixth paragraph. However,  
11 the written description fails to disclose the corresponding structure, material, or acts for  
12 the claimed function. The examiner notes that applicant disclosure only broadly recites  
13 general elements such as software, hardware, or logic (e.g. Specification, par. 374-  
14 376). Means-plus-function recitations, however, must be adequately disclosed in the  
15 form of specific computer algorithms or hardware structural features that transform a  
16 general purpose computing device into a specific purpose computing device.

17 Applicant may:

18 (a) Amend the claim so that the claim limitation will no longer be interpreted  
19 as a limitation under 35 U.S.C. 112, sixth paragraph; or

20 (b) Amend the written description of the specification such that it expressly  
21 recites what structure, material, or acts perform the claimed function without introducing  
22 any new matter (35 U.S.C. 132(a)).

If applicant is of the opinion that the written description of the specification already implicitly or inherently discloses the corresponding structure, material, or acts so that one of ordinary skill in the art would recognize what structure, material, or acts perform the claimed function, applicant should clarify the record by either:

(a) Amending the written description of the specification such that it expressly recites the corresponding structure, material, or acts for performing the claimed function and clearly links or associates the structure, material, or acts to the claimed function, without introducing any new matter (35 U.S.C. 132(a)); or

(b) Stating on the record what the corresponding structure, material, or acts, which are implicitly or inherently set forth in the written description of the specification, perform the claimed function. For more information, see 37 CFR 1.75(d) and MPEP §§ 608.01(o) and 2181.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1 – 5, 8 – 13, 19, and 20 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Yakes et al. (Yakes), US 2003/0158638 A1A1.**



1  
2           Regarding claim 1, as best understood in light of the above rejections, Yakes  
3 discloses:

4           *a computational module selector to select a computational module form among*  
5 *plural computation modules in communication with the computational module selector to*  
6 *perform a selected task, operation, and/or function (e.g. Yakes, fig. 2:14, 16 - CPU).*

7       Herein, Yakes discloses a means, comprising a cpu with a control program, which  
8 selects between and operates a plurality of programmed instructions, i.e. modules.

9           *wherein the vehicle further comprises a network selector module to select one of*  
10 *plural communication networks local to the vehicle for transmitting a selected signal and*  
11 *wherein the network selector module selects one of plural communication networks*  
12 *local to the vehicle for transmitting a selected signal based on one or more of*  
13 *network/node status, signal/noise ratio, type of signal, available and/or unavailable*  
14 *bandwidth, network performance parameter(s), and quality of service; wherein each of*  
15 *the afore-mentioned modules are stored in a non-transient, tangible computer readable*  
16 *memory (e.g. Yakes, fig. 2:16 – control program; par. 102, 103). Herein, Yates*  
17 discloses a stored software program, i.e. “network selector module”, that enables the  
18 CPU to select between different communication networks based upon protocol (e.g.  
19 “type of signal”).

20  
21           Regarding claim 2, Yakes discloses:

1           *a plurality of processing modules, a first processing module being in an active*  
2           *mode whereby the first processing module is in primary control of at least most vehicle*  
3           *functions and a second processing module being in a standby mode whereby the*  
4           *second processing module is ready to assume primary control of at least most vehicle*  
5           *functions, wherein the first and second processing modules are in wireless*  
6           *communication with one another, and wherein a state of the second processing module*  
7           *is maintained substantially in synchronicity with a state of the first processing module to*  
8           *a enable a stateful failover from the first processing module to the second processing*  
9           *module (e.g. Yakes, fig. 2:14; par. 184, 185). Herein, the CPU may execute at least*  
10          one module (i.e. primary control). Furthermore, information transfer for at least some of  
11          the modules is accomplished wirelessly.

12  
13          Regarding claim 3, Yakes discloses:

14          *wherein the vehicle comprises an arbitration module to arbitrate hand-off conflicts*  
15          *between duplicated first and second processing modules and wherein the arbitration*  
16          *module selects one of the first and second processing modules to currently possess*  
17          *and/or own a token, the token indicating which processing module is an active*  
18          *processing module and/or which processing module is a standby processing module*  
19          (e.g. Yakes, fig. 2:14, 16 - CPU). CPU's arbitrate the execution of tasks such as by  
20          semaphore.

1           Regarding claim 4, Yakes discloses:

2           *wherein the vehicle further comprises a health check module to determine a*  
3           *corresponding state of health of each of the duplicated first and second processing*  
4           *modules to perform at least one of critical and non-critical tasks, functions, and*  
5           *operations and wherein the health check module performs a check and/or test, in*  
6           *response wherein the health check module performs a check and/or test, in response to*  
7           *an internally generated interrupt and/or request to determine a selected processing*  
8           *module's ability to perform critical and/or non-critical vehicle tasks, functions, and/or*  
9           *operations, assign a score to the selected processing module based on the check*  
10           *and/or test results, and compare the score to one or more thresholds and/or to a score*  
11           *of a different processing module to determine a state of health to determine a state of*  
12           *health of the selected processing module (e.g. Yakes, par. 336).*

13  
14           Regarding claim 5, Yakes discloses:

15           *wherein the vehicle further comprises a displayed object movement module to*  
16           *move displayed objects from a source input/output system to a target input/output*  
17           *system, the source and target input/output systems corresponding to different vehicle*  
18           *occupants and wherein the displayed object movement module selects the and wherein*  
19           *the displayed object movement module selects the target input/output system from*  
20           *among plural input/output systems on board the vehicle based on input from a user of*  
21           *the source input/output system (e.g. Yakes, par. 357).*

1           Regarding claim 8, Yakes discloses:

2           *and wherein the diagnostic module provides the warning and/or error signal to*  
3           *the vehicle occupant and interactively communicates a likely cause of the warning*  
4           *and/or error signal to the occupant and receives a command from the occupant to*  
5           *contact one or more of an emergency service provider, an emergency responder, and a*  
6           *remotely located diagnostic service (e.g. Yakes, par. 91).*

7  
8           Regarding claim 9, Yakes discloses:

9           *and wherein the remote control module is associated with one or more of the*  
10          *vehicle owner, a law enforcement authority, a lender associated with a loan having the*  
11          *vehicle as collateral, and a vehicle manufacturer and wherein the requested vehicle*  
12          *function, is executed or caused to be executed notwithstanding a contrary command*  
13          *from the vehicle operator (e.g. Yakes, par. 281).*

14  
15          Regarding claim 10, Yakes discloses:

16          *and wherein the media controller, in a dependent mode, provides common*  
17          *content synchronously to each of the input/output systems and, in an independent*  
18          *mode, provides different content to different ones of the input/output systems (e.g.*  
19          *Yakes, par. 184).*

Regarding claim 11, Yakes discloses:

*and wherein the newly installed software and/or hardware and/or other component is one or more of an on-board sensor, a processing module or component thereof, a software application, a circuit board, an expansion module or component thereof, a critical or non-critical device, and a cellular upgrade module (e.g. Yakes, fig. 2).*

Regarding claim 12, Yakes discloses:

*wherein the computational module is selected from among plural computational modules, and wherein the plural computational modules comprise one or more vehicle processing devices and one or more occupant computational devices, the one or more occupant computational devices comprising one or more of a mobile phone, personal digital assistant, tablet computer, and laptop computer (e.g. Yakes, fig. 2; par. 297).*

Regarding claim 13, Yakes discloses:

*wherein the computational module is selected from among plural computational modules, and wherein the plural computational modules comprise multiple software applications corresponding to different versions, releases, and/or vendors of a common type of software application (e.g. Yakes, fig. 2). The software modules comprise different types of functions (i.e. different versions).*

Regarding claims 19 and 20, they comprise essentially similar limitations as claim above, and they are rejected, at least, for the same reasons.

***Claim Rejections - 35 USC § 103***

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 21 and 23 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Yakes in view of Yousefi et al. (Yousefi), US 2012/0110356 A1.**

Regarding claim 21, Yakes discloses:

*a computational module selector to select a computational module form among plural computation modules in communication with the computational module selector to perform a selected task, operation, and/or function (e.g. Yakes, fig. 2:14, 16 - CPU).*

Herein, Yakes discloses a means, comprising a cpu with a control program, which selects between and operates a plurality of programmed instructions, i.e. modules.

*wherein the vehicle further comprises a network selector module to select one of plural communication networks local to the vehicle for transmitting a selected signal and wherein the network selector module selects one of plural communication networks*

1 *local to the vehicle for transmitting a selected signal based on one or more of*  
2 *network/node status, signal/noise ratio, type of signal, available and/or unavailable*  
3 *bandwidth, network performance parameter(s), and quality of service; wherein each of*  
4 *the afore-mentioned modules are stored in a non-transient, tangible computer readable*  
5 *memory (e.g. Yakes, fig. 2:16 – control program; par. 102, 103). Herein, Yates*  
6 *discloses a stored software program, i.e. “network selector module”, that enables the*  
7 *CPU to select between different communication networks based upon protocol (e.g.*  
8 *“type of signal”).*

9 *wherein the vehicle further comprises a social networking module to enable*  
10 *processing modules of different vehicles to wirelessly connect to exchange vehicle*  
11 *information (e.g. Yakes, fig. 34; par. 179, 185, 205). Herein, Yates discloses a stored*  
12 *software element, i.e. “social networking module”, which enables the vehicle modules to*  
13 *exchange, over a wireless network, information with other vehicle modules.*

14 Yakes discloses a system of software modules for monitoring a vehicle, such as  
15 by video from a camera (e.g. Yakes, par. 180, 184). However, Yakes does not appear  
16 to disclose caching streaming media within the system.

17 Yousefi also discloses a system for monitoring a vehicle using video from a  
18 camera. Furthermore Yousefi discloses:

19 *wherein the vehicle further comprises a network controller module to cache*  
20 *automatically streaming media in response to a vehicle state change, function, and/or*  
21 *operation ... (e.g. Yousefi, fig. 60, 61; par. 155, 320, 342 - 345). Herein, Yousefi*

discloses that automatically steaming media, such as camera footage, may be cached in the event of a change in vehicle state or operation.

*and wherein the network controller module caches automatically streaming media in response to the vehicle state changing from a parked state to an unparked state* (e.g. Yousefi, fig. 60, 61; par. 346, 347). Herein, Yousefi discloses that automatically steaming media, such as camera footage, may be cached in the event a parked vehicle becomes unsettled or otherwise involved within a collision (i.e. unparked). Furthermore, the examiner notes that while Yousefi does not explicitly state that a collision results in movement or motion, one of ordinary skill will logically recognize in light of physical principle that a collision may result in motion of the parked vehicle.

*wherein each of the afore-mentioned modules are stored in non-transient, tangible computer readable memory* (e.g. Yakes, par. 419, 420).

Regarding claim 23, the examiner notes that the applicant's recitations of a "selector module", "network controller module" and "social networking module" invoke the 35 USC 112, 6th paragraph because the terms do not apply to any specific structure and the applicant does further define their structure within the claim by the recitation of "implemented substantially in software". However, for the applicant's benefit, the examiner notes that if the applicant had intended for the claim language to be interpreted as reciting software modules, and not according to any specific means



disclosed within the applicant's specification, then the examiner finds claim 23 to be rejected, at least, for the same reasons as claim 21.

***Response to Arguments***

Applicant's arguments filed 1/28/14 have been fully considered but they are not persuasive.

*Applicant argues or alleges essentially that:*

...

Without admission as to the validity of these rejections and solely to facilitate prosecution, Applicants cancel Claim 19 and have amended Claims 1-18 to require that each module element be stored in a non-transient, tangible computer readable memory. As mentioned above, Claim 20 is canceled.

Accordingly, the rejections of Claims 1-18 under 35 U.S.C. § 112 should be reconsidered and withdrawn, and the rejections of Claims 19 and 20 under 35 U.S.C. § 112 are moot.

...

(Remarks, pg. 10)

*Examiner respectfully responds:*

The examiner respectfully disagrees. Specifically, the examiner notes that the applicant's claims only recite that the "**afore**-mentioned modules" are stored in memory. However, the applicant fails to address the recited "computational module selector", (which, as best can be determined by the examiner, would correspond to a CPU) or the plurality of subsequently recited modules in the depending claims. These elements do not correspond to known and specific structures and are recited by the applicant in the form of "means-plus-function" language.

*Applicant argues or alleges essentially that:*

...

As stated above, Applicants have amended independent Claim 1 to, inter alia, additionally require the features of now-canceled dependent Claim 7. Because dependent Claim 7 was not rejected under 35 U.S.C. § 102 to Yakes, amended Claim 1 is therefore allowable. Claims 2-28 depend from Claim 1.

Accordingly, for at least the reasons above, Applicants submit that the rejections of Claims 1-18 under 35 U.S.C. § 102 should be reconsidered and withdrawn.

...

(Remarks, pg. 10)

*Examiner respectfully responds:*

The examiner respectfully disagrees. As presently recited, the particular claim limitations of independent claim 1, as noted by the applicant, no longer invoke the use of “means-plus-function” language and therefore, are no longer required to be interpreted, as best could have been determined by the examiner, according to a specific means disclosed within applicant’s specification. Rather, these limitations are broadly limited to any software element that performs the recited function. Thus, the examiner finds the claims to be rejected according to the reasons noted of record.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

***See Notice of References Cited.***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

1 TWO MONTHS of the mailing date of this final action and the advisory action is not  
2 mailed until after the end of the THREE-MONTH shortened statutory period, then the  
3 shortened statutory period will expire on the date the advisory action is mailed, and any  
4 extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of  
5 the advisory action. In no event, however, will the statutory period for reply expire later  
6 than SIX MONTHS from the date of this final action.

7  
8 Any inquiry concerning this communication or earlier communications from the  
9 examiner should be directed to JEFFERY WILLIAMS whose telephone number is  
10 (571)272-7965. The examiner can normally be reached on 9:30-5:30.

11 If attempts to reach the examiner by telephone are unsuccessful, the examiner's  
12 supervisor, Farid Homayounmerhr can be reached on 571-272-3739. The fax phone  
13 number for the organization where this application or proceeding is assigned is 571 -  
14 273-8300.

Art Unit: 2495

1 Information regarding the status of an application may be obtained from the  
2 Patent Application Information Retrieval (PAIR) system. Status information for  
3 published applications may be obtained from either Private PAIR or Public PAIR.  
4 Status information for unpublished applications is available through Private PAIR only.  
5 For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should  
6 you have questions on access to the Private PAIR system, contact the Electronic  
7 Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a  
8 USPTO Customer Service Representative or access to the automated information  
9 system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

11  
12 /JEFFERY WILLIAMS/  
13 Primary Examiner, Art Unit 2495  
14  
15

|                                   |                                       |  |                                                         |             |
|-----------------------------------|---------------------------------------|--|---------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/679,476 |  | Applicant(s)/Patent Under Reexamination<br>RICCI ET AL. |             |
|                                   | Examiner<br>JEFFERY WILLIAMS          |  | Art Unit<br>2495                                        | Page 1 of 1 |

#### U.S. PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name               | Classification |
|---|---|--------------------------------------------------|-----------------|--------------------|----------------|
| * | A | US-2012/0259951 A1                               | 10-2012         | Schalk et al.      | 709/217        |
| * | B | US-2006/0274829 A1                               | 12-2006         | Siemens et al.     | 375/240.01     |
| * | C | US-2014/0125802 A1                               | 05-2014         | Beckert et al.     | 348/148        |
| * | D | US-2012/0284292 A1                               | 11-2012         | Rechsteiner et al. | 707/758        |
| * | E | US-2011/0267204 A1                               | 11-2011         | Chuang et al.      | 340/933        |
| * | F | US-2011/0035098 A1                               | 02-2011         | Goto et al.        | 701/36         |
|   | G | US-                                              |                 |                    |                |
|   | H | US-                                              |                 |                    |                |
|   | I | US-                                              |                 |                    |                |
|   | J | US-                                              |                 |                    |                |
|   | K | US-                                              |                 |                    |                |
|   | L | US-                                              |                 |                    |                |
|   | M | US-                                              |                 |                    |                |

#### FOREIGN PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Country | Name | Classification |
|---|---|--------------------------------------------------|-----------------|---------|------|----------------|
|   | N |                                                  |                 |         |      |                |
|   | O |                                                  |                 |         |      |                |
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|   | R |                                                  |                 |         |      |                |
|   | S |                                                  |                 |         |      |                |
|   | T |                                                  |                 |         |      |                |

#### NON-PATENT DOCUMENTS

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|-------------------------------------------------------------------------------------------|
|   | U |                                                                                           |
|   | V |                                                                                           |
|   | W |                                                                                           |
|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



# UNITED STATES PATENT AND TRADEMARK OFFICE

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|-----------------------------------------------------------------------|-------------|----------------------|-----------------------------------------|-----------------------------|
| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.                     | CONFIRMATION NO.            |
| 13/828,513                                                            | 03/14/2013  | Christopher P. Ricci | 6583-247-CIP                            | 2080                        |
| 111285                                                                | 7590        | 05/06/2014           |                                         |                             |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>ARTHUR JEANGLAUDE, GERTRUDE |                             |
|                                                                       |             |                      | ART UNIT<br>3661                        | PAPER NUMBER                |
|                                                                       |             |                      | NOTIFICATION DATE<br>05/06/2014         | DELIVERY MODE<br>ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com

|                              |                                                  |                                              |                                                  |
|------------------------------|--------------------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/828,513             | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                              | <b>Examiner</b><br>GERTRUDE ARTHUR<br>JEANGLAUDE | <b>Art Unit</b><br>3661                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 3/14/13.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims\*

- 5) ☒ Claim(s) 1-21 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-21 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 3/14/13 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some\*\*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)  
Paper No(s)/Mail Date \_\_\_\_.
- 3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_.
- 4) ☐ Other: \_\_\_\_.

**Ford Ex. 1002 Page 440 of 1178**



The present application is being examined under the pre-AIA first to invent provisions.

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 103***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-21 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jung et al. (U.S. Pub No. 20120116609) in view of Brinkmeyer et al. (U.S. Patent No. 5,838,251).

Regarding claims 1, 8, 15, Jung et al. disclose a method, a vehicle, and a non-transient, tangible computer readable medium comprising: a microprocessor executable remote control module operable to receive, via a remote node, a command from a vehicle owner to configure and/or alter and/or determine a state of a selected vehicle component (See abstract) Jung et al. fail to specifically disclose and, when the vehicle

Art Unit: 3661

owner is authenticated successfully by the remote control module, to configure and/or alter and/or determine a state of the selected vehicle component. In an analogous art, Brinkmeyer et al. disclose authenticating successfully (avoiding unauthorized attempts See abstract). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Jung et al. with that of Brinkmeyer et al. by authenticating successfully by the remote module to configure and/or alter and/or determine a state of the selected vehicle component in order to provide anti-theft protection.

Regarding claims 2, 9, 16, Brinkmeyer et al. disclose the selected vehicle component is an on board input/output system and wherein the configuration and/or alteration is one or more of moving graphical object to another location, removing a graphical object from the input/output system, adding a graphical object to the input/output system, adding wall paper to the input/output system, and altering a setting of the input/output system (See abstract; col. 2, lines 47-60).

Regarding claims 3, 10, 17, Jung et al. disclose the selected vehicle component is a programmable hard button and wherein the configuration and/or alteration is to assign, to the hard button, a different function (See paragraph 0047).

Regarding claims 4, 11, 18, Jung et al. disclose the command is to download content from the Internet and save the downloaded content in on board memory of the vehicle (See Fig. 1; paragraph 0012).

Regarding claims 5, 12, 19, Brinkmeyer et al. disclose the command is to change a vehicle performance mode from a first performance configuration to a second

Art Unit: 3661

performance configuration and/or alter a setting of a vehicle component associated with a power unit and/or drive train of the vehicle (See col. 2, lines 11-31).

Regarding claims 6, 13, 20, Jung et al. disclose the command is to determine a state of the selected vehicle component (See paragraph 0018).

Regarding claims 7, 14, 21, Jung et al. disclose all but fails to specifically disclose wherein, when a vehicle occupant is identified, the remote control module automatically configures the selected vehicle component as desired by the identified occupant. In an analogous art, Brinkmeyer et al. disclose when a vehicle occupant is identified (unauthorized attempt) (See abstract). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Jung et al. with that of Brinkmeyer et al. by automatically configuring the selected vehicle component as desired by the identified occupant when the vehicle occupant is identified in order to provide anti-theft protection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GERTRUDE ARTHUR JEANGLAUDE whose telephone number is (571)272-6954. The examiner can normally be reached on Monday-Friday from 8:30 a.m. to 6:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Black can be reached on (571) 272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3661

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/GERTRUDE ARTHUR JEANGLAUDE/  
Primary Examiner, Art Unit 3661

|                                   |                                       |  |                                                                  |             |
|-----------------------------------|---------------------------------------|--|------------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/828,513 |  | Applicant(s)/Patent Under Reexamination<br>RICCI, CHRISTOPHER P. |             |
|                                   | Examiner<br>GERTRUDE ARTHUR           |  | Art Unit<br>3661                                                 | Page 1 of 1 |

#### U.S. PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name                      | Classification |
|---|---|--------------------------------------------------|-----------------|---------------------------|----------------|
| * | A | US-2012/0116609                                  | 05-2012         | Jung et al.               | 701/2          |
| * | B | US-2012/0089299                                  | 04-2012         | Breed, David S.           | 701/36         |
| * | C | US-2012/0313771                                  | 12-2012         | Wittliff, III, William W. | 340/441        |
| * | D | US-5,838,251                                     | 11-1998         | Brinkmeyer et al.         | 340/5.22       |
| * | E | US-5,363,306                                     | 11-1994         | Kuwahara et al.           | 701/461        |
| * | F | US-5,710,702                                     | 01-1998         | Hayashi et al.            | 701/1          |
| * | G | US-5,648,769                                     | 07-1997         | Sato et al.               | 340/988        |
|   | H | US-                                              |                 |                           |                |
|   | I | US-                                              |                 |                           |                |
|   | J | US-                                              |                 |                           |                |
|   | K | US-                                              |                 |                           |                |
|   | L | US-                                              |                 |                           |                |
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#### FOREIGN PATENT DOCUMENTS

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|---|---|--------------------------------------------------|-----------------|---------|------|----------------|
|   | N |                                                  |                 |         |      |                |
|   | O |                                                  |                 |         |      |                |
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|   | R |                                                  |                 |         |      |                |
|   | S |                                                  |                 |         |      |                |
|   | T |                                                  |                 |         |      |                |

#### NON-PATENT DOCUMENTS

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|-------------------------------------------------------------------------------------------|
|   | U |                                                                                           |
|   | V |                                                                                           |
|   | W |                                                                                           |
|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



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|-----------------------------------------------------------------------|-------------|----------------------|-----------------------------|------------------|
| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.         | CONFIRMATION NO. |
| 13/829,718                                                            | 03/14/2013  | Christopher P. Ricci | 6583-247-CIP-10             | 1406             |
| 111285                                                                | 7590        | 04/10/2014           | EXAMINER                    |                  |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | ARTHUR JEANGLAUDE, GERTRUDE |                  |
|                                                                       |             |                      | ART UNIT                    | PAPER NUMBER     |
|                                                                       |             |                      | 3661                        |                  |
|                                                                       |             |                      | NOTIFICATION DATE           | DELIVERY MODE    |
|                                                                       |             |                      | 04/10/2014                  | ELECTRONIC       |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com

|                              |                                                  |                                              |                                                  |
|------------------------------|--------------------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/829,718             | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                              | <b>Examiner</b><br>GERTRUDE ARTHUR<br>JEANGLAUDE | <b>Art Unit</b><br>3661                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 3/14/13.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims\*

- 5) ☒ Claim(s) 1-24 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-24 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 3/14/13 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some\*\*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)  
Paper No(s)/Mail Date \_\_\_\_.
- 3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_.
- 4) ☐ Other: \_\_\_\_.

**Ford Ex. 1002 Page 447 of 1178**

The present application is being examined under the pre-AIA first to invent provisions.

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 102***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-24 rejected under pre-AIA 35 U.S.C. 102(b) based upon a public use or sale of the invention. over Breed et al. (U.S. Pub No. 20080129475).

Regarding claims 1, 9, 17, Breed et al. disclose a vehicle, comprising: a microprocessor executable diagnostic module operable to receive, from a vehicle component, a signal regarding a warning and/or error and select a destination for the signal from a plurality of destinations, the plurality of destinations comprising one or more of a vehicle input/output system to present the warning and/or error to a vehicle occupant, an emergency service provider, an emergency responder, a manufacturer of the vehicle, a service facility located in proximity to a current vehicle location, and a



Art Unit: 3661

remotely located diagnostic service to diagnose a cause of the warning and/or error signal (See paragraph 0946, 0949, 1201).

Regarding claims 2, 10, 18, Breed et al. disclose the diagnostic module queries one or more of an on board sensor, on board monitor, critical system controller, and non-critical system controller to determine a corresponding state, determines a diagnosis of the warning and/or error using locally and/or remotely stored pre-determined logic, and generates repair advice and/or a warning and/or an instruction and/or a recommendation to a vehicle operator (See paragraph 1201).

Regarding claims 3, 11, 19, Breed et al. disclose the diagnostic module locates and/or determines and/or identifies a part and/or component required to repair the vehicle and a source for the replacement part and/or component and orders the replacement part and/or component (See paragraph 1201).

Regarding claims 4, 12, 20, Breed et al. disclose the diagnostic module locates and/or determines and/or identifies, based on a current satellite-based location of the vehicle, the service facility, provides the diagnosis of the warning and/or error, and obtains from the service facility one or more of an estimated charge to repair the vehicle, an earliest available appointment to repair the vehicle, and an estimated time required to repair the vehicle (See paragraph 1202).

Regarding claims 5, 13, 21, Breed et al. disclose the diagnostic module contacts plural service facilities, provides, by way of comparison, the one or more of an estimated charge to repair the vehicle, an earliest available appointment to repair the vehicle, and the estimated time required to repair the vehicle received from each service

Art Unit: 3661

facility, and recommends a preferred service facility for repairing the vehicle (See 0741, 0257).

Regarding claims 6, 14, 22, Breed et al. disclose the diagnostic module forwards the signal to one or more of the manufacturer and service facility that compares the warning and/or error and vehicle-specific parameters to a maintenance and/or fault history for a model of the vehicle and provides, to a vehicle operator, the result of the comparison along with a probability of the diagnosis being correct (See paragraph 0741, 0257, 0219).

Regarding claims 7, 15, 23, Breed et al. disclose the forwarded signal comprises a current physical location of the vehicle, an identity of the vehicle and/or vehicle owner or occupant, and diagnostic information and/or a diagnosed cause of the warning and/or error signal and wherein the one or more of the manufacturer and service facility one or more of dispatches an emergency service provider and/or a first responder to the physical location of the vehicle, schedules the vehicle to be repaired by the service facility, and pre-orders a replacement part and/or component required to repair a diagnosed source of the warning and/or error signal (See paragraph 0741, 1202).

Regarding claims 8, 16, 24, Breed et al. disclose the diagnostic module at least one of forwards at least part of the warning and/or error signal to the remotely located diagnostic service to diagnose a cause of the warning and/or error signal and performs local diagnosis of the cause of the warning and/or error signal and interactively engages in a conversational interaction with the vehicle operator regarding the diagnosed cause

Art Unit: 3661

of the warning and/or error, wherein the responses in the interactive conversational interaction are based on a menu-type structure (See 1202, 1204).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GERTRUDE ARTHUR JEANGLAUDE whose telephone number is (571)272-6954. The examiner can normally be reached on Monday-Friday from 8:30 a.m. to 6:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Black can be reached on (571) 272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/GERTRUDE ARTHUR JEANGLAUDE/  
Primary Examiner, Art Unit 3661

|                                   |                                       |                                                                     |             |
|-----------------------------------|---------------------------------------|---------------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/829,718 | Applicant(s)/Patent Under<br>Reexamination<br>RICCI, CHRISTOPHER P. |             |
|                                   | Examiner<br>GERTRUDE ARTHUR           | Art Unit<br>3661                                                    | Page 1 of 1 |

**U.S. PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name         | Classification |
|---|---|--------------------------------------------------|-----------------|--------------|----------------|
| * | A | US-2008/0129475                                  | 06-2008         | Breed et al. | 340/438        |
|   | B | US-                                              |                 |              |                |
|   | C | US-                                              |                 |              |                |
|   | D | US-                                              |                 |              |                |
|   | E | US-                                              |                 |              |                |
|   | F | US-                                              |                 |              |                |
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|   | K | US-                                              |                 |              |                |
|   | L | US-                                              |                 |              |                |
|   | M | US-                                              |                 |              |                |

**FOREIGN PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Country | Name | Classification |
|---|---|--------------------------------------------------|-----------------|---------|------|----------------|
|   | N |                                                  |                 |         |      |                |
|   | O |                                                  |                 |         |      |                |
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|   | S |                                                  |                 |         |      |                |
|   | T |                                                  |                 |         |      |                |

**NON-PATENT DOCUMENTS**

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|-------------------------------------------------------------------------------------------|
|   | U |                                                                                           |
|   | V |                                                                                           |
|   | W |                                                                                           |
|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



# UNITED STATES PATENT AND TRADEMARK OFFICE

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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.                     | CONFIRMATION NO.            |
|-----------------------------------------------------------------------|-------------|----------------------|-----------------------------------------|-----------------------------|
| 13/830,003                                                            | 03/14/2013  | Christopher P. Ricci | 6583-247-CIP-13                         | 7921                        |
| 111285                                                                | 7590        | 04/15/2014           |                                         |                             |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>ARTHUR JEANGLAUDE, GERTRUDE |                             |
|                                                                       |             |                      | ART UNIT<br>3661                        | PAPER NUMBER                |
|                                                                       |             |                      | NOTIFICATION DATE<br>04/15/2014         | DELIVERY MODE<br>ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com

|                              |                                                  |                                              |                                                  |
|------------------------------|--------------------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/830,003             | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                              | <b>Examiner</b><br>GERTRUDE ARTHUR<br>JEANGLAUDE | <b>Art Unit</b><br>3661                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 3/14/13.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims\*

- 5) ☒ Claim(s) 1-24 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-24 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 3/14/13 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some\*\*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)  
Paper No(s)/Mail Date \_\_\_\_.
- 3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_.
- 4) ☐ Other: \_\_\_\_.

**Ford Ex. 1002 Page 454 of 1178**

The present application is being examined under the pre-AIA first to invent provisions.

## **DETAILED ACTION**

### ***Specification***

The disclosure is objected to because of the following informalities: In page 2, the serial number information needs to be updated. Also at page 12 of the specification, the paragraph starting at lines 10-15 needs to be deleted since it is not a description of the invention. Appropriate correction is required.

### ***Information Disclosure Statement***

The IDS filed on 10/18/13 on PTO/SB08 have been considered. However for printing purposes at the end of prosecution, if not already done so, it is required to have all cited references in form 1449. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of 35 U.S.C. 112(b):

(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-24 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly

Art Unit: 3661

claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

In claims 1, 17, the phrase “a microprocessor executable displayed object movement module” is unclear.

In claim 9, the connection among the phrases “microprocessor executable instructions that,” “when executed and upon selection” “by a source vehicle occupant” is unclear.

Claims 2-8, 10-16, 18-24 are also rejected for incorporating the deficiencies of their base claim.

***Claim Rejections - 35 USC § 102***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-24 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Breed (U.S. Pub No. 20070057781).



Regarding claims 1, 9, 17, as best understood, Breed discloses a method, a non-transient, tangible computer readable medium, a vehicle comprising: a microprocessor executable displayed object movement module operable to receive a selected target vehicle display and/or target vehicle occupant to receive a currently displayed object on a source vehicle display of a source vehicle occupant and forward the currently displayed object, in substantial real time, to the selected target vehicle display of the target vehicle occupant and/or a portable computational device associated with the target vehicle occupant and currently located within the vehicle (See paragraph 0016, 0017).

Regarding claims 2, 10, 18, Breed discloses the displayed object is one or more of streaming video, a web page, an icon, a window, and an application and wherein the currently displayed object is directed by a media controller on board the vehicle to the selected target vehicle display of the target vehicle occupant, and/or a computational device associated with the target vehicle occupant and currently located within the vehicle and is not transmitted by a network component located physically outside of the vehicle (See 0017 for remote transmission, 0222, 0784, 0806, 0965).

Regarding claims 3, 11, 19, Breed discloses the selected target vehicle display and/or target vehicle occupant is selected by the source vehicle occupant by one or more of a gesture received by the source vehicle display, the gesture indicating a position and/or orientation of the target vehicle display and/or target vehicle occupant relative to the source vehicle display, a selection, received by the source vehicle display, of the target vehicle display, and a selection, received by the source vehicle

Art Unit: 3661

display, of an identifier associated with the target vehicle occupant and wherein the displayed object is one or more of streaming video, a web page, an icon, a window, and an application (See paragraph 0222, 1012).

Regarding claims 4, 12, 20, Breed discloses gestures used (See paragraph 1011) wherein the selected target vehicle display and/or target vehicle occupant is selected by the source vehicle occupant by the gesture being received by the source vehicle display and wherein the gesture indicates a vector originating substantially at a seating position of the source vehicle occupant and pointing towards a seating position of the target vehicle occupant (See paragraph 0989).

Regarding claims 5, 13, 21, Breed discloses the selected target vehicle display and/or target vehicle occupant is selected by the source vehicle occupant by the selection, received by the source vehicle display, of the target vehicle display and wherein the selection is made by the source vehicle occupant selecting a seating position of the target vehicle occupant on a displayed seating diagram of the vehicle (See 0989).

Regarding claims 6, 14, 22, Breed discloses The vehicle of claim 1, wherein the source vehicle occupant selects multiple target vehicle occupants and wherein the displayed object is provided, substantially simultaneously, to the selected multiple target vehicle occupants (See paragraph 0981).

Regarding claims 7, 15, 23, Breed discloses the displayed object movement module determines whether the target vehicle display is activated and, when not

Art Unit: 3661

activated, causes the target vehicle display to be activated to receive the displayed object (See paragraph 0977).

Regarding claims 8, 16, 24, Breed discloses the displayed object movement module determines whether the target vehicle display is activated and, when not activated, causes the displayed object to be transmitted to the computational device associated with the target vehicle occupant (See paragraph 0993, 0776, 0946, 0949).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GERTRUDE ARTHUR JEANGLAUDE whose telephone number is (571)272-6954. The examiner can normally be reached on Monday-Friday from 8:30 a.m. to 6:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Black can be reached on (571) 272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/GERTRUDE ARTHUR JEANGLAUDE/  
Primary Examiner, Art Unit 3661

|                                   |                                       |                                                                     |             |
|-----------------------------------|---------------------------------------|---------------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/830,003 | Applicant(s)/Patent Under<br>Reexamination<br>RICCI, CHRISTOPHER P. |             |
|                                   | Examiner<br>GERTRUDE ARTHUR           | Art Unit<br>3661                                                    | Page 1 of 1 |

**U.S. PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name            | Classification |
|---|---|--------------------------------------------------|-----------------|-----------------|----------------|
| * | A | US-2007/0057781                                  | 03-2007         | Breed, David S. | 340/457.1      |
|   | B | US-                                              |                 |                 |                |
|   | C | US-                                              |                 |                 |                |
|   | D | US-                                              |                 |                 |                |
|   | E | US-                                              |                 |                 |                |
|   | F | US-                                              |                 |                 |                |
|   | G | US-                                              |                 |                 |                |
|   | H | US-                                              |                 |                 |                |
|   | I | US-                                              |                 |                 |                |
|   | J | US-                                              |                 |                 |                |
|   | K | US-                                              |                 |                 |                |
|   | L | US-                                              |                 |                 |                |
|   | M | US-                                              |                 |                 |                |

**FOREIGN PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Country | Name | Classification |
|---|---|--------------------------------------------------|-----------------|---------|------|----------------|
|   | N |                                                  |                 |         |      |                |
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**NON-PATENT DOCUMENTS**

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|-------------------------------------------------------------------------------------------|
|   | U |                                                                                           |
|   | V |                                                                                           |
|   | W |                                                                                           |
|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.              | CONFIRMATION NO.            |
|-----------------------------------------------------------------------|-------------|----------------------|----------------------------------|-----------------------------|
| 13/678,773                                                            | 11/16/2012  | Christopher P. Ricci | 6583-315                         | 5713                        |
| 111285                                                                | 7590        | 12/30/2013           |                                  |                             |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>BUTLER, RODNEY ALLEN |                             |
|                                                                       |             |                      | ART UNIT<br>3667                 | PAPER NUMBER                |
|                                                                       |             |                      | NOTIFICATION DATE<br>12/30/2013  | DELIVERY MODE<br>ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

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flexpatents@sheridanross.com

|                              |                                      |                                              |                                                  |
|------------------------------|--------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/678,773 | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                              | <b>Examiner</b><br>RODNEY BUTLER     | <b>Art Unit</b><br>3667                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10/09/2013.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims\*

- 5) ☒ Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-20 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 11/16/2012 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some\*\*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)  
Paper No(s)/Mail Date 10/18/2013
- 3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 4) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Status of the Application*

1. The present application is being examined under the pre-AIA first to invent provisions.

### *Status of the Claims*

2. This action is in response to the applicant's filing on October 18, 2013. Claims 1-20 are pending and examined below.

### *Response to Arguments*

3. Applicant's arguments with respect to claims 1-20 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

### *Claim Rejections - 35 USC § 102*

4. The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claim 1, 3, 9-11, 13, 19 and 20 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by **cited** U.S. Patent Application Publication No. 2011/0105097 A1 to Tadayon et al. (herein after "Tadayon et al. publication).

As to **claims 1, 3, 9-11, 13, 19 and 20**,



the Tadayon et al. publication discloses **a system to associate a stand-alone computing device and a vehicle comprising:**

**a vehicle (700) including the stand-alone computing device (704) and an additional console display** (not shown but interpreted as the computer console in the vehicle used to control the music, A/C, etc.), **one or more of the vehicle (700) or stand-alone computing device (704) adapted to determine if the stand-alone computing device is in the vehicle (700)**(see ¶17, ¶58 and Figure 3(a));

**a tracking module** (see ¶46, where the Tadayon et al. publication discusses using GPS services to track the mobile device or the vehicle's position), **executed by the stand-alone computing device (704), adapted to determine stand-alone computing device identifier for a stand-alone computing device to be associated with the vehicle** (see ¶52-¶54);

**if the stand-alone device is not in the vehicle, a location module (752, 758), executed by the stand- alone device (704)**(see ¶90), **adapted to:**

**initiate a locator routine to determine a location of the stand-alone computing device;**

**provide stand-alone computing device location information, to the vehicle (700), about the location of the stand-alone computing device (704); and**

**one or more of the additional console display or a communications device that provides the stand-alone computing device location information.** (See ¶52-¶54 and ¶56.)

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims **2, 7, 8, 12, 17 and 18** are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over the Tadayon et al. publication in view of U.S. Patent No. 5,794,164 to Beckert et al. (herein after "Beckert et al. patent").

As to **claims 2, 7, 8, 12, 17 and 18**,

The Tadayon et al. publication discloses the invention substantially as claimed, including restricting some form of access to the vehicle. (See ¶145-¶146.) However, the Tadayon et al. publication does not specifically disclose **the stand-alone computing device that includes a key to authorize use of the vehicle, the driver being reminded to associate the stand-alone computing device with the vehicle prior to movement, and the stand-alone computing device being dockable and integrally functionable with the vehicle.**

The Beckert et al. patent, on the other hand, teaches the idea of **a key used to authorize use of the vehicle** (see Column 9, lines 42-51), **the driver being reminded to associate the stand-alone computing device (22, 48, 64) with the vehicle prior to movement** (see Column 9, lines 51-53, where the Beckert et al. patent discloses asking the driver for a pin number as added security. This added security can be interpreted as a reminder to the driver before using the car.), **and the stand-alone**

Art Unit: 3667

**computing device (22, 48, 64) being dockable and integrally functionable with the vehicle.** (See Column 4, lines 51-55, Column 11, line 66 through Column 12, line 5.)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify and provide the system of the Tadayon et al. publication with a key used to authorize use of the vehicle, as taught by the Beckert et al. patent, in order to increase security of the vehicle, thereby preventing theft.

It also would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of the Tadayon et al. publication by reminding the driver to associate the stand-alone computing device with the vehicle prior to movement of the vehicle, as suggest by the Beckert et al. patent, in order to increase security and functionality of the vehicle.

It would have been further obvious to one having ordinary skill in the art at the time the invention was made to modify the system of the Tadayon et al. publication so that the stand-alone computing device is dockable and integrally functionable with the vehicle, as taught by the Beckert et al. patent, in order to increase functionality of the vehicle.

8. Claims 4 and 14 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over the Tadayon et al. publication in view of U.S. Patent Application Publication No. 2011/0053506 A1 to Lemke et al. (herein after “Lemke et al. publication”).

As to **claims 4 and 14**,

The Tadayon et al. publication discloses the invention substantially as claimed, except for **a proximity module that determines whether the stand-alone computing device is near, but not associated with, the vehicle.**

The Lemke et al. publication, on the other hand, teaches the idea of using a proximity module (278) that determines whether the stand-alone computing device is near, but not associated with, the vehicle. (See ¶26, lines 1-3.)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify and provide the Tadayon et al. publication with a proximity module that determines whether the stand-alone computing device is near, but not associated with, the vehicle, as taught by the Lemke et al. publication, in order to in order to increase security of the vehicle, thereby preventing theft.

9. Claims 5, 6, 15, and 16 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over the Tadayon et al. publication in view of U.S. Patent Application Publication No. 2010/0222939 A1 to Namburu et al. (herein after “Namburu et al. patent”).

As to **claims 5, 6, 15, and 16,**

The Tadayon et al. publication discloses the invention substantially as claimed, except for **the stand-alone computing device being capable of disabling or remotely disabling one or more features of the vehicle.**

The Namburu et al. patent, on the other hand, teaches the idea of **a stand-alone computing device (110) capable of disabling or remotely disabling one or more features of the vehicle (130).** (See ¶46.)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the Tadayon et al. publication by allowing the stand-alone computing device to disable or remotely disable one or more features of the vehicle, as suggested by the Namburu et al. patent, in order to allow the user to manage the operation of the vehicle and/or various diagnostic information regarding various systems of the vehicle.

### ***Conclusion***

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RODNEY BUTLER whose telephone number is

Art Unit: 3667

(313)446-6513. The examiner can normally be reached on Monday - Friday, 6:30 am - 3:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James P. Trammell can be reached on (571) 272-6712. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. B./  
Examiner, Art Unit 3667

/MARY CHEUNG/  
Primary Examiner, Art Unit 3667



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

## NOTICE OF ALLOWANCE AND FEE(S) DUE

111285 7590 04/02/2014  
Sheridan Ross P.C.  
1560 Broadway  
Suite 1200  
Denver, CO 80202

EXAMINER

BUTLER, RODNEY ALLEN

ART UNIT

PAPER NUMBER

3667

DATE MAILED: 04/02/2014

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
|-----------------|-------------|----------------------|---------------------|------------------|

13/678,773

11/16/2012

Christopher P. Ricci

6583-315

5713

TITLE OF INVENTION: LOCATION INFORMATION EXCHANGE BETWEEN VEHICLE AND DEVICE

| APPLN. TYPE    | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|---------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | UNDISCOUNTED  | \$960         | \$0                 | \$0                  | \$960            | 07/02/2014 |

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

### HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

# PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**  
**Commissioner for Patents**  
**P.O. Box 1450**  
**Alexandria, Virginia 22313-1450**  
**or Fax** **(571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

111285 7590 04/02/2014  
**Sheridan Ross P.C.**  
**1560 Broadway**  
**Suite 1200**  
**Denver, CO 80202**

## Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

|                    |
|--------------------|
| (Depositor's name) |
| (Signature)        |
| (Date)             |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 13/678,773      | 11/16/2012  | Christopher P. Ricci | 6583-315            | 5713             |

TITLE OF INVENTION: LOCATION INFORMATION EXCHANGE BETWEEN VEHICLE AND DEVICE

| APPLN. TYPE    | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|---------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | UNDISCOUNTED  | \$960         | \$0                 | \$0                  | \$960            | 07/02/2014 |

| EXAMINER             | ART UNIT | CLASS-SUBCLASS |
|----------------------|----------|----------------|
| BUTLER, RODNEY ALLEN | 3667     | 701-519000     |

|                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</b><br><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.<br><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. <b>Use of a Customer Number is required.</b> | <b>2. For printing on the patent front page, list</b><br>(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,<br>(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.<br>1 _____<br>2 _____<br>3 _____ |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

|                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>4a. The following fee(s) are submitted:</b><br><input type="checkbox"/> Issue Fee<br><input type="checkbox"/> Publication Fee (No small entity discount permitted)<br><input type="checkbox"/> Advance Order - # of Copies _____ | <b>4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)</b><br><input type="checkbox"/> A check is enclosed.<br><input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.<br><input type="checkbox"/> The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form). |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

**NOTE:** Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

**NOTE:** If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

**NOTE:** Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature \_\_\_\_\_ Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_ Registration No. \_\_\_\_\_





# UNITED STATES PATENT AND TRADEMARK OFFICE

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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.  | CONFIRMATION NO. |
|-----------------------------------------------------------------------|-------------|----------------------|----------------------|------------------|
| 13/678,773                                                            | 11/16/2012  | Christopher P. Ricci | 6583-315             | 5713             |
| 111285                                                                | 7590        | 04/02/2014           | EXAMINER             |                  |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | BUTLER, RODNEY ALLEN |                  |
|                                                                       |             |                      | ART UNIT             | PAPER NUMBER     |
|                                                                       |             |                      | 3667                 |                  |

DATE MAILED: 04/02/2014

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

## OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

### Privacy Act Statement

**The Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation of potential violation of law or regulations.

|                               |                                      |                                              |                                                  |
|-------------------------------|--------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Notice of Allowability</b> | <b>Application No.</b><br>13/678,773 | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                               | <b>Examiner</b><br>RODNEY BUTLER     | <b>Art Unit</b><br>3667                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the claim amendments filed on February 27, 2014.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 1-20. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

- a) ☐ All    b) ☐ Some    \*c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.  
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.  
**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |                                                                                                            |                                                                           |
|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)                                           | 5. <input type="checkbox"/> Examiner's Amendment/Comment                  |
| 2. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date _____    | 6. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material | 7. <input type="checkbox"/> Other _____.                                  |
| 4. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____.                     |                                                                           |

/MARY CHEUNG/  
Primary Examiner, Art Unit 3667



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| APPLICATION NO.                                                       | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.             | CONFIRMATION NO.            |
|-----------------------------------------------------------------------|-------------|----------------------|---------------------------------|-----------------------------|
| 13/679,887                                                            | 11/16/2012  | Christopher P. Ricci | 6583-316                        | 4340                        |
| 111285                                                                | 7590        | 06/30/2014           |                                 |                             |
| Sheridan Ross P.C.<br>1560 Broadway<br>Suite 1200<br>Denver, CO 80202 |             |                      | EXAMINER<br>MITCHELL, NATHAN A  |                             |
|                                                                       |             |                      | ART UNIT<br>2646                | PAPER NUMBER                |
|                                                                       |             |                      | NOTIFICATION DATE<br>06/30/2014 | DELIVERY MODE<br>ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

flexpatents@sheridanross.com

|                              |                                      |                                              |                                                  |
|------------------------------|--------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/679,887 | <b>Applicant(s)</b><br>RICCI, CHRISTOPHER P. |                                                  |
|                              | <b>Examiner</b><br>NATHAN MITCHELL   | <b>Art Unit</b><br>2646                      | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11/16/2012.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims\*

- 5) ☒ Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 6) ☒ Claim(s) 1-15 is/are allowed.
- 7) ☒ Claim(s) 16-20 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 11/16/2012 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

#### Certified copies:

- a) ☐ All    b) ☐ Some\*\*    c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 4) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. The present application is being examined under the pre-AIA first to invent provisions.

#### ***Claim Rejections - 35 USC § 101***

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 16-20 are rejected under 35 U.S.C. 101 because the broadest reasonable interpretation of “computer readable medium” encompasses non-statutory subject matter such as transitory signals.

#### ***Allowable Subject Matter***

2. Claims 1-15 are allowed. Prior art of record fails to disclose the totality of the claimed subject matter.

#### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHAN MITCHELL whose telephone number is (571)270-3117. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lester Kincaid can be reached on (571)272-7922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2646

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NATHAN MITCHELL/

Primary Examiner, Art Unit 2646

|                                   |                                       |  |                                                                  |             |
|-----------------------------------|---------------------------------------|--|------------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/679,887 |  | Applicant(s)/Patent Under Reexamination<br>RICCI, CHRISTOPHER P. |             |
|                                   | Examiner<br>NATHAN MITCHELL           |  | Art Unit<br>2646                                                 | Page 1 of 2 |

#### U.S. PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name                    | Classification |
|---|---|--------------------------------------------------|-----------------|-------------------------|----------------|
| * | A | US-2002/0105968 A1                               | 08-2002         | Pruzan et al.           | 370/465        |
| * | B | US-2008/0090522 A1                               | 04-2008         | OYAMA, Shigeki          | 455/41.2       |
| * | C | US-7,493,140 B2                                  | 02-2009         | Michmerhuizen et al.    | 455/552.1      |
| * | D | US-2011/0184789 A1                               | 07-2011         | Kirsch, David M.        | 705/14.1       |
| * | E | US-2012/0006610 A1                               | 01-2012         | Wallace et al.          | 180/272        |
| * | F | US-8,432,260 B2                                  | 04-2013         | Talty et al.            | 340/10.51      |
| * | G | US-2013/0190978 A1                               | 07-2013         | Kato et al.             | 701/36         |
| * | H | US-8,532,574 B2                                  | 09-2013         | Kirsch, David M.        | 455/41.2       |
| * | I | US-2013/0288606 A1                               | 10-2013         | Kirsch, David Michael   | 455/41.3       |
| * | J | US-2013/0295901 A1                               | 11-2013         | Abramson et al.         | 455/418        |
| * | K | US-2013/0309977 A1                               | 11-2013         | Heines et al.           | 455/67.7       |
| * | L | US-2014/0066014 A1                               | 03-2014         | Nicholson et al.        | 455/411        |
| * | M | US-2014/0088798 A1                               | 03-2014         | Himmelstein, Richard B. | 701/2          |

#### FOREIGN PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Country | Name | Classification |
|---|---|--------------------------------------------------|-----------------|---------|------|----------------|
|   | N |                                                  |                 |         |      |                |
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|   | R |                                                  |                 |         |      |                |
|   | S |                                                  |                 |         |      |                |
|   | T |                                                  |                 |         |      |                |

#### NON-PATENT DOCUMENTS

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|-------------------------------------------------------------------------------------------|
|   | U |                                                                                           |
|   | V |                                                                                           |
|   | W |                                                                                           |
|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



|                                   |                                       |                                                                     |             |
|-----------------------------------|---------------------------------------|---------------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/679,887 | Applicant(s)/Patent Under<br>Reexamination<br>RICCI, CHRISTOPHER P. |             |
|                                   | Examiner<br>NATHAN MITCHELL           | Art Unit<br>2646                                                    | Page 2 of 2 |

**U.S. PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name               | Classification |
|---|---|--------------------------------------------------|-----------------|--------------------|----------------|
| * | A | US-2014/0120829 A1                               | 05-2014         | BHAMIDIPATI et al. | 455/3.06       |
|   | B | US-                                              |                 |                    |                |
|   | C | US-                                              |                 |                    |                |
|   | D | US-                                              |                 |                    |                |
|   | E | US-                                              |                 |                    |                |
|   | F | US-                                              |                 |                    |                |
|   | G | US-                                              |                 |                    |                |
|   | H | US-                                              |                 |                    |                |
|   | I | US-                                              |                 |                    |                |
|   | J | US-                                              |                 |                    |                |
|   | K | US-                                              |                 |                    |                |
|   | L | US-                                              |                 |                    |                |
|   | M | US-                                              |                 |                    |                |

**FOREIGN PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Country | Name | Classification |
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**NON-PATENT DOCUMENTS**

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
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\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

## Electronic Acknowledgement Receipt

|                                             |                                       |
|---------------------------------------------|---------------------------------------|
| <b>EFS ID:</b>                              | 19491307                              |
| <b>Application Number:</b>                  | 13828960                              |
| <b>International Application Number:</b>    |                                       |
| <b>Confirmation Number:</b>                 | 1085                                  |
| <b>Title of Invention:</b>                  | ON BOARD VEHICLE NETWORK SECURITY     |
| <b>First Named Inventor/Applicant Name:</b> | Christopher P. Ricci                  |
| <b>Customer Number:</b>                     | 111285                                |
| <b>Filer:</b>                               | Douglas W. Swartz/Robert Roe-Pachirat |
| <b>Filer Authorized By:</b>                 | Douglas W. Swartz                     |
| <b>Attorney Docket Number:</b>              | 6583-247-CIP-5                        |
| <b>Receipt Date:</b>                        | 03-JUL-2014                           |
| <b>Filing Date:</b>                         | 14-MAR-2013                           |
| <b>Time Stamp:</b>                          | 14:09:23                              |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)           |

### Payment information:

|                        |    |
|------------------------|----|
| Submitted with Payment | no |
|------------------------|----|

### File Listing:

| Document Number | Document Description | File Name                 | File Size(Bytes)/<br>Message Digest               | Multi Part /.zip | Pages (if appl.) |
|-----------------|----------------------|---------------------------|---------------------------------------------------|------------------|------------------|
| 1               |                      | 6583-247-CIP-5_IDS_02.pdf | 264930<br>105eebf74f50808bab10b86d3a654a8f58040be | yes              | 6                |

|              | Multipart Description/PDF files in .zip description |                                           |                                          |     |    |
|--------------|-----------------------------------------------------|-------------------------------------------|------------------------------------------|-----|----|
|              | Document Description                                |                                           | Start                                    | End |    |
|              | Transmittal Letter                                  |                                           | 1                                        | 3   |    |
|              | Information Disclosure Statement (IDS) Form (SB08)  |                                           | 4                                        | 6   |    |
| Warnings:    |                                                     |                                           |                                          |     |    |
| Information: |                                                     |                                           |                                          |     |    |
| 2            | Non Patent Literature                               | A8_Technology_as_standard.pdf             | 98967                                    | no  | 1  |
|              |                                                     |                                           | 53a8b41db45ed2ae5b060182792d6961e7f2da1c |     |    |
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| 3            | Non Patent Literature                               | Audi_A8_MMI_Touch.pdf                     | 516587                                   | no  | 2  |
|              |                                                     |                                           | 1f17a58db7a87e9f856f17dfeb2a6b8c697f123b |     |    |
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| 4            | Non Patent Literature                               | DIAZ_Audi_New_MMI_Touch.pdf               | 1393865                                  | no  | 12 |
|              |                                                     |                                           | 9751ac4ec09e03bdd5738fbafd7dcc0bacc809   |     |    |
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| 5            | Non Patent Literature                               | PURCHER_Apple_Invents_In-Vehicle.pdf      | 756299                                   | no  | 8  |
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| 6            | Non Patent Literature                               | 6583-244-PCT_IPRP_05-30-2014.pdf          | 1060557                                  | no  | 14 |
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| 7            | Non Patent Literature                               | 6583-247-PCT_IPRP_05-30-2014.pdf          | 437375                                   | no  | 8  |
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| 8            | Non Patent Literature                               | 6583-247-CIP-13-PCT_ISR-WO_04-25-2014.pdf | 2160745                                  | no  | 8  |
|              |                                                     |                                           | a4621b947cd26fa93ad2c8e7bc54fec7c900e306 |     |    |
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Ford Ex 1002 Page 482 of 1178

|              |                       |                                   |                                          |    |    |
|--------------|-----------------------|-----------------------------------|------------------------------------------|----|----|
| 9            | Non Patent Literature | 6583-231_OA_06-27-2014.pdf        | 165148                                   | no | 5  |
|              |                       |                                   | fd1a14dd805bd03abfa49c60c71f527e715821b8 |    |    |
| Warnings:    |                       |                                   |                                          |    |    |
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| 10           | Non Patent Literature | 6583-233_OA_04-07-2014.pdf        | 217765                                   | no | 7  |
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| 11           | Non Patent Literature | 6583-244_OA_01-16-2014.pdf        | 204870                                   | no | 6  |
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| 12           | Non Patent Literature | 6583-244_OA_05-09-2014.pdf        | 205767                                   | no | 6  |
|              |                       |                                   | 61a57b32f680bc04eb637a25e3dfeedaf16ba3e4 |    |    |
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| 13           | Non Patent Literature | 6583-247_OA_05-20-2014.pdf        | 629994                                   | no | 19 |
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| Information: |                       |                                   |                                          |    |    |
| 14           | Non Patent Literature | 6583-247-CIP_OA_05-06-2014.pdf    | 245776                                   | no | 7  |
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| 15           | Non Patent Literature | 6583-247-CIP-10_OA_04-10-2014.pdf | 259905                                   | no | 7  |
|              |                       |                                   | de74d57c254436da0e40994a0a37882b475f778a |    |    |
| Warnings:    |                       |                                   |                                          |    |    |
| Information: |                       |                                   |                                          |    |    |
| 16           | Non Patent Literature | 6583-247-CIP-13_OA_04-15-2014.pdf | 295098                                   | no | 9  |
|              |                       |                                   | a83e64e1a87ec0af433b88e393219cc5d7b4ae30 |    |    |
| Warnings:    |                       |                                   |                                          |    |    |
| Information: |                       |                                   |                                          |    |    |
| 17           | Non Patent Literature | 6583-315_OA_12-30-2013.pdf        | 328953                                   | no | 9  |
|              |                       |                                   | 05fa3d9f364e26bf0da2c2082aaa9329419429f0 |    |    |
| Warnings:    |                       |                                   |                                          |    |    |
| Information: |                       |                                   |                                          |    |    |

Ford Ex. 1002 Page 484 of 1178

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| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                             |                                                    |    |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                       |                             |                                                    |    |   |
| 19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Non Patent Literature | 6583-316_OA_06-30-2014.pdf  | 186123<br>92f527809a834acc6bb928aa7d655c18496c70f  | no | 6 |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                             |                                                    |    |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                       |                             |                                                    |    |   |
| <b>Total Files Size (in bytes):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                       |                             | 9777097                                            |    |   |
| <p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/> <b>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/> <b>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/> <b>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</b></p> |                       |                             |                                                    |    |   |

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

|                                               |   |                                 |
|-----------------------------------------------|---|---------------------------------|
| In Re the Application of:                     | ) | Group Art Unit: 2496            |
| Christopher Ricci                             | ) | Confirmation No.: 1085          |
| Serial No.: 13/828,960                        | ) | Examiner: Amir Mehrmanesh       |
| Filed: March 14, 2013                         | ) |                                 |
| Atty. File No.: 6583-247-CIP-5                | ) | <u>SUPPLEMENTAL</u>             |
| Entitled: "On Board Vehicle Network Security" | ) | <u>INFORMATION DISCLOSURE</u>   |
|                                               | ) | <u>STATEMENT</u>                |
|                                               | ) | <i>Electronically Submitted</i> |

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Commissioner:

The references cited on attached Form PTO/SB08 are being called to the attention of the Examiner.

- ☒ Copies of the cited non-patent and/or foreign references are enclosed herewith.
- ☐ Copies of the cited U.S. patents and/or patent applications are enclosed herewith.
- ☒ Copies of the cited U.S. patents/patent application publications are not enclosed in accordance with 37 C.F.R. § 1.98(a).
- ☐ Copies of the cited references are not enclosed, in accordance with 37 C.F.R. § 1.98(d), because the references were cited by or submitted to the U.S. Patent and Trademark Office in prior application Serial No. \_\_\_\_\_ filed \_\_\_\_\_, which is relied upon for an earlier filing date under 35 U.S.C. § 120.
- ☐ To the best of applicants' belief, the pertinence of the foreign-language references is believed to be summarized in the attached English abstracts and/or in the figures, although applicants do not necessarily vouch for the accuracy of the translation.
- ☐ Examiner's attention is drawn to the following related applications:
- Serial No. \_\_\_\_\_ filed \_\_\_\_\_ (Attorney Ref. No. \_\_\_\_\_)
- Serial No. \_\_\_\_\_ filed \_\_\_\_\_ (Attorney Ref. No. \_\_\_\_\_)
- ☐ Other: \_\_\_\_\_

Submission of the above information is not intended as an admission that any item is citable under the statutes or rules to support a rejection, that any item disclosed represents analogous art, or that those skilled in the art would refer to or recognize the pertinence of any reference without the benefit of hindsight, nor should an inference be drawn as to the pertinence