

AO 120 (Rev. 08/10)

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|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>TO:</b><br><b>Mail Stop 8</b><br><b>Director of the U.S. Patent and Trademark Office</b><br><b>P.O. Box 1450</b><br><b>Alexandria, VA 22313-1450</b> | <b>REPORT ON THE</b><br><b>FILING OR DETERMINATION OF AN</b><br><b>ACTION REGARDING A PATENT OR</b><br><b>TRADEMARK</b> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Central District of California on the following

☐ Trademarks or ☒ Patents. ( ☐ the patent action involves 35 U.S.C. § 292.);

|                                           |                                |                                                       |
|-------------------------------------------|--------------------------------|-------------------------------------------------------|
| DOCKET NO.<br>2:23-cv-01048               | DATE FILED<br>2/10/2023        | U.S. DISTRICT COURT<br>Central District of California |
| PLAINTIFF<br>ENTROPIC COMMUNICATIONS, LLC |                                | DEFENDANT<br>COMCAST CORPORATION, ET AL.              |
| PATENT OR<br>TRADEMARK NO.                | DATE OF PATENT<br>OR TRADEMARK | HOLDER OF PATENT OR TRADEMARK                         |
| 1 7,295,518                               | 11/13/2007                     | Entropic Communications, LLC                          |
| 2 7,594,249                               | 9/22/2009                      | Entropic Communications, LLC                          |
| 3 7,889,759                               | 2/15/2011                      | Entropic Communications, LLC                          |
| 4 8,085,802                               | 12/27/2011                     | Entropic Communications, LLC                          |
| 5 (see attached page)                     |                                |                                                       |

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

|                            |                                                                                                                                                               |                               |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| DATE INCLUDED              | INCLUDED BY<br><input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading |                               |
| PATENT OR<br>TRADEMARK NO. | DATE OF PATENT<br>OR TRADEMARK                                                                                                                                | HOLDER OF PATENT OR TRADEMARK |
| 1                          |                                                                                                                                                               |                               |
| 2                          |                                                                                                                                                               |                               |
| 3                          |                                                                                                                                                               |                               |
| 4                          |                                                                                                                                                               |                               |
| 5                          |                                                                                                                                                               |                               |

In the above—entitled case, the following decision has been rendered or judgement issued:

|                    |
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| DECISION/JUDGEMENT |
|--------------------|

|       |                   |      |
|-------|-------------------|------|
| CLERK | (BY) DEPUTY CLERK | DATE |
|-------|-------------------|------|

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director  
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 – Patents (Continued)

|     | <b>Patent No.</b> | <b>Date of Patent</b> | <b>Holder of Patent</b>      |
|-----|-------------------|-----------------------|------------------------------|
| 5.  | 9,838,213         | 12/05/2017            | Entropic Communications, LLC |
| 6.  | 10,432,422        | 10/01/2019            | Entropic Communications, LLC |
| 7.  | 8,631,450         | 01/14/2014            | Entropic Communications, LLC |
| 8.  | 8,621,539         | 12/31/2013            | Entropic Communications, LLC |
| 9.  | 8,320,566         | 11/27/2012            | Entropic Communications, LLC |
| 10. | 10,257,566        | 04/09/2019            | Entropic Communications, LLC |
| 11. | 8,228,910         | 07/24/2012            | Entropic Communications, LLC |
| 12. | 8,363,681         | 01/29/2013            | Entropic Communications, LLC |

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☐ Trademarks or ☒ Patents. ( ☐ the patent action involves 35 U.S.C. § 292.);

|                                           |                                |                                                       |
|-------------------------------------------|--------------------------------|-------------------------------------------------------|
| DOCKET NO.<br>2:23-cv-01047               | DATE FILED<br>2/10/2023        | U.S. DISTRICT COURT<br>Central District of California |
| PLAINTIFF<br>ENTROPIC COMMUNICATIONS, LLC |                                | DEFENDANT<br>COX COMMUNICATIONS, INC., ET AL.         |
| PATENT OR<br>TRADEMARK NO.                | DATE OF PATENT<br>OR TRADEMARK | HOLDER OF PATENT OR TRADEMARK                         |
| 1 7,295,518                               | 11/13/2007                     | Entropic Communications, LLC                          |
| 2 7,594,249                               | 9/22/2009                      | Entropic Communications, LLC                          |
| 3 7,889,759                               | 2/15/2011                      | Entropic Communications, LLC                          |
| 4 8,085,802                               | 12/27/2011                     | Entropic Communications, LLC                          |
| 5 (see attached page)                     |                                |                                                       |

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|                            |                                                                                                                                                               |                               |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| DATE INCLUDED              | INCLUDED BY<br><input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading |                               |
| PATENT OR<br>TRADEMARK NO. | DATE OF PATENT<br>OR TRADEMARK                                                                                                                                | HOLDER OF PATENT OR TRADEMARK |
| 1                          |                                                                                                                                                               |                               |
| 2                          |                                                                                                                                                               |                               |
| 3                          |                                                                                                                                                               |                               |
| 4                          |                                                                                                                                                               |                               |
| 5                          |                                                                                                                                                               |                               |

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|       |                   |      |
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☐ Trademarks or ☒ Patents. ( ☐ the patent action involves 35 U.S.C. § 292.);

|                                           |                                |                                                       |
|-------------------------------------------|--------------------------------|-------------------------------------------------------|
| DOCKET NO.<br>2:23-cv-01043               | DATE FILED<br>2/10/2023        | U.S. DISTRICT COURT<br>Central District of California |
| PLAINTIFF<br>ENTROPIC COMMUNICATIONS, LLC |                                | DEFENDANT<br>DISH NETWORK CORPORATION, ET AL.         |
| PATENT OR<br>TRADEMARK NO.                | DATE OF PATENT<br>OR TRADEMARK | HOLDER OF PATENT OR TRADEMARK                         |
| 1 7,295,518                               | 11/13/2007                     | Entropic Communications, LLC                          |
| 2 7,594,249                               | 9/22/2009                      | Entropic Communications, LLC                          |
| 3 7,889,759                               | 2/15/2011                      | Entropic Communications, LLC                          |
| 4 8,085,802                               | 12/27/2011                     | Entropic Communications, LLC                          |
| 5 (see attached page)                     |                                |                                                       |

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

|                            |                                                                                                                                                               |                               |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| DATE INCLUDED              | INCLUDED BY<br><input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading |                               |
| PATENT OR<br>TRADEMARK NO. | DATE OF PATENT<br>OR TRADEMARK                                                                                                                                | HOLDER OF PATENT OR TRADEMARK |
| 1                          |                                                                                                                                                               |                               |
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| 3                          |                                                                                                                                                               |                               |
| 4                          |                                                                                                                                                               |                               |
| 5                          |                                                                                                                                                               |                               |

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| 11. | 8,228,910         | 07/24/2012            | Entropic Communications, LLC |
| 12. | 8,363,681         | 01/29/2013            | Entropic Communications, LLC |



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 NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 12/580,127         | 10/15/2009            | Arndt MUELLER         | 29268US01              |

**CONFIRMATION NO. 9702**

**POA ACCEPTANCE LETTER**



23446  
MCANDREWS HELD & MALLOY, LTD  
500 WEST MADISON STREET  
SUITE 3400  
CHICAGO, IL 60661

Date Mailed: 07/20/2021

**NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 07/13/2021.

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.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/qnguyen/

**POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO**

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

☒

Practitioners associated with Customer Number:

23,446

**OR**

☐

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

| Name | Registration Number |
|------|---------------------|
|      |                     |
|      |                     |
|      |                     |
|      |                     |
|      |                     |
|      |                     |

| Name | Registration Number |
|------|---------------------|
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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 assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

☒

The address associated with Customer Number:

23,446

**OR**

☐

Firm or individual name

Address

City

State

Zip

Country

Telephone

Email

Assignee name and address: ENTROPIC COMMUNICATIONS, LLC  
1345 AVENUE OF THE AMERICAS, 46TH FLOOR  
NEW YORK, NY 10105

**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 /Andrea L. Gothing/

Date 2021-05-04

Name Andrea L. Gothing

Telephone 415-830-0613

Title Licensing Officer and Authorized Signatory, Entropic Communications, LLC

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 update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 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.**

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

## 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 or potential violation of law or regulation.

## Electronic Acknowledgement Receipt

|                                             |                                                                                  |
|---------------------------------------------|----------------------------------------------------------------------------------|
| <b>EFS ID:</b>                              | 43235135                                                                         |
| <b>Application Number:</b>                  | 12580127                                                                         |
| <b>International Application Number:</b>    |                                                                                  |
| <b>Confirmation Number:</b>                 | 9702                                                                             |
| <b>Title of Invention:</b>                  | METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A MULTIMEDIA HOME NETWORK |
| <b>First Named Inventor/Applicant Name:</b> | Arndt MUELLER                                                                    |
| <b>Customer Number:</b>                     | 23446                                                                            |
| <b>Filer:</b>                               | Ronald H. Spuhler/Deborah Wilson                                                 |
| <b>Filer Authorized By:</b>                 | Ronald H. Spuhler                                                                |
| <b>Attorney Docket Number:</b>              | 29268US01                                                                        |
| <b>Receipt Date:</b>                        | 13-JUL-2021                                                                      |
| <b>Filing Date:</b>                         | 15-OCT-2009                                                                      |
| <b>Time Stamp:</b>                          | 13:47:32                                                                         |
| <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)/ Message Digest         | Multi Part /.zip | Pages (if appl.) |
| 1                      | Assignee showing of ownership per 37 CFR 3.73 | 29268US01_373c_Statement_A<br>IA-96.pdf | 124757                                   | no               | 3                |
|                        |                                               |                                         | b07bd526bf838af60623306f8d14846cace008eb |                  |                  |
| Warnings:              |                                               |                                         |                                          |                  |                  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |                                                                      |                                          |        |   |
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| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                                                                      |                                          |        |   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Power of Attorney | Entropic-<br>POA_General_Assignee_Entrop<br>icCommunications_ALG.pdf | 487892                                   | no     | 2 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |                                                                      | 51444e06ae84b241bfc127dc47c5d6c646944dd7 |        |   |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                                                                      |                                          |        |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                                                                      |                                          |        |   |
| <b>Total Files Size (in bytes):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                                                                      |                                          | 612649 |   |
| <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/> 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.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/> 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.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/> 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.</p> |                   |                                                                      |                                          |        |   |

**STATEMENT UNDER 37 CFR 3.73(c)**

Applicant/Patent Owner: ENTROPIC COMMUNICATIONS, LLC

Application No./Patent No.: 12/580,127 Filed/Issue Date: 2009-10-15

Titled: METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A MULTIMEDIA HOME NETWORK  
ENTROPIC COMMUNICATIONS, LLC, a limited liability company

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.
2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):
- ☐ The extent (by percentage) of its ownership interest is \_\_\_\_%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

- A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.
- B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Arndt MUELLER To: ENTROPIC COMMUNICATIONS, INC.

The document was recorded in the United States Patent and Trademark Office at  
Reel 023380, Frame 0760, or for which a copy thereof is attached.

2. From: EXCALIBUR ACQUISITION CORPORATION, ENTROPIC COMMUNICATIONS, INC. To: ENTROPIC COMMUNICATIONS, INC.

The document was recorded in the United States Patent and Trademark Office at  
Reel 035706, Frame 0267, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). 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 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, 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.*

**STATEMENT UNDER 37 CFR 3.73(c)**

3. From: ENTROPIC COMMUNICATIONS, INC., EXCALIBUR SUBSIDIARY, LLC To: ENTROPIC COMMUNICATIONS, LLC

The document was recorded in the United States Patent and Trademark Office at  
Reel 035717, Frame 0628, or for which a copy thereof is attached.

4. From: ENTROPIC COMMUNICATIONS, LLC To: MAXLINEAR COMMUNICATIONS LLC

The document was recorded in the United States Patent and Trademark Office at  
Reel 055776, Frame 0482, or for which a copy thereof is attached.

5. From: MAXLINEAR COMMUNICATIONS LLC To: ENTROPIC COMMUNICATIONS, LLC

The document was recorded in the United States Patent and Trademark Office at  
Reel 055899, Frame 0291, or for which a copy thereof is attached.

6. From: \_\_\_\_\_ To: \_\_\_\_\_

The document was recorded in the United States Patent and Trademark Office at  
Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Ronald H. Spuhler/

Signature

Ronald H. Spuhler

Printed or Typed Name

2021-07-13

Date

52245

Title or Registration 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.
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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)).
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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 or potential violation of law or regulation.



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 NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 12/580,127         | 10/15/2009            | Arndt MUELLER         | E080048USU1            |

**CONFIRMATION NO. 9702**

**POA ACCEPTANCE LETTER**



23446  
MCANDREWS HELD & MALLOY, LTD  
500 WEST MADISON STREET  
SUITE 3400  
CHICAGO, IL 60661

Date Mailed: 08/05/2015

**NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 07/27/2015.

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.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/zabrah/



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 NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 12/580,127         | 10/15/2009            | Arndt MUELLER         | E080048USU1            |

77330  
ENTROPIC COMMUNICATIONS, INC.  
6350 SEQUENCE DRIVE  
SAN DIEGO, CA 92121

**CONFIRMATION NO. 9702**  
**POWER OF ATTORNEY NOTICE**



Date Mailed: 08/05/2015

**NOTICE REGARDING CHANGE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 07/27/2015.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/zabaha/

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.

**POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO**

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:



Practitioners associated with the Customer Number:

23446

OR



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

| Name | Registration Number | Name | Registration Number |
|------|---------------------|------|---------------------|
|      |                     |      |                     |
|      |                     |      |                     |
|      |                     |      |                     |
|      |                     |      |                     |
|      |                     |      |                     |
|      |                     |      |                     |

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 assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:



The address associated with Customer Number:

23446

OR

Firm or  
Individual Name

Address

City

State

Zip

Country

Telephone

Email

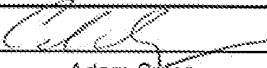
Assignee Name and Address:

Entropic Communications, LLC.  
2051 Palomar Airport Road, Suite 100  
Carlsbad, CA 92011

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, 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      | 6/5/15 |
| Name      | Adam Spice                                                                          | Telephone |        |
| Title     | Chief Financial Officer                                                             |           |        |

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. This 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 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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## 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.

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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).
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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 or potential violation of law or regulation.

| Electronic Acknowledgement Receipt          |                                                                                  |
|---------------------------------------------|----------------------------------------------------------------------------------|
| <b>EFS ID:</b>                              | 23030392                                                                         |
| <b>Application Number:</b>                  | 12580127                                                                         |
| <b>International Application Number:</b>    |                                                                                  |
| <b>Confirmation Number:</b>                 | 9702                                                                             |
| <b>Title of Invention:</b>                  | METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A MULTIMEDIA HOME NETWORK |
| <b>First Named Inventor/Applicant Name:</b> | Arndt MUELLER                                                                    |
| <b>Customer Number:</b>                     | 77330                                                                            |
| <b>Filer:</b>                               | Christopher C. Winslade/Deb Wilson                                               |
| <b>Filer Authorized By:</b>                 | Christopher C. Winslade                                                          |
| <b>Attorney Docket Number:</b>              | E080048USU1                                                                      |
| <b>Receipt Date:</b>                        | 27-JUL-2015                                                                      |
| <b>Filing Date:</b>                         | 15-OCT-2009                                                                      |
| <b>Time Stamp:</b>                          | 14:40:21                                                                         |
| <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               | Assignee showing of ownership per 37 CFR 3.73 | 29268US01_373b_Statement_s<br>b96.pdf | 431161<br>a36a830ebcbf4008c2ae4f12d789aeafe26d9b95 | no               | 2                |

### Warnings:

### Information:

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| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Power of Attorney | Entropic_POA_PreAIA.pdf | 340881                                   | no     | 2 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |                         | 8107f4c6d5473b527f97e45769199b81a37aad1b |        |   |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                         |                                          |        |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                         |                                          |        |   |
| <b>Total Files Size (in bytes):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                         |                                          | 772042 |   |
| <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/> 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.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/> 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.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/> 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.</p> |                   |                         |                                          |        |   |

**STATEMENT UNDER 37 CFR 3.73(b)**

Applicant/Patent Owner: Arndt MUELLER

Application No./Patent No.: 12580127

Filed/Issue Date: 10/15/2009

Titled:

**METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A MULTIMEDIA HOME NETWORK**

Entropic Communications, LLC, a corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;
2. ☐ an assignee of less than the entire right, title, and interest in  
(The extent (by percentage) of its ownership interest is \_\_\_\_\_ %); or
3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

- A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy therefore is attached.

**OR**

- B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Arndt MUELLER To: ENTROPIC COMMUNICATIONS, INC.

The document was recorded in the United States Patent and Trademark Office at  
Reel 023380, Frame 0760, or for which a copy thereof is attached.

2. From: EXCALIBUR ACQUISITION CORPORATION To: ENTROPIC COMMUNICATIONS, INC.

The document was recorded in the United States Patent and Trademark Office at  
Reel 035706, Frame 0267, or for which a copy thereof is attached.

3. From: ENTROPIC COMMUNICATIONS, INC. and EX To: ENTROPIC COMMUNICATIONS, LLC

The document was recorded in the United States Patent and Trademark Office at  
Reel 035717, Frame 0628, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

- ☒ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Christopher C. Winslade/

07/27/2015

Signature

Date

Christopher C. Winslade, Reg. No. 36308

Attorney for Applicant

Printed or Typed Name

Title

This collection of information is required by 37 CFR 3.73(b). 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 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, 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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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.
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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.
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## 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](http://www.uspto.gov)

| APPLICATION NO. | ISSUE DATE | PATENT NO. | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|------------|------------|---------------------|------------------|
| 12/580,127      | 01/29/2013 | 8363681    | E080048USU1         | 9702             |

77330 7590 01/09/2013  
ENTROPIC COMMUNICATIONS, INC.  
6290 SEQUENCE DRIVE  
SAN DIEGO, CA 92121

### ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

#### **Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)** (application filed on or after May 29, 2000)

The Patent Term Adjustment is 462 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

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 Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Arndt MUELLER, San Diego, CA;

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Receipt date: 02/18/2010

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

12580127 - GAI: 2474

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|-----------------------------------------------------------------------------------------------------|------------------------|---------------|------------|--|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |               | 12580127   |  |
|                                                                                                     | Filing Date            |               | 2009-10-15 |  |
|                                                                                                     | First Named Inventor   | Arndt MUELLER |            |  |
|                                                                                                     | Art Unit               | 2472          |            |  |
|                                                                                                     | Examiner Name          | UnKnown       |            |  |
|                                                                                                     | Attorney Docket Number | E080048USU1   |            |  |

| U.S.PATENTS <span>Remove</span> |         |               |                        |                                  |                                                 |                                                                        |
|---------------------------------|---------|---------------|------------------------|----------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Examiner Initial*               | Cite No | Patent Number | Kind Code <sup>1</sup> | Issue Date                       | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|                                 | 1       | 6956865       | B1                     | 2005-10-18                       | KHAUNTE et al.                                  |                                                                        |
|                                 | 2       | 5349582       | A                      | 1994-09-20                       | BISDIKIAN et al.                                |                                                                        |
|                                 | 3       | 7054296       | B1                     | <del>2005-10-18</del><br>05/2006 | SORRELLS et al.                                 |                                                                        |

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|                                                         | 1       | 20080013473        | A1                     | 2008-01-17       | PROCTOR, JR et al.                              |                                                                        |
|                                                         | 2       | 20070133386        | A1                     | 2007-06-14       | KIM et al.                                      |                                                                        |
|                                                         | 3       | 20050287964        | A1                     | 2005-12-29       | TANAKA et al.                                   |                                                                        |

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77330 7590 09/19/2012  
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|                   |                    |
|-------------------|--------------------|
| Tara Sallee       | (Depositor's name) |
| /Tara Sallee/     | (Signature)        |
| December 19, 2012 | (Date)             |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 12/580,127      | 10/15/2009  | Arndt MUELLER        | E080048USU1         | 9702             |

TITLE OF INVENTION: METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A MULTIMEDIA HOME NETWORK

| APPLN. TYPE    | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|--------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | NO           | \$1740        | \$300               | \$0                  | \$2040           | 12/19/2012 |

| EXAMINER               | ART UNIT | CLASS-SUBCLASS |
|------------------------|----------|----------------|
| ELLIOTT IV, BENJAMIN H | 2474     | 370-509000     |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).  
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.  
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 1 Bruce Greenhaus  
 2 \_\_\_\_\_  
 3 \_\_\_\_\_

## 3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

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(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Entropic Communications, Inc.

San Diego, CA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

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Authorized Signature /Richard André Bachand, Reg. #25,107/

Date December 19, 2012

Typed or printed name Richard A. Bachand

Registration No. 25,107

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| Electronic Patent Application Fee Transmittal  |                 |                                                                                  |               |                             |
|------------------------------------------------|-----------------|----------------------------------------------------------------------------------|---------------|-----------------------------|
| <b>Application Number:</b>                     |                 | 12580127                                                                         |               |                             |
| <b>Filing Date:</b>                            |                 | 15-Oct-2009                                                                      |               |                             |
| <b>Title of Invention:</b>                     |                 | METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A MULTIMEDIA HOME NETWORK |               |                             |
| <b>First Named Inventor/Applicant Name:</b>    |                 | Arndt MUELLER                                                                    |               |                             |
| <b>Filer:</b>                                  |                 | Richard A. Bachand                                                               |               |                             |
| <b>Attorney Docket Number:</b>                 |                 | E080048USU1                                                                      |               |                             |
| Filed as Large Entity                          |                 |                                                                                  |               |                             |
| <b>Utility under 35 USC 111(a) Filing Fees</b> |                 |                                                                                  |               |                             |
| <b>Description</b>                             | <b>Fee Code</b> | <b>Quantity</b>                                                                  | <b>Amount</b> | <b>Sub-Total in USD(\$)</b> |
| <b>Basic Filing:</b>                           |                 |                                                                                  |               |                             |
| <b>Pages:</b>                                  |                 |                                                                                  |               |                             |
| <b>Claims:</b>                                 |                 |                                                                                  |               |                             |
| <b>Miscellaneous-Filing:</b>                   |                 |                                                                                  |               |                             |
| <b>Petition:</b>                               |                 |                                                                                  |               |                             |
| <b>Patent-Appeals-and-Interference:</b>        |                 |                                                                                  |               |                             |
| <b>Post-Allowance-and-Post-Issuance:</b>       |                 |                                                                                  |               |                             |
| Utility Appl issue fee                         | 1501            | 1                                                                                | 1770          | 1770                        |
| Publ. Fee- early, voluntary, or normal         | 1504            | 1                                                                                | 300           | 300                         |

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| Miscellaneous:     |          |          |        |                      |
| Total in USD (\$)  |          |          |        | 2070                 |

| Electronic Acknowledgement Receipt          |                                                                                  |
|---------------------------------------------|----------------------------------------------------------------------------------|
| <b>EFS ID:</b>                              | 14521182                                                                         |
| <b>Application Number:</b>                  | 12580127                                                                         |
| <b>International Application Number:</b>    |                                                                                  |
| <b>Confirmation Number:</b>                 | 9702                                                                             |
| <b>Title of Invention:</b>                  | METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A MULTIMEDIA HOME NETWORK |
| <b>First Named Inventor/Applicant Name:</b> | Arndt MUELLER                                                                    |
| <b>Customer Number:</b>                     | 77330                                                                            |
| <b>Filer:</b>                               | Richard A. Bachand                                                               |
| <b>Filer Authorized By:</b>                 |                                                                                  |
| <b>Attorney Docket Number:</b>              | E080048USU1                                                                      |
| <b>Receipt Date:</b>                        | 19-DEC-2012                                                                      |
| <b>Filing Date:</b>                         | 15-OCT-2009                                                                      |
| <b>Time Stamp:</b>                          | 22:14:59                                                                         |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)                                                      |

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|                                          |                 |
|------------------------------------------|-----------------|
| Submitted with Payment                   | yes             |
| Payment Type                             | Deposit Account |
| Payment was successfully received in RAM | \$ 2070         |
| RAM confirmation Number                  | 13867           |
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### File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|-----------------|----------------------|-----------|----------------------------------|------------------|------------------|
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |                                  |                                                    |    |   |
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| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |                                  |                                                    |    |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |                                  |                                                    |    |   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Fee Worksheet (SB06)        | fee-info.pdf                     | 31970<br>db8fce0fb04891b5cd7e2f5d43989c1e4a0c5edf  | no | 2 |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |                                  |                                                    |    |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |                                  |                                                    |    |   |
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EXAMINER

ELLIOTT IV, BENJAMIN H

ART UNIT

PAPER NUMBER

2474

DATE MAILED: 09/19/2012

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 12/580,127      | 10/15/2009  | Arndt MUELLER        | E080048USU1         | 9702             |

TITLE OF INVENTION: METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A MULTIMEDIA HOME NETWORK

| APPLN. TYPE    | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
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| nonprovisional | NO           | \$1740        | \$300               | \$0                  | \$2040           | 12/19/2012 |

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|--------------------|
| (Depositor's name) |
| (Signature)        |
| (Date)             |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 12/580,127      | 10/15/2009  | Arndt MUELLER        | E080048USU1         | 9702             |

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|----------------|--------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | NO           | \$1740        | \$300               | \$0                  | \$2040           | 12/19/2012 |

| EXAMINER               | ART UNIT | CLASS-SUBCLASS |
|------------------------|----------|----------------|
| ELLIOTT IV, BENJAMIN H | 2474     | 370-509000     |

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3 \_\_\_\_\_

**3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)**

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(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

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- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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Authorized Signature \_\_\_\_\_ Date \_\_\_\_\_  
Typed or printed name \_\_\_\_\_ Registration No. \_\_\_\_\_

This collection of information 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.

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 12/580,127      | 10/15/2009  | Arndt MUELLER        | E080048USU1         | 9702             |

77330 7590 09/19/2012  
ENTROPIC COMMUNICATIONS, INC.  
6290 SEQUENCE DRIVE  
SAN DIEGO, CA 92121

|          |
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| EXAMINER |
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ELLIOTT IV, BENJAMIN H

|          |              |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

2474

DATE MAILED: 09/19/2012

## 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 356 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 356 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.

## 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.
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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.
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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 inspection or an issued patent.
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|                               |                        |                     |  |
|-------------------------------|------------------------|---------------------|--|
| <b>Notice of Allowability</b> | <b>Application No.</b> | <b>Applicant(s)</b> |  |
|                               | 12/580,127             | MUELLER, ARNDT      |  |
|                               | <b>Examiner</b>        | <b>Art Unit</b>     |  |
|                               | BENJAMIN H. ELLIOTT IV | 2474                |  |

**-- 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 4/25/2012.
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 1-40.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - 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. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_.
  - (b) ☐ 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).**
7. ☐ 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)**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. <input type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)</li> <li>3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br/>Paper No./Mail Date <u>7/16/2012</u></li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date ____.</li> <li>7. <input type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other ____.</li> </ol> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                     |                                                                 |
|-----------------------------------------------------|-----------------------------------------------------------------|
| BENJAMIN H ELLIOTT IV<br>Examiner<br>Art Unit: 2474 | /MICHAEL T THIER/<br>Supervisory Patent Examiner, Art Unit 2474 |
|-----------------------------------------------------|-----------------------------------------------------------------|

## EAST Search History

## EAST Search History (Prior Art)

| Ref # | Hits  | Search Query                                                                                         | DBs                                                               | Default Operator | Plurals | Time Stamp          |
|-------|-------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------------------|---------|---------------------|
| L1    | 2     | "20100098110"                                                                                        | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:12 |
| L2    | 2     | WO-2010045528-\$.DID.                                                                                | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:13 |
| L6    | 2     | WO-2010045528-\$.DID.                                                                                | FPRS; EPO; JPO;<br>DERWENT;<br>IBM_TDB                            | OR               | ON      | 2012/09/01<br>13:16 |
| L9    | 2     | "7054296".pn.                                                                                        | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:18 |
| L10   | 3     | "20070133386"                                                                                        | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:22 |
| L11   | 1     | wo-2008039951-\$.did.                                                                                | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:23 |
| L12   | 443   | 370/395.62,518.ccls.                                                                                 | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:25 |
| L13   | 9931  | 370/350,503,509-514,519.ccls.                                                                        | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:25 |
| L14   | 347   | 370/519.ccls.                                                                                        | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:25 |
| L15   | 10205 | L12 or L13 or L14                                                                                    | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:25 |
| L16   | 0     | 15 and (local\$5 and clock\$3 and rang43 and packet and propagat\$3 and delay\$3 and synchroniz\$6)  | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:31 |
| L17   | 348   | 15 and (local\$5 and clock\$3 and rang\$3 and packet and propagat\$3 and delay\$3 and synchroniz\$6) | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR               | ON      | 2012/09/01<br>13:31 |
| L18   | 82    | 15 and (local\$5 with clock\$3 and                                                                   | US-PGPUB; USPAT;                                                  | OR               | ON      | 2012/09/01          |

## EAST Search History

|     |     |                                                                                                                     |                                                                   |    |    |                     |
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|     |     | rang\$3 and packet and<br>propagat\$3 same delay\$3 same<br>synchroniz\$6)                                          | USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB                     |    |    | 13:32               |
| L19 | 77  | 15 and (local\$5 with clock\$3 and<br>rang\$3 and packet and<br>propagat\$3 near3 delay\$3 same<br>synchroniz\$6)   | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR | ON | 2012/09/01<br>13:32 |
| L20 | 124 | 15 and (local\$5 with clock\$3<br>same synchroniz\$6 and rang\$3<br>and packet and propagat\$3<br>near3 delay\$3 )  | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR | ON | 2012/09/01<br>13:33 |
| L21 | 20  | 15 and (local\$5 with clock\$3<br>same synchroniz\$6 same<br>propagat\$3 near3 delay\$3 and<br>rang\$3 and packet ) | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR | ON | 2012/09/01<br>13:33 |
| L22 | 20  | 15 and (local\$5 with clock\$3<br>same synchroniz\$6 same<br>propagat\$3 near3 delay\$3 and<br>rang\$3 and packet)  | US-PGPUB; USPAT;<br>USOCR; FPRS; EPO;<br>JPO; DERWENT;<br>IBM_TDB | OR | ON | 2012/09/01<br>13:33 |

9/ 1/ 2012 1:55:34 PM

C:\Users\belliott\Documents\EAST\Workspaces\12580127.wsp

Receipt date: 07/16/2012

Doc description: Information Disclosure Statement (IDS) Filed

12580127 - GAU-2474

Approved for use through 07/31/2012. OMB 0651-0031

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|-----------------------------------------------------------------------------------------------------|------------------------|---------------------------|------------|--|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |                           | 12580127   |  |
|                                                                                                     | Filing Date            |                           | 2009-10-15 |  |
|                                                                                                     | First Named Inventor   | Mueller, Arndt            |            |  |
|                                                                                                     | Art Unit               | 2474                      |            |  |
|                                                                                                     | Examiner Name          | Elliot IV, Benjamin H.    |            |  |
|                                                                                                     | Attorney Docket Number | 05JM-150929 (E080048USU1) |            |  |

| U.S.PATENTS       |         |               |                        |            |                                                 |                                                                        |
|-------------------|---------|---------------|------------------------|------------|-------------------------------------------------|------------------------------------------------------------------------|
| Examiner Initial* | Cite No | Patent Number | Kind Code <sup>1</sup> | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|                   | 1       | 7054296       | B1                     | 2006-05-30 | Sorrells et al.                                 |                                                                        |

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| U.S.PATENT APPLICATION PUBLICATIONS |         |                    |                        |                  |                                                 |                                                                        |
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|                                     | 1       | 20070133386        | A1                     | 2007-06-14       | Kim et al.                                      |                                                                        |

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|                          | 1       | 2008/039951                          | WO                        | A1                     | 2008-04-03       | Qualcomm                                        |                                                                        | <input type="checkbox"/> |

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|                                 |         |                                                                                                                                                                                                                                                                 |  | T <sup>5</sup> |

|                                                                                                                                                   |                        |                           |            |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------------|------------|----------------------|
| <b>Receipt date: 07/16/2012</b><br><br><b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><b>( Not for submission under 37 CFR 1.99)</b> | Application Number     |                           | 12580127   | 12580127 - GAU: 2474 |
|                                                                                                                                                   | Filing Date            |                           | 2009-10-15 |                      |
|                                                                                                                                                   | First Named Inventor   | Mueller, Arndt            |            |                      |
|                                                                                                                                                   | Art Unit               | 2474                      |            |                      |
|                                                                                                                                                   | Examiner Name          | Elliot IV, Benjamin H.    |            |                      |
|                                                                                                                                                   | Attorney Docket Number | 05JM-150929 (E080048USU1) |            |                      |

|   |                                                                                             |                          |
|---|---------------------------------------------------------------------------------------------|--------------------------|
| 1 | Examination Report for App No. GB1104519.2, completed 23 May 2012, Examiner Dr. Mark Lewney | <input type="checkbox"/> |
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#### EXAMINER SIGNATURE

|                    |                       |                 |            |
|--------------------|-----------------------|-----------------|------------|
| Examiner Signature | /Benjamin Elliott Iv/ | Date Considered | 09/01/2012 |
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

|                                                                                                                  |                                            |                                                                  |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------|
| <b>Issue Classification</b><br> | <b>Application/Control No.</b><br>12580127 | <b>Applicant(s)/Patent Under Reexamination</b><br>MUELLER, ARNDT |
|                                                                                                                  | <b>Examiner</b><br>BENJAMIN H ELLIOTT IV   | <b>Art Unit</b><br>2474                                          |

| ORIGINAL           |                                   |     |          |     |     | INTERNATIONAL CLASSIFICATION |   |   |   |                      |             |  |  |  |  |  |
|--------------------|-----------------------------------|-----|----------|-----|-----|------------------------------|---|---|---|----------------------|-------------|--|--|--|--|--|
| CLASS              |                                   |     | SUBCLASS |     |     | CLAIMED                      |   |   |   |                      | NON-CLAIMED |  |  |  |  |  |
| 370                |                                   |     | 509      |     |     | H                            | 0 | 4 | J | 3 / 06 (2006.01.01)  |             |  |  |  |  |  |
| CROSS REFERENCE(S) |                                   |     |          |     |     | H                            | 0 | 4 | L | 12 / 28 (2006.01.01) |             |  |  |  |  |  |
|                    |                                   |     |          |     |     | H                            | 0 | 4 | L | 12 / 56 (2006.01.01) |             |  |  |  |  |  |
| CLASS              | SUBCLASS (ONE SUBCLASS PER BLOCK) |     |          |     |     |                              |   |   |   |                      |             |  |  |  |  |  |
| 370                | 395.62                            | 503 | 510      | 511 | 513 |                              |   |   |   |                      |             |  |  |  |  |  |
| 370                | 514                               | 519 |          |     |     |                              |   |   |   |                      |             |  |  |  |  |  |
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|                    |                                   |     |          |     |     |                              |   |   |   |                      |             |  |  |  |  |  |

| <input checked="" type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47 |          |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|
| Final                                                                                                                                                                                        | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original |
| 1                                                                                                                                                                                            | 1        | 17    | 17       | 33    | 33       |       |          |       |          |       |          |       |          |       |          |
| 2                                                                                                                                                                                            | 2        | 18    | 18       | 34    | 34       |       |          |       |          |       |          |       |          |       |          |
| 3                                                                                                                                                                                            | 3        | 19    | 19       | 35    | 35       |       |          |       |          |       |          |       |          |       |          |
| 4                                                                                                                                                                                            | 4        | 20    | 20       | 36    | 36       |       |          |       |          |       |          |       |          |       |          |
| 5                                                                                                                                                                                            | 5        | 21    | 21       | 37    | 37       |       |          |       |          |       |          |       |          |       |          |
| 6                                                                                                                                                                                            | 6        | 22    | 22       | 38    | 38       |       |          |       |          |       |          |       |          |       |          |
| 7                                                                                                                                                                                            | 7        | 23    | 23       | 39    | 39       |       |          |       |          |       |          |       |          |       |          |
| 8                                                                                                                                                                                            | 8        | 24    | 24       | 40    | 40       |       |          |       |          |       |          |       |          |       |          |
| 9                                                                                                                                                                                            | 9        | 25    | 25       |       |          |       |          |       |          |       |          |       |          |       |          |
| 10                                                                                                                                                                                           | 10       | 26    | 26       |       |          |       |          |       |          |       |          |       |          |       |          |
| 11                                                                                                                                                                                           | 11       | 27    | 27       |       |          |       |          |       |          |       |          |       |          |       |          |
| 12                                                                                                                                                                                           | 12       | 28    | 28       |       |          |       |          |       |          |       |          |       |          |       |          |
| 13                                                                                                                                                                                           | 13       | 29    | 29       |       |          |       |          |       |          |       |          |       |          |       |          |
| 14                                                                                                                                                                                           | 14       | 30    | 30       |       |          |       |          |       |          |       |          |       |          |       |          |
| 15                                                                                                                                                                                           | 15       | 31    | 31       |       |          |       |          |       |          |       |          |       |          |       |          |
| 16                                                                                                                                                                                           | 16       | 32    | 32       |       |          |       |          |       |          |       |          |       |          |       |          |

|                                                                                        |                          |                                        |                            |
|----------------------------------------------------------------------------------------|--------------------------|----------------------------------------|----------------------------|
| /BENJAMIN H ELLIOTT IV/<br>Examiner.Art Unit 2474<br><br>(Assistant Examiner)          | 09/01/2012<br><br>(Date) | <b>Total Claims Allowed:</b><br><br>40 |                            |
| /MICHAEL THIER/<br>Supervisory Patent Examiner.Art Unit 2474<br><br>(Primary Examiner) | 09/04/2012<br><br>(Date) | O.G. Print Claim(s)<br><br>1           | O.G. Print Figure<br><br>5 |

|                                                                                                              |                                                |                                                                      |
|--------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------|
| <b>Search Notes</b><br><br> | <b>Application/Control No.</b><br><br>12580127 | <b>Applicant(s)/Patent Under Reexamination</b><br><br>MUELLER, ARNDT |
|                                                                                                              | <b>Examiner</b><br><br>BENJAMIN H ELLIOTT IV   | <b>Art Unit</b><br><br>2474                                          |

| SEARCHED |                                       |           |          |
|----------|---------------------------------------|-----------|----------|
| Class    | Subclass                              | Date      | Examiner |
| 370      | 395.62,518 (clocks)                   | 1/27/2012 | BHE      |
| 370      | 350,503,509-514,519 (synchronization) | 1/27/2012 | BHE      |
| UPDATED  | UPDATED                               | UPDATED   | UPDATED  |
| 370      | 395.62,518,350,503,509-514,519        | 9/01/2012 | BHE      |

| SEARCH NOTES                                                                                                                                                                                                 |           |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|
| Search Notes                                                                                                                                                                                                 | Date      | Examiner |
| Reviewed information submitted in IDS                                                                                                                                                                        | 1/27/2012 | BHE      |
| Classification search (see attached) with limited text search in EAST                                                                                                                                        | 1/27/2012 | BHE      |
| Inventor searchthrough PALM and eDAN for any DP-related issues. Also searched for any relevant prior art references that could be found in co-pending applications' search notes, Office actions, and IDS's. | 1/27/2012 | BHE      |
| IEEE Explore search using inventor name and keywords                                                                                                                                                         | 1/27/2012 | BHE      |
| Reviewed submitted ISR information                                                                                                                                                                           | 1/27/2012 | BHE      |
| EAST search                                                                                                                                                                                                  | 1/27/2012 | BHE      |
| Consulted with Kwang Yao, SPE 2473, regarding objectability of claims 3, 13, 23, and 33. Suggested objecting to the claims.                                                                                  | 1/27/2012 | BHE      |
| UPDATED                                                                                                                                                                                                      | UPDATED   | UPDATED  |
| Reviewed Applicant's arguments and amendments to include the object-to subject matter of claims 3,13,23, and 33 into independent form.                                                                       | 9/01/2012 | BHE      |
| Reviewed newly-submitted IDS information                                                                                                                                                                     | 9/01/2012 | BHE      |
| Consulted with Michael Thier, SPE 2474, regarding case merits and status of the claims. Suggested updating search and allowing application.                                                                  | 9/01/2012 | BHE      |
| Updated classification search (see attached) with limited text search in EAST                                                                                                                                | 9/01/2012 | BHE      |
| Updated inventor search through PALM and eDAN for any DP-related issues                                                                                                                                      | 9/01/2012 | BHE      |
| Updated EAST search                                                                                                                                                                                          | 9/01/2012 | BHE      |
| Interference search (see attached)                                                                                                                                                                           | 9/01/2012 | BHE      |

| INTERFERENCE SEARCH |                                |           |          |
|---------------------|--------------------------------|-----------|----------|
| Class               | Subclass                       | Date      | Examiner |
| 370                 | 395.62,518,350,503,509-514,519 | 9/01/2012 | BHE      |

|                                    |  |
|------------------------------------|--|
| /B.H.E./<br>Examiner.Art Unit 2474 |  |
|------------------------------------|--|

**EAST Search History****EAST Search History (Interference)**

| Ref # | Hits | Search Query                                                                                                   | DBs                         | Default Operator | Plurals | Time Stamp          |
|-------|------|----------------------------------------------------------------------------------------------------------------|-----------------------------|------------------|---------|---------------------|
| L23   | 438  | 370/395.62,518.ccls.                                                                                           | US-PGPUB;<br>USPAT;<br>UPAD | OR               | ON      | 2012/09/01<br>13:39 |
| L24   | 7573 | 370/350,503,509-514,519.ccls.                                                                                  | US-PGPUB;<br>USPAT;<br>UPAD | OR               | ON      | 2012/09/01<br>13:40 |
| L25   | 342  | 370/519.ccls.                                                                                                  | US-PGPUB;<br>USPAT;<br>UPAD | OR               | ON      | 2012/09/01<br>13:40 |
| L26   | 7843 | 23 or 24 or 25                                                                                                 | US-PGPUB;<br>USPAT;<br>UPAD | OR               | ON      | 2012/09/01<br>13:40 |
| L27   | 20   | 26 and (local\$5 with clock\$3 same synchroniz\$6 same propagat\$3 near3 delay\$3 and rang\$3 and packet)      | US-PGPUB;<br>USPAT;<br>UPAD | OR               | ON      | 2012/09/01<br>13:40 |
| L28   | 1    | 26 and (local\$5 with clock\$3 same synchroniz\$6 same propagat\$3 near3 delay\$3 and rang\$3 and packet).clm. | US-PGPUB;<br>USPAT;<br>UPAD | OR               | ON      | 2012/09/01<br>13:40 |
| L29   | 3    | 26 and (local\$5 and clock\$3 and synchroniz\$6 and propagat\$3 and delay\$3 and rang\$3 and packet).clm.      | US-PGPUB;<br>USPAT;<br>UPAD | OR               | ON      | 2012/09/01<br>13:41 |
| L30   | 12   | (local\$5 and clock\$3 and synchroniz\$6 and propagat\$3 and delay\$3 and rang\$3 and packet).clm.             | US-PGPUB;<br>USPAT;<br>UPAD | OR               | ON      | 2012/09/01<br>13:41 |
| L31   | 0    | (local\$5 same clock\$3 same synchroniz\$6 same propagat\$3 near3 delay\$3 same rang\$3 same packet).clm.      | US-PGPUB;<br>USPAT;<br>UPAD | OR               | ON      | 2012/09/01<br>13:54 |

**9/ 1/ 2012 1:54:46 PM****C:\Users\belliott\Documents\EAST\Workspaces\12580127.wsp**

|                                                                                                     |                        |                           |            |  |
|-----------------------------------------------------------------------------------------------------|------------------------|---------------------------|------------|--|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |                           | 12580127   |  |
|                                                                                                     | Filing Date            |                           | 2009-10-15 |  |
|                                                                                                     | First Named Inventor   | Mueller, Arndt            |            |  |
|                                                                                                     | Art Unit               | 2474                      |            |  |
|                                                                                                     | Examiner Name          | Elliot IV, Benjamin H.    |            |  |
|                                                                                                     | Attorney Docket Number | 05JM-150929 (E080048USU1) |            |  |

| U.S.PATENTS       |         |               |                        |            |                                                 |                                                                          |
|-------------------|---------|---------------|------------------------|------------|-------------------------------------------------|--------------------------------------------------------------------------|
| Examiner Initial* | Cite No | Patent Number | Kind Code <sup>1</sup> | Issue Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear |
|                   | 1       | 7054296       | B1                     | 2006-05-30 | Sorrells et al.                                 |                                                                          |

If you wish to add additional U.S. Patent citation information please click the Add button.

| U.S.PATENT APPLICATION PUBLICATIONS |         |                    |                        |                  |                                                 |                                                                          |
|-------------------------------------|---------|--------------------|------------------------|------------------|-------------------------------------------------|--------------------------------------------------------------------------|
| Examiner Initial*                   | Cite No | Publication Number | Kind Code <sup>1</sup> | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear |
|                                     | 1       | 20070133386        | A1                     | 2007-06-14       | Kim et al.                                      |                                                                          |

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| FOREIGN PATENT DOCUMENTS |         |                                      |                           |                        |                  |                                                 |                                                                          |                          |
|--------------------------|---------|--------------------------------------|---------------------------|------------------------|------------------|-------------------------------------------------|--------------------------------------------------------------------------|--------------------------|
| Examiner Initial*        | Cite No | Foreign Document Number <sup>3</sup> | Country Code <sup>2</sup> | Kind Code <sup>4</sup> | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T <sup>5</sup>           |
|                          | 1       | 2008/039951                          | WO                        | A1                     | 2008-04-03       | Qualcomm                                        |                                                                          | <input type="checkbox"/> |

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| NON-PATENT LITERATURE DOCUMENTS |         |                                                                                                                                                                                                                                                                 |  |                |
|---------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------|
| Examiner Initials*              | Cite No | 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, pages(s), volume-issue number(s), publisher, city and/or country where published. |  |                |
|                                 |         |                                                                                                                                                                                                                                                                 |  | T <sup>5</sup> |

|                                                                                                     |                        |                           |            |
|-----------------------------------------------------------------------------------------------------|------------------------|---------------------------|------------|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |                           | 12580127   |
|                                                                                                     | Filing Date            |                           | 2009-10-15 |
|                                                                                                     | First Named Inventor   | Mueller, Arndt            |            |
|                                                                                                     | Art Unit               | 2474                      |            |
|                                                                                                     | Examiner Name          | Elliot IV, Benjamin H.    |            |
|                                                                                                     | Attorney Docket Number | 05JM-150929 (E080048USU1) |            |

|   |                                                                                             |                          |
|---|---------------------------------------------------------------------------------------------|--------------------------|
| 1 | Examination Report for App No. GB1104519.2, completed 23 May 2012, Examiner Dr. Mark Lewney | <input type="checkbox"/> |
|---|---------------------------------------------------------------------------------------------|--------------------------|

If you wish to add additional non-patent literature document citation information please click the Add button

#### EXAMINER SIGNATURE

|                    |  |                 |  |
|--------------------|--|-----------------|--|
| Examiner Signature |  | Date Considered |  |
|--------------------|--|-----------------|--|

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.



| Electronic Acknowledgement Receipt          |                                                                                  |
|---------------------------------------------|----------------------------------------------------------------------------------|
| <b>EFS ID:</b>                              | 13265060                                                                         |
| <b>Application Number:</b>                  | 12580127                                                                         |
| <b>International Application Number:</b>    |                                                                                  |
| <b>Confirmation Number:</b>                 | 9702                                                                             |
| <b>Title of Invention:</b>                  | Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network |
| <b>First Named Inventor/Applicant Name:</b> | Arndt MUELLER                                                                    |
| <b>Customer Number:</b>                     | 77330                                                                            |
| <b>Filer:</b>                               | Daniel N. Yannuzzi/Linda Spirra                                                  |
| <b>Filer Authorized By:</b>                 | Daniel N. Yannuzzi                                                               |
| <b>Attorney Docket Number:</b>              | E080048USU1                                                                      |
| <b>Receipt Date:</b>                        | 16-JUL-2012                                                                      |
| <b>Filing Date:</b>                         | 15-OCT-2009                                                                      |
| <b>Time Stamp:</b>                          | 19:16:36                                                                         |
| <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               |                      | 150929-IDS.pdf | 242652                                   | yes              | 5                |
|                 |                      |                | e6bcc69ad007adb106852902d07976f295140a1b |                  |                  |

| Multipart Description/PDF files in .zip description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |         |                                          |     |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------|------------------------------------------|-----|---|
| Document Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |         | Start                                    | End |   |
| Transmittal Letter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       |         | 1                                        | 3   |   |
| Information Disclosure Statement (IDS) Form (SB08)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       |         | 4                                        | 5   |   |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |         |                                          |     |   |
| The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |         |                                          |     |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |         |                                          |     |   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Foreign Reference     | FPD.pdf | 72806                                    | no  | 1 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |         | 74eccfe46ffd2d77bacb78d0e35cead954e9b693 |     |   |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |         |                                          |     |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |         |                                          |     |   |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Non Patent Literature | NPL.pdf | 87548                                    | no  | 3 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |         | 8e85f15c4987a154d19b54b793aa5fd125b0a5b3 |     |   |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |         |                                          |     |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |         |                                          |     |   |
| Total Files Size (in bytes):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |         | 403006                                   |     |   |
| <p>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.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/> 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.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/> 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.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/> 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.</p> |                       |         |                                          |     |   |

# Information Disclosure Statement Transmittal

Docket Number

05JM-150929

Address To  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

## In Re Application Of:

Mueller, Arndt

|                 |                        |
|-----------------|------------------------|
| Application No. | 12/580,127             |
| Filing Date     | October 15, 2009       |
| Examiner        | Elliot IV, Benjamin H. |
| Art Unit        | 2474                   |

## Title of Invention

METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A MULTIMEDIA HOME NETWORK

## BASIS FOR FILING (Select 1, 2 or 3 below.)

### 37 CFR 1.97(b)

- 1) ☐ The Information Disclosure Statement submitted herewith is being filed within three months of the filing of a national application other than a continued prosecution application under 37 CFR 1.53 (d); within three months of the date of entry of the national stage as set forth in 37 CFR 1.491 in an international application; before the mailing of a first Office Action on the merits, or before the mailing of a first Office Action after the filing of a request for continued examination under 37 CFR 1.114.

### 37 CFR 1.97(c)

- 2) ☒ The Information Disclosure Statement submitted herewith is being filed after the period specified in 37 CFR 1.97(b), but before the mailing date of a Final Action under 37 CFR 1.113, a Notice of Allowance under 37 CFR 1.311, or an Action that otherwise closes prosecution in the application, and is accompanied by one of:

- a) ☒ the statement specified in 37 CFR 1.97(e);

OR

- b) ☐ the fee set forth in 37 CFR 1.17(p).

### 37 CFR 1.97(d)

- 3) ☐ The Information Disclosure Statement submitted herewith is being filed after the period specified in 37 CFR 1.97(c), and on or before payment of the issue fee, and is accompanied by the Statement as specified in 37 CFR 1.97(e) and the fee set forth in 37 CFR 1.17(p).

## Information Disclosure Statement Transmittal

Docket Number

05JM-150929

### STATEMENT UNDER 37 CFR 1.97(e) ACCOMPANYING INFORMATION DISCLOSURE STATEMENT

The Information Disclosure Statement submitted herewith is submitted under one of the following conditions, which satisfies the requirement under 37 CFR 1.97(e). (Select 4 or 5 below if applicable.)

- 4) ☒ That each item of information contained in the 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 the Information Disclosure Statement; or
- 5) ☐ That no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the Information Disclosure Statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the Information Disclosure Statement.

### Remarks (Enter Remarks Below or Attach Document Containing Remarks)

### Fee set forth in 37 CFR 1.17(p):

- ☒ No additional fee is required.
- ☐ A check in the amount of \_\_\_\_\_ is attached.
- ☐ The Director is hereby authorized to charge and credit Deposit Account No. \_\_\_\_\_ as described below.
- ☐ Charge the amount of \_\_\_\_\_
- ☐ Credit any overpayment.
- ☐ Charge any additional fee required.
- ☐ Payment by credit card. Form PTO-2038 is attached.

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# Information Disclosure Statement Transmittal

Docket Number

05JM-150929

## Correspondence Address

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Signatory Drop-Down Box

Daniel N. Yannuzzi

|                                      |                           |                     |        |
|--------------------------------------|---------------------------|---------------------|--------|
| Name                                 | Daniel N. Yannuzzi        | Registration Number | 36,727 |
| Signatory Capacity                   | Attorney for Applicant(s) | E-mail Address      |        |
| <input type="button" value="eSign"/> |                           | Date Signed         |        |

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

|                                                                                             |                                          |
|---------------------------------------------------------------------------------------------|------------------------------------------|
| In re Patent Application of:<br>Arndt Mueller <i>et al.</i>                                 | Docket No.: 05JM-150929<br>(E080048USU1) |
| Application No.: 12/580,127                                                                 | Confirmation No.: 9702                   |
| Filed: October 15, 2009                                                                     | Art Unit: 2474                           |
| For: Method and Apparatus for Using<br>Ranging Measurements in a<br>Multimedia Home Network | Examiner: Elliot IV, Benjamin H.         |

**AMENDMENT AND REPLY UNDER 37 C.F.R. § 1.111**

Mail Stop: Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**INTRODUCTORY COMMENTS**

In response to the Office Action (hereinafter referred to as *Office Action*) dated February 1, 2012, please amend the above-identified application as follows and consider the following amendments and remarks as provided below. This response is submitted before the 3-month deadline of May 1, 2012, and therefore is timely filed without need of extension.

**Amendments to the Claims** begin on page 2 of this paper.

**Remarks** begin on page 13 of this paper.

**AMENDMENTS TO THE CLAIMS**

Without prejudice or surrender of any subject matter, please amend the claims as follows:

1. (Currently Amended) A method for synchronizing a plurality of nodes on a communication network, comprising:
  - exchanging a local clock time between a first node and a second node over the communication network, wherein the exchange comprises:
    - transmitting a first packet from the first node to the second node, wherein the first packet includes a first packet clock time set to the local clock time of the first node at transmission time, and includes a scheduled arrival clock time, and
    - setting the local clock time of the second node to the first packet clock time;
  - performing a ranging method between the first and second nodes based on the local clock time exchanged, wherein the ranging method results in an estimated propagation delay between the first and second node, and wherein the ranging method comprises:
    - transmitting a second packet from the second node to the first node, wherein the second packet is transmitted from the second node at the scheduled arrival clock time, and wherein the second packet is received by the first node at an actual arrival clock time,
    - calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the scheduled arrival clock time and the actual arrival time, and
    - transmitting a third packet from the first node to the second node, wherein the third packet comprises the estimated propagation delay; and
  - adjusting the local clock time of either the first or second node based on the estimated propagation delay, thereby resulting in a synchronized local clock time between the first and second node.
2. (Original) The method of claim 1, further comprising using the synchronized local clock time in subsequent packet transmissions between the first and second nodes.

3. (Currently Amended) The method of claim 1, wherein ~~exchanging local clock times, performing the ranging method, and~~ adjusting the local clock times comprises storing the estimated propagation delay at the second node.[:]

~~transmitting from the first node and receiving at the second node a first packet, wherein the first packet comprises a first packet clock time comprising the local clock time of the first node at transmission time, and a scheduled arrival clock time;~~

~~setting the local clock time of the second node to the first packet clock time;~~

~~transmitting from the second node and receiving at the first node a second packet at the first scheduled arrival clock time, wherein the second packet is received by the first node at an actual arrival clock time;~~

~~calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the first scheduled arrival clock time and the first actual time;~~

~~transmitting from the first node and receiving at the second node a third packet, wherein the third packet comprises the estimated propagation delay; and~~

~~storing the estimated propagation delay at the second node.~~

4. (Currently Amended) The method of claim ~~[[3]]~~ 1, wherein a transmission time of a transmitted packet is measured at 90% of peak amplitude of a transmission signal, 90% of peak power of a transmission signal, 90% of total power of a transmission signal, or a mean delay of a transmission signal.

5. (Currently Amended) The method of claim ~~[[3]]~~ 1, wherein an arrival time of a received packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of a received signal, 90% of total power of a received signal, or a mean delay of a received signal.

6. (Original) The method of claim 1, wherein the first node is a network coordinator.
7. (Original) The method of claim 1, wherein the second node is a new node and the method is performed as part of admission of the second node to the communication network.
8. (Original) The method of claim 1, wherein the method is performed periodically to maintain synchronization between the first and second nodes.
9. (Original) The method of claim 1, wherein the communication network is a mesh network.
10. (Original) The method of claim 1, wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard.
11. (Currently Amended) A network device, comprising:
  - a controller;
  - a device module;
  - memory coupled to the controller;
  - computer executable program code on a non-transitory computer readable medium configured to cause the controller to perform the functions of:
    - exchanging local clock times between a first node and a second node over a communication network, wherein the exchange comprises:
      - transmitting a first packet from the first node to the second node, wherein the first packet includes a first packet clock time set to the local clock time of the first node at transmission time, and includes a scheduled arrival clock time, and
      - setting the local clock time of the second node to the first packet clock time;
    - performing a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes, wherein the ranging method results in an

estimated propagation delay between the first and second nodes, and wherein the ranging method comprises:

transmitting a second packet from the second node to the first node, wherein the second packet is transmitted from the second node at the scheduled arrival clock time, and wherein the second packet is received by the first node at an actual arrival clock time, calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the scheduled arrival clock time and the actual arrival time, and

transmitting a third packet from the first node to the second node, wherein the third packet comprises the estimated propagation delay; and

adjusting the local clock times of either the first and second nodes based on the estimated propagation delay, thereby resulting in a synchronized local clock time at the first and second nodes.

12. (Original) The network device of claim 11, wherein the computer executable program code is further configured to cause the controller to use the synchronized local clock time in subsequent packet transmissions between the first and second nodes.

13. (Currently Amended) The network device of claim 11, wherein ~~the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times comprises~~ storing the estimated propagation delay at the second node.[::]

~~transmitting from the first node and receiving at the second node a first packet, wherein the first packet comprises a first packet clock time comprising the local clock time of the first node at transmission time, and a scheduled arrival clock time;~~

~~setting the local clock time of the second node to the first packet clock time;~~

~~transmitting from the second node and receiving at the first node a second packet at the first scheduled arrival clock time, wherein the second packet is received by the first node at an actual arrival clock time;~~

~~calculating and storing the estimated propagation delay at the first node, wherein  
calculating the estimated propagation delay is based on the first scheduled arrival clock time and  
the first actual time;~~

~~transmitting from the first node and receiving at the second node a third packet, wherein  
the third packet comprises the estimated propagation delay; and~~

~~storing the estimated propagation delay at the second node.~~

14. (Currently Amended) The network device of claim ~~[[13]]~~ 11, wherein a transmission time of a transmitted packet is measured at 90% of peak amplitude of a transmission signal, 90% of peak power of a transmission signal, 90% of total power of a transmission signal, or a mean delay of a transmission signal.

15. (Currently Amended) The network device of claim ~~[[13]]~~ 11, wherein an arrival time of a received packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of a received signal, 90% of total power of a received signal, or a mean delay of a received signal.

16. (Original) The network device of claim 11, wherein the first node is a network coordinator.

17. (Original) The network device of claim 11, wherein the second node is a new node and the functions are performed as part of admission of the second node to the communication network.

18. (Original) The network device of claim 11, wherein the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times are performed periodically to maintain synchronization between the first and second nodes.

19. (Original) The network device of claim 11, wherein the communication network is a mesh network.

20. (Original) The network device of claim 11, wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard.

21. (Currently Amended) A computer program product comprising a non-transitory computer usable medium having computer readable program code embodied therein for synchronizing a plurality of nodes on a communication network, the computer program product comprising computer readable program code configured to cause a device to:

exchange local clock times between a first node and a second node over a communication network, wherein the exchange comprises:

transmitting a first packet from the first node to the second node, wherein the first packet includes a first packet clock time set to the local clock time of the first node at transmission time, and includes a scheduled arrival clock time, and

setting the local clock time of the second node to the first packet clock time;

perform a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes, wherein the ranging method results in an estimated propagation delay between the first and second nodes, and wherein the ranging method comprises:

transmitting a second packet from the second node to the first node, wherein the second packet is transmitted from the second node at the scheduled arrival clock time, and wherein the second packet is received by the first node at an actual arrival clock time,

calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the scheduled arrival clock time and the actual arrival time, and

transmitting a third packet from the first node to the second node, wherein the third packet comprises the estimated propagation delay; and

adjust the local clock times of either the first and second nodes based on the estimated propagation delay, thereby resulting in a synchronized local clock time at the first and second nodes.

22. (Original) The computer program product of claim 21, wherein the computer executable program code is further configured to cause the device to use the synchronized local clock time in subsequent packet transmissions between the first and second nodes.

23. (Currently Amended) The computer program product of claim 21, wherein the ~~functions of exchanging local clock times, performing the ranging method, and adjusting the~~ local clock times comprises storing the estimated propagation delay at the second node.[:]

~~transmitting from the first node and receiving at the second node a first packet, wherein the first packet comprises a first packet clock time comprising the local clock time of the first node at transmission time, and a scheduled arrival clock time;~~

~~setting the local clock time of the second node to the first packet clock time;~~

~~transmitting from the second node and receiving at the first node a second packet at the first scheduled arrival clock time, wherein the second packet is received by the first node at an actual arrival clock time;~~

~~calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the first scheduled arrival clock time and the first actual time;~~

~~transmitting from the first node and receiving at the second node a third packet, wherein the third packet comprises the estimated propagation delay; and~~

~~storing the estimated propagation delay at the second node.~~

24. (Currently Amended) The computer program product of claim ~~[[23]]~~ 21, wherein a transmission time of a transmitted packet is measured at 90% of peak amplitude of a

transmission signal, 90% of peak power of a transmission signal, 90% of total power of a transmission signal, or a mean delay of a transmission signal.

25. (Currently Amended) The computer program product of claim ~~[[23]]~~ 21, wherein an arrival time of a received packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of a received signal, 90% of total power of a received signal, or a mean delay of a received signal.

26. (Original) The computer program product of claim 21, wherein the first node is a network coordinator.

27. (Original) The computer program product of claim 21, wherein the second node is a new node and the functions are performed as part of admission of the second node to the communication network.

28. (Original) The computer program product of claim 21, wherein the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times are performed periodically to maintain synchronization between the first and second nodes.

29. (Original) The computer program product of claim 21, wherein the communication network is a mesh network.

30. (Original) The computer program product of claim 21, wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard.

31. (Currently Amended) A network interface module, comprising:
- a controller;
  - memory coupled to the controller;
  - computer executable program code on a non-transitory computer readable medium configured to cause the controller to perform the functions of:
    - exchanging local clock times between a first node and a second node over a network, wherein the exchange comprises:
      - transmitting a first packet from the first node to the second node, wherein the first packet includes a first packet clock time set to the local clock time of the first node at transmission time, and includes a scheduled arrival clock time, and
      - setting the local clock time of the second node to the first packet clock time;
    - performing a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes, wherein the ranging method results in an estimated propagation delay between the first and second nodes, and wherein the ranging method comprises:
      - transmitting a second packet from the second node to the first node, wherein the second packet is transmitted from the second node at the scheduled arrival clock time, and wherein the second packet is received by the first node at an actual arrival clock time,
      - calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the scheduled arrival clock time and the actual arrival time, and
      - transmitting a third packet from the first node to the second node, wherein the third packet comprises the estimated propagation delay; and
    - adjusting the local clock times of either the first and second nodes based on the estimated propagation delay, thereby resulting in a synchronized local clock time at the first and second nodes.

32. (Original) The network interface module of claim 31, wherein the computer executable program code is further configured to cause the controller to use the synchronized local clock time in subsequent packet transmissions between the first and second nodes.

33. (Currently Amended) The network interface module of claim 31, wherein the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times comprises storing the estimated propagation delay at the second node.[:]

~~transmitting from the first node and receiving at the second node a first packet, wherein the first packet comprises a first packet clock time comprising the local clock time of the first node at transmission time, and a scheduled arrival clock time;~~

~~setting the local clock time of the second node to the first packet clock time;~~

~~transmitting from the second node and receiving at the first node a second packet at the first scheduled arrival clock time, wherein the second packet is received by the first node at an actual arrival clock time;~~

~~calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the first scheduled arrival clock time and the first actual time;~~

~~transmitting from the first node and receiving at the second node a third packet, wherein the third packet comprises the estimated propagation delay; and~~

~~storing the estimated propagation delay at the second node.~~

34. (Currently Amended) The network interface module of claim ~~[[33]]~~ 31, wherein a transmission time of a transmitted packet is measured at 90% of peak amplitude of a transmission signal, 90% of peak power of a transmission signal, 90% of total power of a transmission signal, or a mean delay of a transmission signal.

35. (Currently Amended) The network interface module of claim ~~[[33]]~~ 31, wherein an arrival time of a received packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of a received signal, 90% of total power of a received signal, or a mean delay of a received signal.

36. (Original) The network interface module of claim 31, wherein the first node is a network coordinator.

37. (Original) The network interface module of claim 31, wherein the second node is a new node and the functions are performed as part of admission of the second node to the communication network.

38. (Original) The network interface module of claim 31, wherein the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times are performed periodically to maintain synchronization between the first and second nodes.

39. (Original) The network interface module of claim 31, wherein the communication network is a mesh network.

40. (Original) The network interface module of claim 31, wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard.

### **REMARKS**

Upon entry of the foregoing amendments, claims 1-40 remain pending. Claims 1, 11, 21, and 31 are independent. Claims 1, 3-5, 11, 13-15, 21, 23-25, 31, and 33-35 are currently amended. No new matter is introduced by these amendments and their entry is respectfully requested.

In view of the above amendments and following remarks, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to reconsider and withdraw the outstanding rejections of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

### **Allowable Subject Matter**

Applicant respectfully thanks the Examiner for indicating that dependent claims 3-5, 13-15, 33-35 are otherwise allowable if they were rewritten in independent form, and indicating the same for dependent claims 23-25 if they were rewritten in independent form and were rewritten to overcome their rejection under 35 U.S.C. §101.

Without waiving any arguments and purely to advance prosecution, Applicant has currently amended each of independent claims 1, 11, 21, and 31 to incorporate limitations from allowable dependent claims 3, 13, 23, and 33. In addition, independent claim 21 has been amended to overcome its rejection under 35 U.S.C. §101. Applicant, therefore, believes independent claims 1, 11, 21, and 31 as currently amended (and the claims that depend therefrom) are in condition for allowance and respectfully request their reconsideration.

### **Claim Objection**

Claim 1 is objected to because the last limitation recites “adjusting the local clock time either the first or second node based on the estimated propagation delay” and, as such, appears to be missing a preposition or some identifying grammar.

Applicant has currently amended claim 1 to recite “adjusting the local clock time of either the first or second node based on the estimated propagation delay.” Applicant, therefore, respectfully requests that the Examiner reconsider and withdraw the objection of claim 1.

**Rejection under 35 U.S.C. § 101**

Claims 21-30 are rejected under 35 U.S.C. §101 because the claimed invention is allegedly directed to non-statutory subject matter. In particular, claim 21 recites “a computer program product comprising a computer useable medium having computer readable program code” and, as such, is deemed to be non-statutory since the originally-filed disclosure describes the medium” to be “signals on channel.”

Applicant has currently amended claim 21 to recite “non-transitory” before “computer readable medium,” as suggested by the Examiner. Applicant, therefore, submits that claim 21 as currently amended (and claims 22-30 which depend therefrom) are directed toward statutory subject matter, and respectfully requests the Examiner to reconsider and withdraw the rejection of claims 21-30 under 35 U.S.C. §101.

**Rejection under 35 U.S.C. §102(b)**

Claims 1, 2, and 6-9 are rejected under 35 U.S.C. §102(b) for allegedly being anticipated by U.S. Patent Application Publication No. 2008/0056308 to Zumsteg (hereafter, “Zumsteg”).

Applicant has currently amended claim 1 to incorporate limitations from dependent claim 13, which the Examiner has identified as containing allowable subject matter. In view of this incorporation, Applicant submits that independent claim 1 as amended is patentable over Zumsteg and claims 2 and 6-9 are patentable over Zumsteg at least by virtue of their dependency from claim 1. Applicant, therefore, respectfully requests that the Examiner reconsider and withdraw the rejection of claims 1, 2, and 6-9 under 35 U.S.C. §102(b).

**Rejection under 35 U.S.C. §103(a)**

Claim 10-12, 16-22, 26-32 and 36-39 are rejected under 35 U.S.C. §103(a) for allegedly being unpatentable over Zumsteg in view of U.S. Patent Application Publication No. 2008/0271076 to Schlack (hereafter, “Schlack”), Official Notice, or both.

As noted above, Applicant has amended independent claims 11, 21, and 31 such that each respectively incorporates limitations from dependent claims 13, 23, and 33, which have been identified by the Examiner as containing allowable subject matter. In view of this incorporation, Applicant submits that independent claims 11, 21, and 31 as amended are patentable over Zumsteg, Schlack, and other prior art, whether considered alone or in combination. Furthermore, claims 10, 12, 16-20, 22, 26-30, 32 and 36-39 are patentable over Zumsteg, Schlack, and other prior art, whether considered alone or in combination, at least by virtue of their dependency from one of independent claims 1, 11, 21, and 31. Applicant, therefore, respectfully requests that the Examiner reconsider and withdraw the rejection of claims 10-12, 16-22, 26-32 and 36-39 under 35 U.S.C. §103(a).

**CONCLUSION**

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to reconsider and withdraw the outstanding rejection of the claims and to pass this application to issue.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, Applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 50-4562 referencing the Attorney Docket No. noted above. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

Dated: April 25, 2012

Respectfully submitted,

By: /Anup A. Suresh/  
Anup Suresh  
Registration No.: 65,338

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## Electronic Acknowledgement Receipt

|                                             |                                                                                  |
|---------------------------------------------|----------------------------------------------------------------------------------|
| <b>EFS ID:</b>                              | 12631678                                                                         |
| <b>Application Number:</b>                  | 12580127                                                                         |
| <b>International Application Number:</b>    |                                                                                  |
| <b>Confirmation Number:</b>                 | 9702                                                                             |
| <b>Title of Invention:</b>                  | Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network |
| <b>First Named Inventor/Applicant Name:</b> | Arndt MUELLER                                                                    |
| <b>Customer Number:</b>                     | 77330                                                                            |
| <b>Filer:</b>                               | Daniel N. Yannuzzi/Linda Spirra                                                  |
| <b>Filer Authorized By:</b>                 | Daniel N. Yannuzzi                                                               |
| <b>Attorney Docket Number:</b>              | E080048USU1                                                                      |
| <b>Receipt Date:</b>                        | 25-APR-2012                                                                      |
| <b>Filing Date:</b>                         | 15-OCT-2009                                                                      |
| <b>Time Stamp:</b>                          | 19:25:45                                                                         |
| <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               |                      | 150929-Amendmnt.pdf | 784311<br>bd46086e2b01f5f91931ebdf40007ee9db5659f1 | yes              | 18               |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Miscellaneous Incoming Letter                         | 1      | 2   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Amendment/Req. Reconsideration-After Non-Final Reject | 3      | 18  |
| Warnings:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                       |        |     |
| Information:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                       |        |     |
| Total Files Size (in bytes):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                       | 784311 |     |
| <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/>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.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/>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.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/>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.</p> |                                                       |        |     |

# Amendment Transmittal Letter

Docket Number

05JM-150929

Address To  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

## Title of Invention

METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A MULTIMEDIA HOME NETWORK

|                      |                        |
|----------------------|------------------------|
| First Named Inventor | Arndt Mueller          |
| Application No.      | 12/580,127             |
| Filing Date          | October 15, 2009       |
| Examiner             | Elliot IV, Benjamin H. |
| Art Unit             | 2474                   |

Transmitted herewith is an amendment in the above-identified application.

The fee has been calculated and is transmitted as shown below.

☒ Applicant claims Small Entity Status. See 37 CFR 1.27.

## Fee Calculation

Claims as Amended

| For                                                                      | #Filed | #Previously Paid For | #Extra | Rate    | Fee |
|--------------------------------------------------------------------------|--------|----------------------|--------|---------|-----|
| Total Claims                                                             | 40     | - 40 =               |        | x 30 =  |     |
| Total Indep. Claims                                                      | 4      | - 4 =                |        | x 125 = |     |
| Multiple Dependent Claims (check if applicable) <input type="checkbox"/> |        |                      |        |         |     |
| TOTAL                                                                    |        |                      |        |         | \$0 |

## Method of Payment

☐ Deposit Account ☐ Credit Card ☐ Check ☐ Money Order ☐ Other: \_\_\_\_\_

Deposit Account Number \_\_\_\_\_

**For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)**

- ☐ Charge the fee(s) set forth above  
☐ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17  
☐ Charge fee(s) indicated above, **except for the filing fee**  
☐ Credit any overpayments

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on form PTO-2038.**

Amount Grand Total \_\_\_\_\_ \$0

|                                       |               |
|---------------------------------------|---------------|
| <h1>Amendment Transmittal Letter</h1> | Docket Number |
|                                       | 05JM-150929   |

| Correspondence Address |       |             |  |
|------------------------|-------|-------------|--|
| Customer Number        | 77882 |             |  |
| -OR-                   |       |             |  |
| Name                   |       |             |  |
| Address                |       |             |  |
| City                   |       | State       |  |
| Country                |       | Postal Code |  |
| Phone Number           |       |             |  |
| E-mail Address         |       |             |  |

| Certificate of Mailing by Express Mail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>I hereby certify that this Amendment, accompanying documents, and fee (if appropriate) are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on the date indicated below:</p> <p>_____</p> <p style="text-align: center;">(Date of Mailing)</p> <p>_____</p> <p style="text-align: center;">(Typed or Printed Name of Person Mailing Correspondence)</p> <p>_____</p> <p style="text-align: center;">(Signature of Person Mailing Correspondence)</p> <p>_____</p> <p style="text-align: center;">("Express Mail" Mailing Label Number)</p> |

| Certificate of Mailing by First Class Mail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>I hereby certify that this Amendment, accompanying documents, and fee (if appropriate) are being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on the date indicated below:</p> <p>_____</p> <p style="text-align: center;">(Date of Mailing)                      (Name of Person Mailing Correspondence)</p> <p>_____</p> <p style="text-align: center;">(Signature of Person Mailing Correspondence)</p> |

| Certificate of Transmission                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>I hereby certify that this Amendment, accompanying documents, and fee (if appropriate) authorization are being facsimile transmitted to the United States Patent and Trademark Office on the date indicated below:</p> <p>_____</p> <p style="text-align: center;">(Date of Transmission)                      (Name of Person Transmitting Correspondence)</p> <p>_____</p> <p style="text-align: center;">(Signature of Person Transmitting Correspondence)</p> |

| Signature Instructions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Select the name of the person who will electronically sign the Amendment from the drop-down box below.</p> <p>If a practitioner is not present in the drop-down list, you must close this form and select 'Add Practitioner...' in the Form Manager's Utility menu.</p> <p><b>Verify that the signatory information is correct and press the 'eSign' button to electronically sign the submission. If you prefer to sign the form manually, simply do not click the 'eSign' button; just print and manually sign.</b></p> <p style="text-align: center;">Signatory Drop-Down Box      <input type="text" value="Anup A. Suresh"/></p> |

|                                      |                           |                |                     |            |
|--------------------------------------|---------------------------|----------------|---------------------|------------|
| Name                                 | Anup A. Suresh            |                | Registration Number | 65,338     |
| Signatory Capacity                   | Attorney for Applicant(s) | E-mail Address |                     |            |
| <input type="button" value="eSign"/> | /Anup A. Suresh/          |                | Date Signed         | 04/25/2012 |

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|                                                                                   |  |  |  |  |                                                   |  |                                  |  |                                       |  |
|-----------------------------------------------------------------------------------|--|--|--|--|---------------------------------------------------|--|----------------------------------|--|---------------------------------------|--|
| <b>PATENT APPLICATION FEE DETERMINATION RECORD</b><br>Substitute for Form PTO-875 |  |  |  |  | Application or Docket Number<br><b>12/580,127</b> |  | Filing Date<br><b>10/15/2009</b> |  | <input type="checkbox"/> To be Mailed |  |
|-----------------------------------------------------------------------------------|--|--|--|--|---------------------------------------------------|--|----------------------------------|--|---------------------------------------|--|

| APPLICATION AS FILED – PART I                                              |              |              |                                                                                                                                                                                                                               |                                          |    | OTHER THAN SMALL ENTITY |          |  |  |
|----------------------------------------------------------------------------|--------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----|-------------------------|----------|--|--|
| (Column 1)                                                                 |              | (Column 2)   |                                                                                                                                                                                                                               | SMALL ENTITY <input type="checkbox"/> OR |    | OTHER THAN SMALL ENTITY |          |  |  |
| FOR                                                                        | NUMBER FILED | NUMBER EXTRA | RATE (\$)                                                                                                                                                                                                                     | FEE (\$)                                 | OR | RATE (\$)               | FEE (\$) |  |  |
| <input type="checkbox"/> BASIC FEE<br>(37 CFR 1.16(a), (b), or (c))        | N/A          | N/A          | N/A                                                                                                                                                                                                                           |                                          |    | N/A                     |          |  |  |
| <input type="checkbox"/> SEARCH FEE<br>(37 CFR 1.16(k), (l), or (m))       | N/A          | N/A          | N/A                                                                                                                                                                                                                           |                                          |    | N/A                     |          |  |  |
| <input type="checkbox"/> EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q))  | N/A          | N/A          | N/A                                                                                                                                                                                                                           |                                          |    | N/A                     |          |  |  |
| TOTAL CLAIMS<br>(37 CFR 1.16(i))                                           | minus 20 =   | *            | X \$ =                                                                                                                                                                                                                        |                                          | OR | X \$ =                  |          |  |  |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h))                                     | minus 3 =    | *            | X \$ =                                                                                                                                                                                                                        |                                          |    | X \$ =                  |          |  |  |
| <input type="checkbox"/> 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 \$250 (\$125 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). |                                          |    |                         |          |  |  |
| <input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) |              |              |                                                                                                                                                                                                                               |                                          |    |                         |          |  |  |
| * If the difference in column 1 is less than zero, enter "0" in column 2.  |              |              | TOTAL                                                                                                                                                                                                                         |                                          |    | TOTAL                   |          |  |  |

| APPLICATION AS AMENDED – PART II                                                         |                                  |            |                                    |               |           | OTHER THAN SMALL ENTITY |    |                 |                     |                         |  |
|------------------------------------------------------------------------------------------|----------------------------------|------------|------------------------------------|---------------|-----------|-------------------------|----|-----------------|---------------------|-------------------------|--|
| (Column 1)                                                                               |                                  | (Column 2) |                                    | (Column 3)    |           | SMALL ENTITY            |    | OR              |                     | OTHER THAN SMALL ENTITY |  |
| DATE                                                                                     | CLAIMS REMAINING AFTER AMENDMENT | MINUS      | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | RATE (\$) | ADDITIONAL FEE (\$)     | OR | RATE (\$)       | ADDITIONAL FEE (\$) |                         |  |
| <b>04/25/2012</b>                                                                        | *                                | 40         | Minus                              | ** 40         | =         | 0                       |    | X \$60=         | 0                   |                         |  |
| Independent (37 CFR 1.16(h))                                                             | *                                | 4          | Minus                              | ***4          | =         | 0                       |    | X \$250=        | 0                   |                         |  |
| <input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))                           |                                  |            |                                    |               |           |                         |    |                 |                     |                         |  |
| <input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                  |            |                                    |               |           |                         |    |                 |                     |                         |  |
| TOTAL ADD'L FEE                                                                          |                                  |            |                                    |               |           |                         | OR | TOTAL ADD'L FEE |                     | <b>0</b>                |  |

| (Column 1)                                                                               |                                  | (Column 2) |                                    | (Column 3)    |           | SMALL ENTITY        |    | OR              |                     | OTHER THAN SMALL ENTITY |  |
|------------------------------------------------------------------------------------------|----------------------------------|------------|------------------------------------|---------------|-----------|---------------------|----|-----------------|---------------------|-------------------------|--|
| DATE                                                                                     | CLAIMS REMAINING AFTER AMENDMENT | MINUS      | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | RATE (\$) | ADDITIONAL FEE (\$) | OR | RATE (\$)       | ADDITIONAL FEE (\$) |                         |  |
| Total (37 CFR 1.16(i))                                                                   | *                                |            | Minus                              | **            | =         |                     |    | X \$ =          |                     |                         |  |
| Independent (37 CFR 1.16(h))                                                             | *                                |            | Minus                              | ***           | =         |                     |    | X \$ =          |                     |                         |  |
| <input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))                           |                                  |            |                                    |               |           |                     |    |                 |                     |                         |  |
| <input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                  |            |                                    |               |           |                     |    |                 |                     |                         |  |
| TOTAL ADD'L FEE                                                                          |                                  |            |                                    |               |           |                     | OR | TOTAL ADD'L FEE |                     |                         |  |

\* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.  
 \*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".  
 \*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".  
 The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. 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, 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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|------------------------------------------------------------------------------------------------------|-------------|----------------------|------------------------------------|------------------|
| APPLICATION NO.                                                                                      | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.                | CONFIRMATION NO. |
| 12/580,127                                                                                           | 10/15/2009  | Arndt MUELLER        | E080048USU1                        | 9702             |
| 77330 7590 02/01/2012<br>ENTROPIC COMMUNICATIONS, INC.<br>6290 SEQUENCE DRIVE<br>SAN DIEGO, CA 92121 |             |                      | EXAMINER<br>ELLIOTT IV, BENJAMIN H |                  |
|                                                                                                      |             |                      | ART UNIT                           | PAPER NUMBER     |
|                                                                                                      |             |                      | 2474                               |                  |
|                                                                                                      |             |                      | MAIL DATE                          | DELIVERY MODE    |
|                                                                                                      |             |                      | 02/01/2012                         | PAPER            |

**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.

|                              |                                           |  |                                       |  |
|------------------------------|-------------------------------------------|--|---------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>12/580,127      |  | <b>Applicant(s)</b><br>MUELLER, ARNDT |  |
|                              | <b>Examiner</b><br>BENJAMIN H. ELLIOTT IV |  | <b>Art Unit</b><br>2474               |  |
|                              |                                           |  |                                       |  |

**-- 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 15 October 2009.

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) 1-40 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) 1,2,6-12,16-32 and 36-40 is/are rejected.

8) ☒ Claim(s) 3-5,13-15,33-35 is/are objected to.

9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

10) ☐ The specification is objected to by the Examiner.

11) ☒ The drawing(s) filed on 15 October 2009 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).

12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \*    c) ☐ None of:  
         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)<br>2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)<br>3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>2/18/2010</u> | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____<br>5) <input type="checkbox"/> Notice of Informal Patent Application<br>6) <input type="checkbox"/> Other: ____ |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**DETAILED ACTION**

1. Claims 1-40 have been examined and are pending.

***Priority***

2. Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, or 365(c) is acknowledged.

***Information Disclosure Statement***

3. The information disclosure statement (IDS) submitted on 2/18/2010 has been found to be in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement has been considered by the examiner.

***Claim Objections***

4. Claim 1 is objected to because of the following informalities: the last limitation recites "adjusting the local clock time either the first or second node based on the estimated propagation delay". There appears to be a preposition or some identifying grammar missing between "time" and "either", for example, "adjusting the local clock time either **to** the first or second node" or "adjusting the local clock time **for** either the first or second node". Appropriate correction is required.

***Claim Rejections - 35 USC § 101***

5. 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 21-30 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 21 recites "a computer program product comprising a computer usable medium having computer readable program code" is non-statutory since the originally-filed disclosure describes the "medium" to be "signals on channel" ([0072]). Examiner respectfully suggests amending the claim to recite "a computer program product comprising a computer usable *non-transitory* medium having computer readable program code".

Claims 22-30 are rejected as being dependent upon a rejected base claim and for not curing the deficiencies of the rejected base claim.

### ***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 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.

7. Claims 1, 2, and 6-9 are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent Application Publication 2008/0056308 A1 to Zumsteg (hereinafter "Zumsteg").

**Regarding Claim 1**, Zumsteg discloses **a method for synchronizing a plurality of nodes on a communication network** (Zumsteg: [0010]; synchronizing two

or more nodes in a communication network. Also see Figures 1A and 1B with accompanying description in [0028-0030].), **comprising:**

**exchanging a local clock time between a first node and a second node over the communication network** (Zumsteg: [0027]; describing the elapsed time based on the exchange of local time-synchronized clock signals.);

**performing a ranging method between the first and second nodes based on the local clock time exchanged** (Zumsteg: [0027]; ranges are determined between first and second nodes in the network according to the elapsed time between the scheduled time and the time of detection.), **wherein the ranging method results in an estimated propagation delay between the first and second node** (Zumsteg: [0037-0038]; corresponding to the time delays according to range values.); **and**

**adjusting the local clock time either the first or second node based on the estimated propagation delay** (Zumsteg: [0027]; nodes in receiving mode have their clocks synchronized to the clocks in transmitting mode, then a range is computed. Figure 7 and accompanying description in [0043-0047] recite the ranging application wherein the scheduling clock of the local clock is continuously updated in view of the delay from reception of the ranging signals.), **thereby resulting in a synchronized local clock time between the first and second node** (Zumsteg: Figure 6: after ranging application is complete, item 612, the process returns time synchronization, item 602, between transmitting and receiving nodes.).

**Regarding Claim 2, Zumsteg discloses the method of claim 1, further comprising using the synchronized local clock time in subsequent packet**

**transmissions between the first and second nodes** (Zumsteg: Figure 6 and accompanying description in [0041-0042]; repeating the process.).

**Regarding Claim 6**, Zumsteg discloses **the method of claim 1, wherein the first node is a network coordinator** (Zumsteg: implied by [0027] in that the receiving nodes (acting as slaves) synchronize to clocks of transmitting nodes (masters, or coordinators).).

**Regarding Claim 7**, Zumsteg discloses **the method of claim 1, wherein the second node is a new node and the method is performed as part of admission of the second node to the communication network** (Zumsteg: [0031]; corresponding to a switch point, permitting another node (second node) in the communication to transmit according to a schedule.).

**Regarding Claim 8**, Zumsteg discloses **the method of claim 1, wherein the method is performed periodically to maintain synchronization between the first and second nodes** (Zumsteg: [0028]).

**Regarding Claim 9**, Zumsteg discloses **the method of claim 1, wherein the communication network is a mesh network** (Zumsteg: Figure 1B and accompanying description in [0030]).

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 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.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zumsteg in view of United States Patent Application Publication 2008/0271076 A1 to Schlack (hereinafter "Schlack").

**Regarding Claim 10**, Zumsteg discloses **the method of claim 1**, but does expressly disclose implementing in accordance with the Multimedia over Coax Alliance (MoCA) standard.

However, Schlack discloses a set-top box terminal operating in a communication network capable of clock synchronization (Schlack: [0027], Figure 1 and [0014-0015]) **wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard** (Schlack: [0038]).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of synchronizing clock signals as disclosed by Zumsteg to include a communication network operating according to the MoCA standard as disclosed by Schlack, since all the claimed elements were known at the time the invention was made, and combining the known elements would have

required only routine skill in the art (implementation via protocol-enabled circuitry) yielding nothing more than predictable results at the time the invention was made, i.e., synchronization of clocks of a plurality of wireless devices operating in LAN or WLAN environment.).

11. Claims 11, 12, 16-19, 21, 22, 26-29, 31, 32, and 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zumsteg in view of Examiner's Official Notice.

**Regarding Claim 11**, Zumsteg discloses **a network device, comprising:**  
**a controller** (Zumsteg: Figure 3; control circuit, item 302);  
**a device module** (Zumsteg: Figure 4; CPU, item 414);  
**memory coupled to the controller** (Zumsteg: [0027] and [0045]; storing values implies memory modules);  
**the controller to perform the functions of:**  
**exchanging local clock times between a first node and a second node over a communication network** (Zumsteg: [0027]; describing the elapsed time based on the exchange of local time-synchronized clock signals.);  
**performing a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes** (Zumsteg: [0027]; ranges are determined between first and second nodes in the network according to the elapsed time between the scheduled time and the time of detection.), **wherein the ranging method results in an estimated propagation delay between the first and**

**second nodes** (Zumsteg: [0037-0038]; corresponding to the time delays according to range values.); **and**

**adjusting the local clock times of the first and second nodes based on the estimated propagation delay** (Zumsteg: [0027]; nodes in receiving mode have their clocks synchronized to the clocks in transmitting mode, then a range is computed.

Figure 7 and accompanying description in [0043-0047] recite the ranging application wherein the scheduling clock of the local clock is continuously updated in view of the delay from reception of the ranging signals.), **thereby resulting in a synchronized local clock time at the first and second nodes** (Zumsteg: Figure 6: after ranging application is complete, item 612, the process returns time synchronization, item 602, between transmitting and receiving nodes.).

Zumsteg does not expressly define a computer-readable program product.

However, packet transmitting devices comprising at least transmit/receive capabilities, CPU and memory, interfaces to other devices and further comprising a machine readable medium with program instructions to perform a method, the program including instructions for causing a processor to perform the method steps, is so well known in the art. Thus, Official Notice is taken that both the concept and the advantages of providing "a computer readable medium" in a networking device are well known and expected in the art, allowing diverse ability of networking devices.

**Claims 12 and 16-19 are substantial duplicates to claims 2 and 6-9, in view of Examiner's Official Notice, and are therefore rejected under the same grounds as claims 2 and 6-9.**

**Regarding Claim 21**, Zumsteg discloses **a computer configured to cause a device to:**

**exchange local clock times between a first node and a second node over a communication network** (Zumsteg: [0027]; describing the elapsed time based on the exchange of local time-synchronized clock signals.);

**perform a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes** (Zumsteg: [0027]; ranges are determined between first and second nodes in the network according to the elapsed time between the scheduled time and the time of detection.), **wherein the ranging method results in an estimated propagation delay between the first and second nodes** (Zumsteg: [0037-0038]; corresponding to the time delays according to range values.); **and**

**adjust the local clock times of the first and second nodes based on the estimated propagation delay** (Zumsteg: [0027]; nodes in receiving mode have their clocks synchronized to the clocks in transmitting mode, then a range is computed. Figure 7 and accompanying description in [0043-0047] recite the ranging application wherein the scheduling clock of the local clock is continuously updated in view of the delay from reception of the ranging signals.), **thereby resulting in a synchronized local clock**

**time at the first and second nodes** (Zumsteg: Figure 6: after ranging application is complete, item 612, the process returns time synchronization, item 602, between transmitting and receiving nodes.).

Zumsteg does not expressly define a computer-readable program product.

However, packet transmitting devices comprising at least transmit/receive capabilities, CPU and memory, interfaces to other devices and further comprising a machine readable medium with program instructions to perform a method, the program including instructions for causing a processor to perform the method steps, is so well known in the art. Thus, Official Notice is taken that both the concept and the advantages of providing "a computer readable medium" in a networking device are well known and expected in the art, allowing diverse ability of networking devices.

**Claims 22 and 26-29 are substantial duplicates to claims 2 and 6-9, in view of Examiner's Official Notice, and are therefore rejected under the same grounds as claims 2 and 6-9.**

**Regarding Claim 31, Zumsteg discloses a network interface module, comprising:**  
**a controller** (Zumsteg: Figure 3; control circuit, item 302);  
**memory coupled to the controller** (Zumsteg: [0027] and [0045]; storing values implies memory modules);  
**the controller to perform the functions of:**

**exchanging local clock times between a first node and a second node over a network** (Zumsteg: [0027]; describing the elapsed time based on the exchange of local time-synchronized clock signals.);

**performing a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes** (Zumsteg: [0027]; ranges are determined between first and second nodes in the network according to the elapsed time between the scheduled time and the time of detection.), **wherein the ranging method results in an estimated propagation delay between the first and second nodes** (Zumsteg: [0037-0038]; corresponding to the time delays according to range values.); **and**

**adjusting the local clock times of the first and second nodes based on the estimated propagation delay** (Zumsteg: [0027]; nodes in receiving mode have their clocks synchronized to the clocks in transmitting mode, then a range is computed. Figure 7 and accompanying description in [0043-0047] recite the ranging application wherein the scheduling clock of the local clock is continuously updated in view of the delay from reception of the ranging signals.), **thereby resulting in a synchronized local clock time at the first and second nodes** (Zumsteg: Figure 6: after ranging application is complete, item 612, the process returns time synchronization, item 602, between transmitting and receiving nodes.).

Zumsteg does not expressly define a computer-readable program product.

However, packet transmitting devices comprising at least transmit/receive capabilities, CPU and memory, interfaces to other devices and further comprising a

machine readable medium with program instructions to perform a method, the program including instructions for causing a processor to perform the method steps, is so well known in the art. Thus, Official Notice is taken that both the concept and the advantages of providing "a computer readable medium" in a networking device are well known and expected in the art, allowing diverse ability of networking devices.

**Claims 32 and 36-39 are substantial duplicates to claims 2 and 6-9, in view of Examiner's Official Notice, and are therefore rejected under the same grounds as claims 2 and 6-9.**

12. Claims 20, 30 ,and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zumsteg, in view of Examiner's Official Notice, and further in view of Schlack.

**Regarding Claim 20**, the combination of Zumsteg and Examiner's Official Notice discloses **the network device of claim 11**, but does expressly disclose implementing in accordance with the Multimedia over Coax Alliance (MoCA) standard.

However, Schlack discloses a set-top box terminal operating in a communication network capable of clock synchronization (Schlack: [0027], Figure 1 and [0014-0015]) **wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard** (Schlack: [0038]).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of synchronizing clock signals as

disclosed by Zumsteg to include a communication network operating according to the MoCA standard as disclosed by Schlack, since all the claimed elements were known at the time the invention was made, and combining the known elements would have required only routine skill in the art (implementation via protocol-enabled circuitry) yielding nothing more than predictable results at the time the invention was made, i.e., synchronization of clocks of a plurality of wireless devices operating in LAN or WLAN environment.).

**Claim 30 is a substantial duplicate to claim 20 and is therefore rejected under the same grounds as claim 20.**

**Claim 40 is a substantial duplicate to claim 20 and is therefore rejected under the same grounds as claim 20.**

***Allowable Subject Matter***

13. Claims 3-5, 13-15, and 33-35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

14. Claims 23-25 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 101, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BENJAMIN H. ELLIOTT IV whose telephone number is (571)270-7163. The examiner can normally be reached on Monday thru Friday, 9:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kwang Yao can be reached on (571) 272-3182. 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.

BENJAMIN H ELLIOTT IV  
Examiner  
Art Unit 2474

/KWANG B YAO/

Supervisory Patent Examiner, Art Unit 2473

|                                   |                                       |                                                              |             |
|-----------------------------------|---------------------------------------|--------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>12/580,127 | Applicant(s)/Patent Under<br>Reexamination<br>MUELLER, ARNDT |             |
|                                   | Examiner<br>BENJAMIN H. ELLIOTT IV    | Art Unit<br>2474                                             | Page 1 of 1 |

**U.S. PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name               | Classification |
|---|---|--------------------------------------------------|-----------------|--------------------|----------------|
| * | A | US-2008/0056308                                  | 03-2008         | Zumsteg, Philip J. | 370/503        |
| * | B | US-2008/0271076                                  | 10-2008         | Schlack, John      | 725/39         |
|   | 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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|   | R |                                                  |                 |         |      |                |
|   | S |                                                  |                 |         |      |                |
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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.

## EAST Search History

## EAST Search History (Prior Art)

| Ref # | Hits | Search Query                                                                                                        | DBs                                                                     | Default Operator | Plurals | Time Stamp          |
|-------|------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------|---------|---------------------|
| L1    | 132  | clock with synchroniz\$6<br>same packet same (rang<br>\$3 distance) same delay<br>\$3                               | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2012/01/27<br>10:09 |
| L2    | 420  | 370/395.62,518.ccls.                                                                                                | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2012/01/27<br>10:10 |
| L3    | 9483 | 370/350,503,509-<br>514,519.ccls.                                                                                   | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2012/01/27<br>10:13 |
| L4    | 332  | 370/519.ccls.                                                                                                       | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2012/01/27<br>10:14 |
| L5    | 3    | 4 and clock with<br>synchroniz\$6 same<br>packet same (rang\$3<br>distance) same delay\$3                           | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2012/01/27<br>10:14 |
| L6    | 2    | clock with synchroniz\$6<br>same packet same (rang<br>\$3 distance) same delay<br>\$3 same local same<br>schedul\$3 | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2012/01/27<br>10:22 |
| L7    | 17   | clock with synchroniz\$6<br>same (rang\$3 distance)<br>same delay\$3 same local<br>same schedul\$3                  | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2012/01/27<br>10:23 |

|     |    |                                                                                                                        |                                                                         |    |    |                     |
|-----|----|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----|----|---------------------|
| L8  | 2  | clock with synchroniz\$6<br>same schedul\$3 adj1<br>time same local adj1<br>time same transmi\$5<br>adj1 time          | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/27<br>10:28 |
| L10 | 40 | (clock and synchroniz\$5<br>and rang\$3).ti.                                                                           | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/27<br>10:29 |
| L11 | 14 | ("20050287964"  <br>"20070133386"  <br>"20080013473"  <br>"20080076432"  <br>"5349582"   "6956865"  <br>"7054296").PN. | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/27<br>10:47 |
| L12 | 0  | master same slave same<br>clock adj1 synchroniz\$5<br>same delay same packet<br>same local same schedul<br>\$3         | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/27<br>10:48 |
| L13 | 1  | master same slave same<br>clock with synchroniz\$5<br>same delay same packet<br>same local same schedul<br>\$3         | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/27<br>10:49 |
| L14 | 6  | master same slave same<br>clock with synchroniz\$5<br>same packet same local<br>same schedul\$3                        | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/27<br>10:49 |
| L15 | 34 | master same slave same<br>clock with synchroniz\$5<br>same packet same rang<br>\$3                                     | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/27<br>10:50 |
| L16 | 9  | master same slave same<br>clock with synchroniz\$5<br>same packet same<br>distance                                     | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/27<br>10:57 |

|    |    |                                                                                                  |                                                                         |    |    |                     |
|----|----|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----|----|---------------------|
| S1 | 1  | "12580127"                                                                                       | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/26<br>18:19 |
| S2 | 0  | clock with synchroniz\$6<br>same first same second<br>same packet same rang<br>\$3 same delay\$3 | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/26<br>18:20 |
| S5 | 11 | clock with synchroniz\$6<br>same first same second<br>same packet same rang<br>\$3 same delay\$3 | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2012/01/26<br>18:21 |

**1/27/2012 11:53:28 AM**

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CONFIRMATION NO. 9702

| SERIAL NUMBER                                                                                                                                                                                                                                                                                                                                               | FILING or 371(c)<br>DATE                                                                                          | CLASS                                                           | GROUP ART UNIT            | ATTORNEY DOCKET<br>NO.                                       |                       |                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|---------------------------|--------------------------------------------------------------|-----------------------|----------------------------|
| 12/580,127                                                                                                                                                                                                                                                                                                                                                  | 10/15/2009                                                                                                        | 370                                                             | 2474                      | E080048USU1                                                  |                       |                            |
| <b>APPLICANTS</b><br>Arndt MUELLER, San Diego, CA;<br><b>** CONTINUING DATA *****</b><br>This appln claims benefit of 61/105,942 10/16/2008<br>and claims benefit of 61/144,061 01/12/2009<br>and claims benefit of 61/144,676 01/14/2009<br><b>** FOREIGN APPLICATIONS *****</b><br><b>** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **</b><br>10/29/2009 |                                                                                                                   |                                                                 |                           |                                                              |                       |                            |
| Foreign Priority claimed <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>35 USC 119(a-d) conditions met <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>Verified and <u>/BENJAMIN H ELLIOTT IV/</u><br>Acknowledged <u>Examiner's Signature</u>                                                               |                                                                                                                   | <input type="checkbox"/> Met after Allowance<br><u>Initials</u> | STATE OR<br>COUNTRY<br>CA | SHEETS<br>DRAWINGS<br>14                                     | TOTAL<br>CLAIMS<br>40 | INDEPENDENT<br>CLAIMS<br>4 |
| <b>ADDRESS</b><br>ENTROPIC COMMUNICATIONS, INC.<br>6290 SEQUENCE DRIVE<br>SAN DIEGO, CA 92121<br>UNITED STATES                                                                                                                                                                                                                                              |                                                                                                                   |                                                                 |                           |                                                              |                       |                            |
| <b>TITLE</b><br>Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network                                                                                                                                                                                                                                                            |                                                                                                                   |                                                                 |                           |                                                              |                       |                            |
| FILING FEE<br>RECEIVED<br>2350                                                                                                                                                                                                                                                                                                                              | FEES: Authority has been given in Paper<br>No. _____ to charge/credit DEPOSIT ACCOUNT<br>No. _____ for following: |                                                                 |                           | <input type="checkbox"/> All Fees                            |                       |                            |
|                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |                                                                 |                           | <input type="checkbox"/> 1.16 Fees (Filing)                  |                       |                            |
|                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |                                                                 |                           | <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) |                       |                            |
|                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |                                                                 |                           | <input type="checkbox"/> 1.18 Fees (Issue)                   |                       |                            |
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Receipt date: 02/18/2010

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

12580127 - GAI: 2474

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|-----------------------------------------------------------------------------------------------------|------------------------|---------------|------------|--|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |               | 12580127   |  |
|                                                                                                     | Filing Date            |               | 2009-10-15 |  |
|                                                                                                     | First Named Inventor   | Arndt MUELLER |            |  |
|                                                                                                     | Art Unit               | 2472          |            |  |
|                                                                                                     | Examiner Name          | UnKnown       |            |  |
|                                                                                                     | Attorney Docket Number | E080048USU1   |            |  |

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|                                                                                             | 1       | 6956865            | B1                     | 2005-10-18       | KHAUNTE et al.                                  |                                                                        |
|                                                                                             | 2       | 5349582            | A                      | 1994-09-20       | BISDIKIAN et al.                                |                                                                        |
|                                                                                             | 3       | 7054296            | B1                     | 2005-10-18       | SORRELLS et al.                                 |                                                                        |
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|                                                                                             | 1       | 20080013473        | A1                     | 2008-01-17       | PROCTOR, JR et al.                              |                                                                        |
|                                                                                             | 2       | 20070133386        | A1                     | 2007-06-14       | KIM et al.                                      |                                                                        |
|                                                                                             | 3       | 20050287964        | A1                     | 2005-12-29       | TANAKA et al.                                   |                                                                        |

|                                                                                                                                            |                        |               |            |                      |
|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------|------------|----------------------|
| <b>Receipt date: 02/18/2010</b><br><br><b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |               | 12580127   | 12580127 - GAU: 2474 |
|                                                                                                                                            | Filing Date            |               | 2009-10-15 |                      |
|                                                                                                                                            | First Named Inventor   | Arndt MUELLER |            |                      |
|                                                                                                                                            | Art Unit               | 2472          |            |                      |
|                                                                                                                                            | Examiner Name          | UnKnown       |            |                      |
|                                                                                                                                            | Attorney Docket Number | E080048USU1   |            |                      |

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|  | 4 | 20080076432 | A1 | 2008-03-27 | SENARATH et al. |  |
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| Examiner Initial* | Cite No | Foreign Document Number <sup>3</sup> | Country Code <sup>2</sup> i | Kind Code <sup>4</sup> | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T <sup>5</sup>           |
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| Examiner Signature | /Benjamin Elliott Iv/ | Date Considered | 01/27/2012 |
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

|                                                                                                                        |                                                |                                                                      |
|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------|
| <b><i>Index of Claims</i></b><br><br> | <b>Application/Control No.</b><br><br>12580127 | <b>Applicant(s)/Patent Under Reexamination</b><br><br>MUELLER, ARNDT |
|                                                                                                                        | <b>Examiner</b><br><br>BENJAMIN H ELLIOTT IV   | <b>Art Unit</b><br><br>2474                                          |

|   |                 |   |                   |   |                     |   |                 |
|---|-----------------|---|-------------------|---|---------------------|---|-----------------|
| ✓ | <b>Rejected</b> | - | <b>Cancelled</b>  | N | <b>Non-Elected</b>  | A | <b>Appeal</b>   |
| = | <b>Allowed</b>  | ÷ | <b>Restricted</b> | I | <b>Interference</b> | O | <b>Objected</b> |

| <input type="checkbox"/> Claims renumbered in the same order as presented by applicant |          | <input type="checkbox"/> CPA |  | <input type="checkbox"/> T.D. |  | <input type="checkbox"/> R.1.47 |  |  |  |
|----------------------------------------------------------------------------------------|----------|------------------------------|--|-------------------------------|--|---------------------------------|--|--|--|
| CLAIM                                                                                  |          | DATE                         |  |                               |  |                                 |  |  |  |
| Final                                                                                  | Original | 01/27/2012                   |  |                               |  |                                 |  |  |  |
|                                                                                        | 1        | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 2        | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 3        | O                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 4        | O                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 5        | O                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 6        | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 7        | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 8        | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 9        | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 10       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 11       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 12       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 13       | O                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 14       | O                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 15       | O                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 16       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 17       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 18       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 19       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 20       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 21       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 22       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 23       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 24       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 25       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 26       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 27       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 28       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 29       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 30       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 31       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 32       | ✓                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 33       | O                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 34       | O                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 35       | O                            |  |                               |  |                                 |  |  |  |
|                                                                                        | 36       | ✓                            |  |                               |  |                                 |  |  |  |

|                                                                                                                        |                                                |                                                                      |
|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------|
| <b><i>Index of Claims</i></b><br><br> | <b>Application/Control No.</b><br><br>12580127 | <b>Applicant(s)/Patent Under Reexamination</b><br><br>MUELLER, ARNDT |
|                                                                                                                        | <b>Examiner</b><br><br>BENJAMIN H ELLIOTT IV   | <b>Art Unit</b><br><br>2474                                          |

|   |                 |   |                   |   |                     |   |                 |
|---|-----------------|---|-------------------|---|---------------------|---|-----------------|
| ✓ | <b>Rejected</b> | - | <b>Cancelled</b>  | N | <b>Non-Elected</b>  | A | <b>Appeal</b>   |
| = | <b>Allowed</b>  | ÷ | <b>Restricted</b> | I | <b>Interference</b> | O | <b>Objected</b> |

| <input type="checkbox"/> Claims renumbered in the same order as presented by applicant |          |            |      | <input type="checkbox"/> CPA |  |  |  | <input type="checkbox"/> T.D. |  |  |  | <input type="checkbox"/> R.1.47 |  |  |  |
|----------------------------------------------------------------------------------------|----------|------------|------|------------------------------|--|--|--|-------------------------------|--|--|--|---------------------------------|--|--|--|
| CLAIM                                                                                  |          |            | DATE |                              |  |  |  |                               |  |  |  |                                 |  |  |  |
| Final                                                                                  | Original | 01/27/2012 |      |                              |  |  |  |                               |  |  |  |                                 |  |  |  |
|                                                                                        | 37       | ✓          |      |                              |  |  |  |                               |  |  |  |                                 |  |  |  |
|                                                                                        | 38       | ✓          |      |                              |  |  |  |                               |  |  |  |                                 |  |  |  |
|                                                                                        | 39       | ✓          |      |                              |  |  |  |                               |  |  |  |                                 |  |  |  |
|                                                                                        | 40       | ✓          |      |                              |  |  |  |                               |  |  |  |                                 |  |  |  |

|                                                                                                              |                                                |                                                                      |
|--------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------|
| <b>Search Notes</b><br><br> | <b>Application/Control No.</b><br><br>12580127 | <b>Applicant(s)/Patent Under Reexamination</b><br><br>MUELLER, ARNDT |
|                                                                                                              | <b>Examiner</b><br><br>BENJAMIN H ELLIOTT IV   | <b>Art Unit</b><br><br>2474                                          |

| SEARCHED |                                       |           |          |
|----------|---------------------------------------|-----------|----------|
| Class    | Subclass                              | Date      | Examiner |
| 370      | 395.62,518 (clocks)                   | 1/27/2012 | BHE      |
| 370      | 350,503,509-514,519 (synchronization) | 1/27/2012 | BHE      |

| SEARCH NOTES                                                                                                                                                                                                 |           |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|
| Search Notes                                                                                                                                                                                                 | Date      | Examiner |
| Reviewed information submitted in IDS                                                                                                                                                                        | 1/27/2012 | BHE      |
| Classification search (see attached) with limited text search in EAST                                                                                                                                        | 1/27/2012 | BHE      |
| Inventor searchthrough PALM and eDAN for any DP-related issues. Also searched for any relevant prior art references that could be found in co-pending applications' search notes, Office actions, and IDS's. | 1/27/2012 | BHE      |
| IEEE Explore search using inventor name and keywords                                                                                                                                                         | 1/27/2012 | BHE      |
| Reviewed submitted ISR information                                                                                                                                                                           | 1/27/2012 | BHE      |
| EAST search                                                                                                                                                                                                  | 1/27/2012 | BHE      |
| Consulted with Kwang Yao, SPE 2473, regarding objectability of claims 3, 13, 23, and 33. Suggested objecting to the claims.                                                                                  | 1/27/2012 | BHE      |

| INTERFERENCE SEARCH |          |      |          |
|---------------------|----------|------|----------|
| Class               | Subclass | Date | Examiner |
|                     |          |      |          |

/B.H.E./  
Examiner.Art Unit 2474



# UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office  
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www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 12/580,127         | 10/15/2009            | Arndt MUELLER         | E080048USU1            |

**CONFIRMATION NO. 9702**

77330  
ENTROPIC COMMUNICATIONS, INC.  
6290 SEQUENCE DRIVE  
SAN DIEGO, CA 92121

## PUBLICATION NOTICE



\*OC000000041235559\*

**Title:**Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network

**Publication No.**US-2010-0098110-A1

**Publication Date:**04/22/2010

## 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.

The publication may be accessed through the USPTO's publicly available Searchable Databases via the Internet at [www.uspto.gov](http://www.uspto.gov). The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at [www.uspto.gov](http://www.uspto.gov) using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <http://pair.uspto.gov/>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

|                                                                                                     |                        |               |            |
|-----------------------------------------------------------------------------------------------------|------------------------|---------------|------------|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |               | 12580127   |
|                                                                                                     | Filing Date            |               | 2009-10-15 |
|                                                                                                     | First Named Inventor   | Arndt MUELLER |            |
|                                                                                                     | Art Unit               | 2472          |            |
|                                                                                                     | Examiner Name          | UnKnown       |            |
|                                                                                                     | Attorney Docket Number | E080048USU1   |            |

| U.S.PATENTS <span>Remove</span>                                                             |         |                    |                        |                  |                                                 |                                                                        |
|---------------------------------------------------------------------------------------------|---------|--------------------|------------------------|------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Examiner Initial*                                                                           | Cite No | Patent Number      | Kind Code <sup>1</sup> | Issue Date       | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|                                                                                             | 1       | 6956865            | B1                     | 2005-10-18       | KHAUNTE et al.                                  |                                                                        |
|                                                                                             | 2       | 5349582            | A                      | 1994-09-20       | BISDIKIAN et al.                                |                                                                        |
|                                                                                             | 3       | 7054296            | B1                     | 2005-10-18       | SORRELLS et al.                                 |                                                                        |
| If you wish to add additional U.S. Patent citation information please click the Add button. |         |                    |                        |                  |                                                 | <span>Add</span>                                                       |
| U.S.PATENT APPLICATION PUBLICATIONS <span>Remove</span>                                     |         |                    |                        |                  |                                                 |                                                                        |
| Examiner Initial*                                                                           | Cite No | Publication Number | Kind Code <sup>1</sup> | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|                                                                                             | 1       | 20080013473        | A1                     | 2008-01-17       | PROCTOR, JR et al.                              |                                                                        |
|                                                                                             | 2       | 20070133386        | A1                     | 2007-06-14       | KIM et al.                                      |                                                                        |
|                                                                                             | 3       | 20050287964        | A1                     | 2005-12-29       | TANAKA et al.                                   |                                                                        |

|                                                                                                     |                        |               |
|-----------------------------------------------------------------------------------------------------|------------------------|---------------|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     | 12580127      |
|                                                                                                     | Filing Date            | 2009-10-15    |
|                                                                                                     | First Named Inventor   | Arndt MUELLER |
|                                                                                                     | Art Unit               | 2472          |
|                                                                                                     | Examiner Name          | UnKnown       |
|                                                                                                     | Attorney Docket Number | E080048USU1   |

|  |   |             |    |            |                 |  |
|--|---|-------------|----|------------|-----------------|--|
|  | 4 | 20080076432 | A1 | 2008-03-27 | SENARATH et al. |  |
|--|---|-------------|----|------------|-----------------|--|

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#### FOREIGN PATENT DOCUMENTS

| Examiner Initial* | Cite No | Foreign Document Number <sup>3</sup> | Country Code <sup>2</sup> i | Kind Code <sup>4</sup> | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T <sup>5</sup>           |
|-------------------|---------|--------------------------------------|-----------------------------|------------------------|------------------|-------------------------------------------------|--------------------------------------------------------------------------|--------------------------|
|                   | 1       |                                      |                             |                        |                  |                                                 |                                                                          | <input type="checkbox"/> |

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#### NON-PATENT LITERATURE DOCUMENTS

| Examiner Initials* | Cite No | 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, pages(s), volume-issue number(s), publisher, city and/or country where published. | T <sup>5</sup>           |
|--------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
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#### EXAMINER SIGNATURE

|                    |  |                 |  |
|--------------------|--|-----------------|--|
| Examiner Signature |  | Date Considered |  |
|--------------------|--|-----------------|--|

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

|                                                                                                     |                        |               |
|-----------------------------------------------------------------------------------------------------|------------------------|---------------|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     | 12580127      |
|                                                                                                     | Filing Date            | 2009-10-15    |
|                                                                                                     | First Named Inventor   | Arndt MUELLER |
|                                                                                                     | Art Unit               | 2472          |
|                                                                                                     | Examiner Name          | UnKnown       |
|                                                                                                     | Attorney Docket Number | E080048USU1   |

### CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the 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 the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

|            |                      |                     |            |
|------------|----------------------|---------------------|------------|
| Signature  | /Bruce W. Greenhaus/ | Date (YYYY-MM-DD)   | 2010-02-18 |
| Name/Print | Bruce W. Greenhaus   | Registration Number | 37,339     |

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

## 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 the Freedom of Information Act requires disclosure of these records.
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 inspections 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 or potential violation of law or regulation.

## PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

**PCT**

To:

BRUCE GREENHAUS  
6290 SEQUENCE DRIVE  
SAN DIEGO, CA 92121

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<br>(day/month/year) <b>10 DEC 2009</b>               |
| Applicant's or agent's file reference<br><b>E080048WOP1</b> | <b>FOR FURTHER ACTION</b> See paragraphs 1 and 4 below               |
| International application No.<br><b>PCT/US2009/060952</b>   | International filing date<br>(day/month/year) <b>16 October 2009</b> |
| Applicant<br><b>ENTROPIC COMMUNICATIONS, INC.</b>           |                                                                      |

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 the notes on the accompanying sheet.

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 the applicant's 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**

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 as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

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. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

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.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

|                                                                                                                                                                                   |                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| 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 | Authorized officer:<br><br>Blaine R. Copenheaver<br><br>Telephone No. 571-272-7774 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|

Form PCT/ISA/220 (January 2004)

(See notes on accompanying sheet)

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|                                                      |                                                                                               |                                                              |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| Applicant's or agent's file reference<br>E080048WOP1 | <b>FOR FURTHER ACTION</b> see Form PCT/ISA/220<br>as well as, where applicable, item 5 below. |                                                              |
| International application No.<br>PCT/US2009/060952   | International filing date (day/month/year)<br>16 October 2009                                 | (Earliest) Priority Date (day/month/year)<br>16 October 2008 |
| Applicant<br>ENTROPIC COMMUNICATIONS, INC.           |                                                                                               |                                                              |

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. 5  
☒ 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/US2009/060952

| <b>A. CLASSIFICATION OF SUBJECT MATTER</b><br>IPC(8) - H04J 3/06 (2009.01)<br>USPC - 370/503<br>According to International Patent Classification (IPC) or to both national classification and IPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                      |                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <b>B. FIELDS SEARCHED</b><br>Minimum documentation searched (classification system followed by classification symbols)<br>IPC(8) - H04J 3/06 (2009.01)<br>USPC - 370/503<br>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched<br>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)<br>MicroPatent and Google Patents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                      |                                                                                                     |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                      |                                                                                                     |
| Category*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.                                                                               |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 6,956,865 B1 (KHAUNTE et al) 18 October 2005 (18.10.2005) entire document         | 1-40                                                                                                |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 2008/0013473 A1 (PROCTOR, JR. et al) 17 January 2008 (17.01.2008) entire document | 1-40                                                                                                |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 5,349,582 A (BISDIKIAN et al) 20 September 1994 (20.09.1994) entire document      | 4-5, 14-15, 24-25, and 34-35                                                                        |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                      |                                                                                                     |
| * Special categories of cited documents:<br>"A" document defining the general state of the art which is not considered to be of particular relevance<br>"E" earlier application or patent but published on or after the international filing date<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>"O" document referring to an oral disclosure, use, exhibition or other means<br>"P" document published prior to the international filing date but later than the priority date claimed<br>"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>"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>"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>"&" document member of the same patent family |                                                                                      |                                                                                                     |
| Date of the actual completion of the international search<br>21 November 2009                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                      | Date of mailing of the international search report<br>10 DEC 2009                                   |
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US, Commissioner for Patents<br>P.O. Box 1450, Alexandria, Virginia 22313-1450<br>Facsimile No. 571-273-3201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                      | Authorized officer:<br>Blaine R. Copenheaver<br>PCT Helpdesk: 571-272-4300<br>PCT OSP: 571-272-7774 |

Form PCT/ISA/210 (second sheet) (July 2009)

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

BRUCE GREENHAUS  
6290 SEQUENCE DRIVE  
SAN DIEGO, CA 92121

Date of mailing  
(day/month/year)

10 DEC 2009

Applicant's or agent's file reference  
E080048WOP1

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US2009/060952

International filing date (day/month/year)

16 October 2009

Priority date (day/month/year)

16 October 2008

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

IPC(8) - H04J 3/06 (2009.01)

USPC - 370/503

Applicant ENTROPIC COMMUNICATIONS, INC.

## 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  
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

21 November 2009

Authorized officer:

Blaine R. Copenheaver

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

Form PCT/ISA/237 (cover sheet) (July 2009)

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2009/060952

## 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/US2009/060952

**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 | 1-40 | YES |
|                               | Claims | None | NO  |
| Inventive step (IS)           | Claims | None | YES |
|                               | Claims | 1-40 | NO  |
| Industrial applicability (IA) | Claims | 1-40 | YES |
|                               | Claims | None | NO  |

## 2. Citations and explanations:

Claims 1-3, 6-13, 16-23, 26-33, and 36-40 lack an inventive step under PCT Article 33(3) as being obvious over Khaunte et al, hereinafter Khaunte in view of Proctor, Jr. et al, hereinafter Proctor.

Regarding Claim 1, Khaunte teaches a method for synchronizing a plurality of nodes on a communication network (col 3, lines 35-40 for sharing channels in a network with a plurality of nodes), comprising: exchanging a local clock time between a first node and a second node over the communication network (col 3, lines 40-50 for head node communicating with other nodes with a start time to determine propagation delay between nodes; and col 3, lines 30-45 for current and start time of messages [a local clock time]); performing a ranging method between the first and second nodes based on the local clock time exchanged (col 3, lines 50-55 for determining range for nodes using delays based on clock times in the lookahead time value), wherein the ranging method results in an estimated propagation delay between the first and second node (col 3, lines 50-60 for using minimum propagation delay between nodes); and adjusting the local clock time either the first or second node based on the estimated propagation delay (col 3, lines 50-55 for dynamically adjusting lookahead time value based on propagation delay or adjusting local clock). Khaunte does not explicitly teach synchronizing clock time between the first and second node. In the same field of endeavor, Proctor teaches synchronizing clock time between the first and second node (paragraph 10 for synchronizing nodes based on timing offsets). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Khaunte's network method with Proctor's synchronizing because the combination would allow Khaunte's network method to improve communication timing between nodes on the uplink and downlink by using range calculations (Proctor, paragraph 10).

Regarding Claim 11, Khaunte discloses network device, comprising: a controller (col 3, lines 38-42 for access control system or controller); a device module (col 3, lines 30-40 for head end nodes or devices); memory coupled to the controller (col 3, lines 30-35 for computer program there for a computer with memory); computer executable program code on a computer readable medium (col 3, lines 30-35 for computer program) configured to cause the controller to perform the functions of: exchanging local clock times between a first node and a second node over a communication network (col 3, lines 40-50 for head node communicating with other nodes with a start time to determine propagation delay between nodes on a network and col 3, lines 30-45 for current and start time of messages or a local clock time); performing a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes (col 3, lines 50-55 for determining range for nodes using delays based on clock times in the lookahead time values), wherein the ranging method results in an estimated propagation delay between the first and second nodes (col 3, lines 50-60 for using minimum propagation delay between nodes); and adjusting the local clock times of the first and second nodes based on the estimated propagation delay (col 3, lines 50-55 for dynamically adjusting lookahead time values based on propagation delay or adjusting local clock). Khaunte does not explicitly disclose synchronizing local clock time between the first and second node. In the same field of endeavor, Proctor discloses synchronizing local clock time between the first and second node (paragraph 10 for synchronizing nodes based on timing offsets). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Khaunte's network with Proctor's synchronizing because the combination would allow Khaunte's network to improve communication timing between nodes on the uplink and downlink by using range calculations (Proctor, paragraph 10).

Regarding Claim 21, Khaunte discloses computer program product comprising a computer usable medium having computer readable program code embodied therein for synchronizing a plurality of nodes on a communication network (col 3, lines 35-40 for sharing channels in a network with a plurality of nodes), the computer program product comprising computer readable program code configured to cause a device to: exchange local clock times between a first node and a second node over a communication network (col 3, lines 40-50 for head node communicating with other nodes with a start time to determine propagation delay between nodes and col 3, lines 30-45 for current and start time of messages or a local clock time); perform a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes (col 3, lines 50-55 for determining range for nodes using delays based on clock times in the lookahead time values), wherein the ranging method results in an estimated propagation delay between the first and second nodes (col 3, lines 50-60 for using minimum propagation delay between nodes); and adjust the local clock times of the first and second nodes based on the estimated propagation delay (col 3, lines 50-55 for dynamically adjusting lookahead time values based on propagation delay or adjusting local clock). Khaunte does not explicitly disclose synchronizing local clock time between the first and second node. In the same field of endeavor, Proctor discloses synchronizing local clock time between the first and second node (paragraph 10 for synchronizing nodes based on timing offsets). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Khaunte's network with Proctor's synchronizing because the combination would allow Khaunte's network to improve communication timing between nodes on the uplink and downlink by using range calculations (Proctor, paragraph 10).

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2009/060952

**Supplemental Box**

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

Continuation of:

Regarding Claim 31, Khaunte discloses a network interface module, comprising: a controller (col 3, lines 38-42 for access control system or controller); memory coupled to the controller (col 3, lines 30-35 for computer program there for a computer with memory); computer executable program code on a computer readable medium configured to cause the controller to perform the functions of: exchanging local clock times between a first node and a second node over a network (col 3, lines 40-50 for head node communicating with other nodes with a start time to determine propagation delay between nodes and col 3, lines 30-45 for current and start time of messages or a local clock time); performing a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes (col 3, lines 50-55 for determining range for nodes using delays based on clock times in the lookahead time values), wherein the ranging method results in an estimated propagation delay between the first and second nodes (col 3, lines 50-60 for using minimum propagation delay between nodes); and adjusting the local clock times of the first and second nodes based on the estimated propagation delay (col 3, lines 50-55 for dynamically adjusting lookahead time values based on propagation delay or adjusting local clock). Khaunte does not explicitly disclose synchronizing local clock time between the first and second node. In the same field of endeavor, Proctor discloses synchronizing local clock time between the first and second node (paragraph 10 for synchronizing nodes based on timing offsets). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Khaunte's network with Proctor's synchronizing because the combination would allow Khaunte's network to improve communication timing between nodes on the uplink and downlink by using range calculations (Proctor, paragraph 10).

Regarding Claim 2, 12, 22, and 32, Khaunte teaches using the synchronized local clock time in subsequent packet transmissions between the first and second nodes (col 4, lines 35-40 for using minimum lookahead time for subsequent MAP messages).

Regarding Claim 3, 13, 23, and 33, Khaunte teaches wherein exchanging local clock times, performing the ranging method (col 9, line 65 to col 10, line 5 for ranging on cable modem networks), and adjusting the local clock times comprises: transmitting from the first node and receiving at the second node a first packet (col 9, lines 47-63 for transmitting a test signal and receiving test signal or packet), wherein the first packet comprises a first packet clock time comprising the local clock time of the first node at transmission time, and a scheduled arrival clock time (col 9, lines 50-60 for determining distance and timing propagation delay and determining offset or scheduled arrival time for packet); setting the local clock time of the second node to the first packet clock time (col 9, lines 50-63 for storing timing offset value of second node or setting clock time for transmitting to second node); transmitting from the second node and receiving at the first node a second packet at the first scheduled arrival clock time (col 9, lines 50-60 for transmitting message back upstream to adjust upstream link), wherein the second packet is received by the first node at an actual arrival clock time (col 10, lines 25-32 for checking propagation delay with theoretical delay or estimated arrival time with actual propagation time and col 15, lines 50-67 for scheduler to generate precise time of ranging slot or actual arrival time and generating a lookahead time taking into account propagation of MAP message); calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the first scheduled arrival clock time and the first actual time (col 9, lines 50-60 for calculating propagation delay between two nodes); transmitting from the first node and receiving at the second node a third packet, wherein the third packet comprises the estimated propagation delay (figure 5 element SAT3 for third packet transmitted to determine network timing); and storing the estimated propagation delay at the second node (col 9, lines 60-64 for storing offset information).

Regarding Claim 6, 16, 26, and 36 Khaunte teaches wherein the first node is a network coordinator (col 5, lines 30-40 for network scheduler or coordinator).

Regarding Claim 7, 17, 27, and 37 Khaunte teaches wherein the second node is a new node and the method is performed as part of admission of the second node to the communication network (col 12, lines 12-20 for performing ranging methods for new modems on the network).

Regarding Claim 8, 18, 28, and 38 Khaunte teaches wherein the method is performed periodically to maintain synchronization between the first and second nodes (col 10, lines 1-8 for periodic ranging for network nodes).

Regarding Claim 9, 19, 29, and 39 Khaunte teaches wherein the communication network is a mesh network (col 22, lines 1-12 for a network with a host of nodes or a mesh network).

Regarding Claim 10, 20, 30, and 40 Khaunte teaches the method as shown above. Khaunte does not explicitly teach wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard. In the same field of endeavor, Proctor teaches wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard (paragraph 9 for using the MoCA standard). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Khaunte's network with Proctor's standard because the combination would allow Khaunte's network to improve communication by using existing wiring for the network (Proctor, paragraph 9).

Claims 4-5, 14-15, 24-25, and 34-35 lack an inventive step under PCT Article 33(3) as being obvious over Khaunte in view of Proctor, and further in view of Bisdikian et al, hereinafter Bisdikian.

Regarding Claim 4, 14, 24, and 34 Khaunte teaches wherein a transmission time of a transmitted packet is measured at 90% of peak amplitude of a transmission signal, 90% of peak power of a transmission signal, 90% of total power of a transmission signal, or delay of a transmission signal (col 7, lines 45-60 for using propagation, interleaver, and processing delays to calculate the delay of the transmitted signal as shown in figure 4C). Khaunte and Proctor do not explicitly teach a mean delay. In the same field of endeavor, Bisdikian teaches a mean delay (col 6, lines 47-55 for mean delay of the message in the network). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Khaunte and Proctor's network with Bisdikian's delay because the combination would allow Khaunte and Proctor's network to improve delay calculations for accessing buses and releasing slots in the network (Bisdikian, col 6, lines 47-55).

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2009/060952

## Supplemental Box

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

Regarding Claim 5, 15, 25, and 35 Khaunte teaches wherein an arrival time of a received packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of a received signal, 90% of total power of a received signal, or delay of a received signal (col 7, lines 45-60 for using propagation, interleaver, and processing delays to calculate the delay of the transmitted signal as shown in figure 4C and using round trip signal or both transmit and receive). Khaunte and Proctor do not explicitly teach a mean delay. In the same field of endeavor, Bisdikian teaches a mean delay (col 6, lines 47-55 for mean delay of the message in the network). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Khaunte and Proctor's network with Bisdikian's delay because the combination would allow Khaunte and Proctor's network to improve delay calculations for accessing buses and releasing slots in the network (Bisdikian, col 6, lines 47-55).

Claims 1-40 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.

## PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:  
 BRUCE W. GREENHAUS  
 6290 SEQUENCE DRIVE  
 SAN DIEGO, CA 92121

**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)

Date of mailing  
 (day/month/year)

**09 DEC 2009**

Applicant's or agent's file reference  
 E080048WOP2

**FOR FURTHER ACTION** See paragraphs 1 and 4 below

International application No.  
 PCT/US 09/60995

International filing date  
 (day/month/year) 16 October 2009 (16.10.2009)

Applicant **ENTROPIC COMMUNICATIONS, INC.**

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 8270

**For more detailed instructions,** see the notes on the accompanying sheet.

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 the applicant's 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**

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 as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

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. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

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.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

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

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|                                                      |                                                                                            |                                                                                    |
|------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Applicant's or agent's file reference<br>E080048WOP2 | <b>FOR FURTHER ACTION</b> see Form PCT/ISA/220 as well as, where applicable, item 5 below. |                                                                                    |
| International application No.<br>PCT/US 09/60995     | International filing date ( <i>day/month/year</i> )<br>16 October 2009 (16.10.2009)        | (Earliest) Priority Date ( <i>day/month/year</i> )<br>16 October 2008 (16.10.2008) |
| Applicant<br>ENTROPIC COMMUNICATIONS, INC.           |                                                                                            |                                                                                    |

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. 4  
☒ 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 09/60995

| <b>A. CLASSIFICATION OF SUBJECT MATTER</b><br>IPC(8) - H04J 11/00 (2009.01)<br>USPC - 370/206<br>According to International Patent Classification (IPC) or to both national classification and IPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                  |                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>B. FIELDS SEARCHED</b><br>Minimum documentation searched (classification system followed by classification symbols)<br>USPC: 370/206<br>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched<br>USPC: 370/206, 208 (keyword limited - see terms below)<br>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)<br>PubWEST(USPT,PGPB,EPAB,JPAB); Google Scholar<br>Search Terms Used: orthogonal, frequency, divisional, multiple, access, communication, pseudorandom, subcarrier, PN-15, rotate, 180, amplitude, computer, program, quadrature, sequence, resource, reservation, network, coordinator                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                  |                                                                                            |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                  |                                                                                            |
| Category*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document, with indication, where appropriate, of the relevant passages                                                                               | Relevant to claim No.                                                                      |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 2007/0133386 A1 (Kim et al.) 14 June 2007 (14.06.2007), para [0009], [0014], [0063]-[0065], [0070]-[0072]                                                     | 1 - 18                                                                                     |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 7,054,296 B1 (Sorrells et al.) 30 May 2006 (30.05.2006), col 53, ln 39-50; col 75, ln 50-col 76, ln 7; col 103, ln 2-22; col 119, ln 49-57; col 121, ln 43-48 | 1 - 18                                                                                     |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 2005/0287964 A1 (Tanaka et al.) 29 December 2005 (29.12.2005), para [0083]                                                                                    | 4-6, 10-12, 18                                                                             |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 2008/0076432 A1 (Senarath et al.) 27 March 2008 (27.03.2008), para [0034]                                                                                     | 6, 12, 18                                                                                  |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                  |                                                                                            |
| * Special categories of cited documents:<br>"A" document defining the general state of the art which is not considered to be of particular relevance<br>"E" earlier application or patent but published on or after the international filing date<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>"O" document referring to an oral disclosure, use, exhibition or other means<br>"P" document published prior to the international filing date but later than the priority date claimed<br>"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>"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>"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>"&" document member of the same patent family |                                                                                                                                                                  |                                                                                            |
| Date of the actual completion of the international search<br>25 November 2009 (25.11.2009)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                  | Date of mailing of the international search report<br><b>09 DEC 2009</b>                   |
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US, Commissioner for Patents<br>P.O. Box 1450, Alexandria, Virginia 22313-1450<br>Facsimile No. 571-273-3201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                  | Authorized officer:<br>Lee W. Young<br>PCT Helpdesk: 571-272-4300<br>PCT OSP: 571-272-7774 |

Form PCT/ISA/210 (second sheet) (July 2009)

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To: BRUCE W. GREENHAUS  
6290 SEQUENCE DRIVE  
SAN DIEGO, CA 92121

**PCT**

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year) **09 DEC 2009**

Applicant's or agent's file reference  
**E080048WOP2**

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.

**PCT/US 09/60995**

International filing date (day/month/year)

**16 October 2009 (16.10.2009)**

Priority date (day/month/year)

**16 October 2008 (16.10.2008)**

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

**IPC(8) - H04J 11/00 (2009.01)**

**USPC - 370/206**

Applicant **ENTROPIC COMMUNICATIONS, INC.**

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  
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

**25 November 2009 (25.11.2009)**

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 09/60995

**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  
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**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 - 18 | YES |
|                               | Claims | None.  | NO  |
| Inventive step (IS)           | Claims | None.  | YES |
|                               | Claims | 1 - 18 | NO  |
| Industrial applicability (IA) | Claims | 1 - 18 | YES |
|                               | Claims | None.  | NO  |

## 2. Citations and explanations:

Claims 1-3, 7-9 and 13-17 lack an inventive step under PCT Article 33(3) as being obvious over US 2007/0133386 A1 to Kim et al. (hereinafter 'Kim'), in view of US 7,054,296 B1 to Sorrells et al. (hereinafter 'Sorrells').

As per claim 1, Kim teaches a method for communications transmission using orthogonal frequency division multiple access on a network (para [0009] wherein the mobile communication system is usually in the form of a network) comprising: providing a plurality of transmitting network devices with a set of available subcarriers for orthogonal frequency division multiple access (para [0009], [0014] wherein the cells are the network devices); providing a corresponding element of a pseudorandom noise sequence for each subcarrier of the set of available subcarriers (para [0065]); allocating a subset of the set of available subcarriers to each of the transmitting network devices (para [0065] wherein different carrier is assigned to different cells); a transmitting network device of the plurality of devices mapping a packet onto a plurality of used subcarriers of its allocated subset of available subcarriers, wherein the step of mapping the packet comprises mapping the packet onto a plurality of modulated symbols to be transmitted on the used subcarriers (para [0065]); the transmitting network device performing a predetermined transformation on a modulated symbol using the element of the pseudorandom noise sequence corresponding to the used subcarrier (para [0072]); the transmitting network device transmitting the transformed symbol to a receiving network device (para [0065]). Kim does not specifically teach a transmitting network device of the plurality of devices mapping a packet onto a plurality of used subcarriers of its allocated subset of available subcarriers, wherein the step of mapping the packet comprises mapping the packet onto a plurality of quadrature amplitude modulated symbols to be transmitted on the used subcarriers; the transmitting network device performing a predetermined transformation on a quadrature amplitude modulated symbol using the element of the pseudorandom noise sequence corresponding to the used subcarrier. However, Sorrells teaches a transmitting network device of the plurality of devices mapping a packet onto a plurality of used subcarriers of its allocated subset of available subcarriers, wherein the step of mapping the packet comprises mapping the packet onto a plurality of modulated symbols to be transmitted on the used subcarriers (col 103, ln 2-22), and mapping the packet onto a plurality of quadrature amplitude modulated symbols (col 75, ln 50-col 76, ln 7 wherein quadrature amplitude modulation is adopted). It would have been obvious to one of ordinary skill in the art to combine the teachings of Kim and Sorrells since adopting quadrature amplitude modulation in an OFDMA network would have simplified the modulation and demodulation system.

As per claim 2, Kim further teaches the steps of providing a corresponding element of a pseudorandom noise sequence and performing a predetermined transformation (para [0065], [0072]) comprise: the transmitting network device receiving an initial pseudorandom noise sequence element from a pseudorandom noise sequence generator, the initial pseudorandom noise sequence element corresponding to a first available subcarrier and transforming the symbol to be transmitted on the first available subcarrier if the first available subcarrier is a used subcarrier (para [0065] wherein  $v(k)$  is the generated random sequence and thus there must be a random noise generator inside the system. Each value of  $k$  represents a recurrently-used subcarrier, and when  $k=0$ ,  $v(k)$  gives the initial random element and the corresponding subcarrier is assigned to the transmitter); and the transmitting network device advancing the pseudorandom noise generator to receive a next element of the pseudorandom noise sequence corresponding to a next available subcarrier and transforming the symbol to be transmitted on the next available subcarrier if the next available subcarrier is a used subcarrier (para [0065] wherein when  $k$  increases, the next random element is used and the corresponding symbol is transmitted).

As per claim 3, Kim further teaches the step of the transmitting network device advancing the pseudorandom noise generator is repeated until a symbol to be transmitted on a last used subcarrier is transformed (para [0065] wherein  $v(k)$  is a pseudorandom sequence and it was well known in the art at the time of the invention that such sequence will repeat after its end, thus, the  $v(k)$ -related subcarrier will repeat after the end also).

--Please See Supplemental Boxes--

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**Box No. VII Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

Claim 3 is written as depending on itself. For the purposes of this search and opinion, claim 3 will be treated as depending on the preceding claim 2.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

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Supplemental Box

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

Box V. 2. Citations and explanations:

As per claim 7, Kim teaches a method for communications reception using orthogonal frequency division multiple access on a network (para [0009]) comprising: receiving a first scrambled orthogonal frequency division modulation symbol from a first transmitting network device, the first orthogonal frequency division modulation symbol comprising a first plurality of scrambled modulation symbols transmitted on a corresponding first plurality of used subcarriers assigned to the first transmitting network device (para [0065] wherein the modulation contains periodically recurrent noise and can thus be regarded as scrambled modulation); receiving a second scrambled orthogonal frequency division modulation symbol from a second transmitting network device, the second orthogonal frequency division modulation symbol comprising a second plurality of scrambled modulation symbols transmitted on a corresponding second plurality of used subcarriers assigned to the second transmitting network device (para [0065]); wherein the first plurality of subcarriers and the second plurality of subcarriers are subsets of a set of available subcarriers, and wherein the subcarriers of the set of available subcarriers have corresponding elements of a pseudorandom noise sequence (para [0065]); and descrambling the first and second scrambled orthogonal frequency division modulation symbols, the step of descrambling comprising descrambling a scrambled modulation symbol transmitted on a used subcarrier using the element of the pseudorandom noise sequence corresponding to the used subcarrier (para [0065] wherein the pilot signal contains the pseudorandom noise info; para [0070]-[0071] wherein the pilot signal is used for frequency synchronization during descrambling). Kim does not specifically teach receiving a first scrambled orthogonal frequency division modulation symbol from a first transmitting network device, the first orthogonal frequency division modulation symbol comprising a first plurality of scrambled quadrature amplitude modulation symbols transmitted on a corresponding first plurality of used subcarriers assigned to the first transmitting network device; receiving a second scrambled orthogonal frequency division modulation symbol from a second transmitting network device, the second orthogonal frequency division modulation symbol comprising a second plurality of scrambled quadrature amplitude modulation symbols transmitted on a corresponding second plurality of used subcarriers assigned to the second transmitting network device; and descrambling the first and second scrambled orthogonal frequency division modulation symbols, the step of descrambling comprising descrambling a scrambled quadrature amplitude modulation symbol transmitted on a used subcarrier using the element of the pseudorandom noise sequence corresponding to the used subcarrier. However, Sorrells teaches the orthogonal frequency division modulation symbol comprising a plurality of scrambled quadrature amplitude modulation symbols transmitted on a corresponding plurality of used subcarriers assigned to the transmitting network device (col 103, in 2-22; col 75, in 50-col 76, in 7). It would have been obvious to one of ordinary skill in the art to combine the teachings of Kim and Sorrells since adopting quadrature amplitude modulation in an OFDMA network would have simplified the modulation and demodulation system.

As per claim 8, Kim further teaches the step of descrambling the first and second scrambled orthogonal frequency division modulation symbols (para [0065] wherein first and second scrambled orthogonal frequency division modulation symbols are taught when  $k$  equals 0 and 1, respectively; para [0070]-[0071] wherein descrambling is taught) comprises receiving an initial pseudorandom noise sequence element from a pseudorandom noise sequence generator, the initial pseudorandom noise sequence element corresponding to a first available subcarrier (para [0065]) and descrambling the symbol received on the first available subcarrier if the first available subcarrier is a used subcarrier (para [0070]-[0071]); and advancing the pseudorandom noise generator to receive a next element of the pseudorandom noise sequence corresponding to a next available subcarrier and descrambling the symbol received on the next available subcarrier if the next available subcarrier is a used subcarrier (para [0065], [0070]-[0071]).

As per claim 9, Kim further teaches the step of advancing the pseudorandom noise generator is repeated until a symbol to be transmitted on a last used subcarrier is descrambled (para [0065], [0070]-[0071]).

As per claim 13, Kim teaches a communications network system (para [0009]), comprising: a network device configured to transmit a modulated symbol on a subcarrier of a set of subcarriers available for orthogonal frequency division multiple access (para [0009]); wherein the network device is configured to perform a constellation scrambling operation on the modulated symbol (para [0063]-[0065]; Fig. 3C wherein constellation structure is shown), the constellation scrambling operation comprising: a sequence generator (para [0065]); and, while proceeding through the set of available subcarriers in a predetermined order, advancing the sequence generator for each subcarrier preceding the subcarrier, and using an element of a sequence generated by the sequence generator to scramble the modulated symbol (para [0065], [0070]-[0071]). Kim does not specifically teach a network device configured to transmit a quadrature amplitude modulated symbol on a subcarrier of a set of subcarriers available for orthogonal frequency division multiple access; wherein the network device is configured to perform a constellation scrambling operation on the quadrature amplitude modulated symbol, the constellation scrambling operation comprising: initializing a sequence generator with a predetermined seed; and, while proceeding through the set of available subcarriers in a predetermined order, advancing the sequence generator for each subcarrier preceding the subcarrier, and using an element of a sequence generated by the sequence generator to scramble the quadrature amplitude modulated symbol. However, Sorrells teaches a network device configured to transmit a quadrature amplitude modulated symbol (col 75, in 50-col 76, in 7) and initializing a sequence generator with a predetermined seed (col 119, in 49-57). It would have been obvious to one of ordinary skill in the art to combine the teachings of Kim and Sorrells since adopting quadrature amplitude modulation in an OFDMA network would have simplified the modulation and demodulation system, and using a predetermined seed would have enabled the generation of pseudorandom noise.

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
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**Supplemental Box**

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

**Box V. 2. Citations and explanations:**

As per claim 14, Kim further teaches a second network device configured to transmit a second modulated symbol on a second subcarrier of the set of available subcarriers (para [0065]); wherein the second network device is configured to perform a second constellation scrambling operation on the second quadrature amplitude modulated symbol (para [0063]-[0065]; Fig. 3C), the second constellation scrambling operation comprising: a second sequence generator (para [0065]) wherein multiple cell groups are taught, each group corresponds to a random sequence and must have a sequence generator; and, while proceeding through the set of available subcarriers in the predetermined order, advancing the second sequence generator for each subcarrier preceding the second subcarrier, and using a second element of a second sequence generated by the second sequence generator to scramble the second quadrature amplitude modulated symbol (para [0065], [0070]-[0071]). Sorrells further teaches a network device configured to transmit a quadrature amplitude modulated symbol (col 75, In 50-col 76, In 7), initializing a sequence generator with the predetermined seed (col 119, In 49-57).

As per claim 15, Kim further teaches a receiving network device configured to receive the first and second scrambled modulated symbols (para [0063]-[0065], [0070]-[0071]; Fig. 3C); wherein the receiving network device is configured to perform a constellation descrambling operation on the first and second scrambled modulated symbols (para [0063]-[0065], [0070]-[0071]; Fig. 3C), comprising: a third sequence generator (para [0065]); and, while proceeding through the set of available subcarriers in the predetermined order, advancing the third sequence generator for each subcarrier preceding the first subcarrier, and using the first element to descramble the first modulated symbol, advancing the third sequence generator for each subcarrier preceding the second subcarrier, and the using the second element to descramble the second modulated symbol (para [0065], [0070]-[0071] wherein synchronized descrambling is taught). Sorrells further teaches the quadrature amplitude modulated symbols (col 75, In 50-col 76, In 7), and initializing a sequence generator with the predetermined seed (col 119, In 49-57), initializing a sequence generator with the predetermined seed (col 119, In 49-57).

As per claim 16, Kim teaches a network device configured to transmit a modulated symbol on a subcarrier of a set of subcarriers available for orthogonal frequency division multiple access (para [0009], [0065]), the network device comprising the steps of: performing a constellation scrambling operation on the modulated symbol to form a scrambled modulated symbol (para [0065], [0070]-[0071]), the constellation scrambling operation comprising: a sequence generator (para [0065]); and, while proceeding through the set of available subcarriers in a predetermined order, advancing the sequence generator for each subcarrier preceding the subcarrier, and using an element of a sequence generated by the sequence generator to scramble the modulated symbol (para [0065], [0070]-[0071]). Kim does not specifically teach a network device configured to transmit a quadrature amplitude modulated symbol on a subcarrier of a set of subcarriers available for orthogonal frequency division multiple access, the network device comprising a computer readable medium having a computer executable program code embodied on the computer readable medium, wherein the computer executable code is configured to cause the network device to perform the steps of: performing a constellation scrambling operation on the quadrature amplitude modulated symbol to form a scrambled quadrature amplitude modulated symbol, the constellation scrambling operation comprising: initializing a sequence generator with a predetermined seed; and, while proceeding through the set of available subcarriers in a predetermined order, advancing the sequence generator for each subcarrier preceding the subcarrier, and using an element of a sequence generated by the sequence generator to scramble the quadrature amplitude modulated symbol. However, Sorrells teaches a network device configured to transmit a quadrature amplitude modulated symbol (col 75, In 50-col 76, In 7), the network device comprising a computer readable medium having a computer executable program code embodied on the computer readable medium, wherein the computer executable code is configured to cause the network device to perform the steps (col 53, In 39-50), and initializing a sequence generator with a predetermined seed (col 119, In 49-57). It would have been obvious to one of ordinary skill in the art to combine the teachings of Kim and Sorrells since adopting quadrature amplitude modulation in an OFDMA network would have simplified the modulation and demodulation system, adopting computer executable program would have enabled the automatic control of the system, and using a predetermined seed would have enabled the generation of pseudorandom noise.

As per claim 17, Kim further teaches a system configured to cause the device to transmit the scrambled modulated symbol to a receiving network device (para [0065]). Sorrells further teaches quadrature amplitude modulated symbol (col 75, In 50-col 76, In 7) and the computer executable program code is further configured to cause the device to transmit the symbol to a receiving network device (col 53, In 39-50).

Claims 4, 5, 10 and 11 lack an inventive step under PCT Article 33(3) as being obvious over Kim in view of Sorrells, and further in view of US 2005/0287964 A1 to Tanaka et al. (hereinafter 'Tanaka').

As per claim 4, Kim and Sorrells teach the method of claim 1. Kim teaches the pseudorandom noise sequence (para [0065]) but does not specifically teaches the pseudorandom noise sequence comprises a PN-15 sequence. However, Tanaka teaches the pseudorandom noise sequence comprises a PN-15 sequence (para [0083]). It would have been obvious to one of ordinary skill in the art to combine the teachings of Kim, Sorrells and Tanaka since adopting PN-15 sequence would have simplified the generation of random noise.

As per claim 5, Kim further teaches the element of the pseudorandom noise sequence is a '1' and the element of the pseudorandom noise sequence is a '0' (para [0065] wherein the random sequence  $v(k)$  may be 0 or 1). Sorrells further teaches the quadrature amplitude modulated symbol (col 75, In 50-col 76, In 7), the step of performing the predetermined transformation comprises rotating the symbol by 180 deg if the element of the sequence is a certain value and not modifying the symbol if the element of the sequence is another value (col 121, In 43-48 wherein 4th and 7th terms are rotated by 180 deg and other terms keep unchanged).

As per claim 10, Kim and Sorrells teach the method of claim 7. Kim teaches the pseudorandom noise sequence (para [0065]) but does not specifically teaches the pseudorandom noise sequence comprises a 15th order pseudorandom noise sequence. However, Tanaka teaches the pseudorandom noise sequence comprises a 15th order pseudorandom noise sequence (para [0083] wherein the PN15 sequence is a 15th order random sequence). It would have been obvious to one of ordinary skill in the art to combine the teachings of Kim, Sorrells and Tanaka since adopting 15th order sequence would have simplified the generation of random noise.

--Please See Continuation Sheet--

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

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**Supplemental Box**

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

Continuation of:

Box V. 2. Citations and explanations:

As per claim 11, Kim further teaches the step of descrambling the scrambled modulated symbol (para [0070]-[0071]), the element of the pseudorandom noise sequence is a '1' and the element of the pseudorandom noise sequence is a '0' (para [0065]). Sorrells further teaches the quadrature amplitude modulated symbol (col 75, in 50-col 76, in 7), rotating the symbol by 180 deg if the element of the sequence is a certain value and not modifying the symbol if the element of the sequence is another value (col 121, in 43-48).

Claims 6, 12 and 18 lack an inventive step under PCT Article 33(3) as being obvious over Kim in view of Sorrells and Tanaka, and further in view of US 2008/0076432 A1 to Senarath et al. (hereinafter 'Senarath').

As per claim 6, Kim, Sorrells and Tanaka teach the method of claim 4. Sorrells further teaches the receiving network device comprises a network coordinator (col 70, in 4-11) but does not specifically teach the packet comprises a resource reservation request packet. However, Senarath teaches the packet comprises a resource reservation request packet (para [0034]). It would have been obvious to one of ordinary skill in the art to combine the teachings of Kim, Sorrells, Tanaka and Senarath since using resource reservation coding would have ensured the communication quality.

As per claim 12, Kim, Sorrells and Tanaka teach the method of claim 4. Kim further teaches first and second scrambled orthogonal frequency division modulation symbols (para [0065]). Sorrells further teaches the method is performed by a network coordinator (col 70, in 4-11). Kim, Sorrells and Tanaka do not specifically teach the method is performed by a network coordinator and wherein first and second scrambled orthogonal frequency division modulation symbols are contained in a resource reservation request packet. However, Senarath teaches the symbols are contained in a resource reservation request packet (para [0034]). It would have been obvious to one of ordinary skill in the art to combine the teachings of Kim, Sorrells, Tanaka and Senarath since using resource reservation coding would have ensured the communication quality.

As per claim 18, Kim and Sorrells teach the network device of claim 17. Kim further teaches the sequence comprises a pseudorandom sequence (para [0065]). Sorrells further teaches the receiving network device comprises a network coordinator (col 70, in 4-11), and the quadrature amplitude modulated symbol (col 75, in 50-col 76, in 7). Kim and Sorrells do not specifically teach the sequence comprises a 15th order pseudorandom sequence, and the quadrature amplitude modulated symbol comprises an encoded symbol of a resource reservation request. However, Tanaka teaches the sequence comprises a 15th order pseudorandom sequence (para [0083]). Senarath teaches an encoded symbol of a resource reservation request (para [0034]). It would have been obvious to one of ordinary skill in the art to combine the teachings of Kim, Sorrells, Tanaka and Senarath since adopting 15th order sequence would have simplified the generation of random noise, and using resource reservation coding would have ensured the communication quality.

Claims 1 - 18 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

## Electronic Acknowledgement Receipt

|                                             |                                                                                  |
|---------------------------------------------|----------------------------------------------------------------------------------|
| <b>EFS ID:</b>                              | 7041254                                                                          |
| <b>Application Number:</b>                  | 12580127                                                                         |
| <b>International Application Number:</b>    |                                                                                  |
| <b>Confirmation Number:</b>                 | 9702                                                                             |
| <b>Title of Invention:</b>                  | Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network |
| <b>First Named Inventor/Applicant Name:</b> | Arndt MUELLER                                                                    |
| <b>Customer Number:</b>                     | 77330                                                                            |
| <b>Filer:</b>                               | Bruce Wayne Greenhaus/Tim Ellis                                                  |
| <b>Filer Authorized By:</b>                 | Bruce Wayne Greenhaus                                                            |
| <b>Attorney Docket Number:</b>              | E080048USU1                                                                      |
| <b>Receipt Date:</b>                        | 18-FEB-2010                                                                      |
| <b>Filing Date:</b>                         | 15-OCT-2009                                                                      |
| <b>Time Stamp:</b>                          | 17:22:39                                                                         |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)                                                      |

### Payment information:

|                        |    |
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| 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               | Transmittal Letter   | E080048USU1_IDS_Response_2-18-2010.pdf | 94816<br>d3b7e0adfeb70f09d0cdbee9bc73e3967df7de95 | no               | 2                |

### Warnings:

### Information:

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| Warnings:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                         |                                      |                                                                |    |    |
| Information:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                         |                                      |                                                                |    |    |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Miscellaneous Incoming Letter                           | E080048WOP1_ISR_12-10-09.pdf         | 465467<br><div>a183d964ce92950dc8d56a5576cc6821c04ee9eb</div>  | no | 8  |
| Warnings:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                         |                                      |                                                                |    |    |
| Information:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                         |                                      |                                                                |    |    |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Miscellaneous Incoming Letter                           | E080048WOP2_ISR_12-9-09.pdf          | 611907<br><div>60d0515eef9ad3f34bf05a70d14c9fe53a5b5eeb</div>  | no | 10 |
| Warnings:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                         |                                      |                                                                |    |    |
| Information:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                         |                                      |                                                                |    |    |
| Total Files Size (in bytes):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                         |                                      | 2340024                                                        |    |    |
| <p>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.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/>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.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/>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.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/>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.</p> |                                                         |                                      |                                                                |    |    |

I hereby certify that this correspondence is being electronically deposited with the Commissioner for Patents through the USPTO electronic filing system, on:

**Attorney Docket No.: E080048USU1**

February 18, 2010

(Date of Deposit)

Tim L. Ellis

(Name of Person Making Deposit)

/Tim L. Ellis/

(Signature)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**In Re Application of:  
Arndt MUELLER**

**For: Method and Apparatus for Using  
Ranging Measurements in a Multimedia  
Home Network.**

**Serial No.: 12/580,127**

**Group Art Unit: 2472**

**Filed: 15-Oct-2009**

**Information Disclosure Statement Under 37 CFR § 1.97 and § 1.98**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Attention: **Unknown**  
Examiner

Dear Sir:

The references cited on attached form, PTO/SB/08a, are being provided for consideration during examination of the above-identified patent application. It is respectfully requested that all cited references be expressly considered during the prosecution of this application, and the references be made of record therein and appear among the "references cited" on any patent to issue from this application

Enclosed is a copy of the following International Search Reports: (1) ISR dated December 9, 2009, which was issued in corresponding PCT application serial number PCT/US2009/060995 filed October 16, 2009, and (2) ISR dated December 10, 2009, which was issued in corresponding PCT application serial number PCT/US2009/060952 filed October 16, 2009, and in which these references were cited.

I hereby certify that this correspondence is being electronically deposited with the Commissioner for Patents through the USPTO electronic filing system, on:

**Attorney Docket No.: E080048USU1**

February 18, 2010

(Date of Deposit)

Tim L. Ellis

(Name of Person Making Deposit)

/Tim L. Ellis/

(Signature)

As provided for by 37 CFR § 1.97 (g) and (h), no inference should be made that the information and references cited are prior art merely because they are in this statement and no representation is being made that a search has been conducted, or that this statement encompasses all the possible relevant information.

The Applicants provide this Information Disclosure Statement before the issuance of an Office Action on the merits, therefore, Applicants believe that no fee is required for submission of this statement; however, if a fee is required the Commissioner is authorized to deduct such fee from the undersigned's Deposit Account Number 50-4613. Please deduct any additional fees from, or credit any overpayment to the above-noted Deposit Account as well.

Should any questions arise, a telephone call to the Applicants' representative is invited.

Respectfully submitted,

Dated: February 18, 2010

By: /Bruce W. Greenhaus/  
Bruce W. Greenhaus  
Attorney for Applicants  
Registration No. 37,339

Entropic Communications, Inc.  
6290 Sequence Drive  
San Diego, California 92121  
Telephone: (619) 980-2612  
e-mail address: patentteam@entropic.com



UNITED STATES PATENT AND TRADEMARK OFFICE

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www.uspto.gov

| APPLICATION<br>NUMBER | FILING or<br>371(c) DATE | GRP ART<br>UNIT | FIL FEE REC'D | ATTY. DOCKET NO | TOT CLAIMS | IND CLAIMS |
|-----------------------|--------------------------|-----------------|---------------|-----------------|------------|------------|
| 12/580,127            | 10/15/2009               | 2472            | 2350          | E080048USU1     | 40         | 4          |

CONFIRMATION NO. 9702

FILING RECEIPT



OC000000038525820\*

77330  
ENTROPIC COMMUNICATIONS, INC.  
6290 SEQUENCE DRIVE  
SAN DIEGO, CA 92121

Date Mailed: 11/06/2009

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**

**Applicant(s)**

Arndt MUELLER, San Diego, CA;

**Assignment For Published Patent Application**

Entropic Communications, Inc., San Diego, CA

**Power of Attorney:** The patent practitioners associated with Customer Number 77330

**Domestic Priority data as claimed by applicant**

This appln claims benefit of 61/105,942 10/16/2008  
and claims benefit of 61/144,061 01/12/2009  
and claims benefit of 61/144,676 01/14/2009

**Foreign Applications**

**If Required, Foreign Filing License Granted:** 10/29/2009

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/580,127**

**Projected Publication Date:** 04/22/2010

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network

**Preliminary Class**

370

**PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES**

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

**LICENSE FOR FOREIGN FILING UNDER****Title 35, United States Code, Section 184****Title 37, Code of Federal Regulations, 5.11 & 5.15****GRANTED**

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

page 2 of 3

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

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#### **NOT GRANTED**

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                  |                        |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------|-------------|
| <b>Application Data Sheet 37 CFR 1.76</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  | Attorney Docket Number | E080048USU1 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                  | Application Number     |             |
| Title of Invention                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network |                        |             |
| <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. 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.) |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Applicant Information:**

|                                                                                                                                                                                 |                   |                                           |                    |                                                                |                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------|--------------------|----------------------------------------------------------------|-------------------------------------------------------------|
| <b>Applicant 1</b>                                                                                                                                                              |                   |                                           |                    |                                                                | <b>Remove</b>                                               |
| <b>Applicant Authority</b>                                                                                                                                                      |                   | <input checked="" type="radio"/> Inventor |                    | <input type="radio"/> Legal Representative under 35 U.S.C. 117 | <input type="radio"/> Party of Interest under 35 U.S.C. 118 |
| <b>Prefix</b>                                                                                                                                                                   | <b>Given Name</b> | <b>Middle Name</b>                        | <b>Family Name</b> | <b>Suffix</b>                                                  |                                                             |
|                                                                                                                                                                                 | Arndt             |                                           | MUELLER            |                                                                |                                                             |
| <b>Residence Information (Select One)</b> <input checked="" type="radio"/> US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service |                   |                                           |                    |                                                                |                                                             |
| <b>City</b>                                                                                                                                                                     | San Diego         | <b>State/Province</b>                     | CA                 | <b>Country of Residence i</b>                                  | US                                                          |
| <b>Citizenship under 37 CFR 1.41(b) i</b>                                                                                                                                       |                   | CA                                        |                    |                                                                |                                                             |
| <b>Mailing Address of Applicant:</b>                                                                                                                                            |                   |                                           |                    |                                                                |                                                             |
| <b>Address 1</b>                                                                                                                                                                | 12631 La Tortola  |                                           |                    |                                                                |                                                             |
| <b>Address 2</b>                                                                                                                                                                |                   |                                           |                    |                                                                |                                                             |
| <b>City</b>                                                                                                                                                                     | San Diego         | <b>State/Province</b>                     | CA                 |                                                                |                                                             |
| <b>Postal Code</b>                                                                                                                                                              | 92129             | <b>Country i</b>                          | US                 |                                                                |                                                             |
| All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the <b>Add</b> button.                                     |                   |                                           |                    |                                                                |                                                             |
| <b>Add</b>                                                                                                                                                                      |                   |                                           |                    |                                                                |                                                             |

**Correspondence Information:**

|                                                                                                                                    |                         |                  |                     |
|------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------|---------------------|
| Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a). |                         |                  |                     |
| <input type="checkbox"/> An Address is being provided for the correspondence information of this application.                      |                         |                  |                     |
| <b>Customer Number</b>                                                                                                             | 77330                   |                  |                     |
| <b>Email Address</b>                                                                                                               | patentteam@entropic.com | <b>Add Email</b> | <b>Remove Email</b> |

**Application Information:**

|                                                |                                                                                  |                                                  |                          |
|------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------|--------------------------|
| <b>Title of the Invention</b>                  | Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network |                                                  |                          |
| <b>Attorney Docket Number</b>                  | E080048USU1                                                                      | <b>Small Entity Status Claimed</b>               | <input type="checkbox"/> |
| <b>Application Type</b>                        | Nonprovisional                                                                   |                                                  |                          |
| <b>Subject Matter</b>                          | Utility                                                                          |                                                  |                          |
| <b>Suggested Class (if any)</b>                |                                                                                  | <b>Sub Class (if any)</b>                        |                          |
| <b>Suggested Technology Center (if any)</b>    |                                                                                  |                                                  |                          |
| <b>Total Number of Drawing Sheets (if any)</b> | 14                                                                               | <b>Suggested Figure for Publication (if any)</b> | 5                        |

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|                                           |                                                                                  |                        |             |
|-------------------------------------------|----------------------------------------------------------------------------------|------------------------|-------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                                                                  | Attorney Docket Number | E080048USU1 |
|                                           |                                                                                  | Application Number     |             |
| Title of Invention                        | Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network |                        |             |

**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:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |                                              |                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------|---------------------------------------------------------|
| 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). Enter either 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. |                                                  |                                              |                                                         |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 77330                                            |                                              |                                                         |

**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(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification. |                 |                          |                          |
| Prior Application Status                                                                                                                                                                                                                                                                                                                                                                               | Pending         | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                                                                                                                                                                                                                                                                                                     | Continuity Type | Prior Application Number | Filing Date (YYYY-MM-DD) |
|                                                                                                                                                                                                                                                                                                                                                                                                        |                 | 61105942                 | 2008-10-16               |
| Prior Application Status                                                                                                                                                                                                                                                                                                                                                                               | Pending         | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                                                                                                                                                                                                                                                                                                     | Continuity Type | Prior Application Number | Filing Date (YYYY-MM-DD) |
|                                                                                                                                                                                                                                                                                                                                                                                                        |                 | 61144061                 | 2009-01-12               |
| Prior Application Status                                                                                                                                                                                                                                                                                                                                                                               | Pending         | <a href="#">Remove</a>   |                          |
| Application Number                                                                                                                                                                                                                                                                                                                                                                                     | Continuity Type | Prior Application Number | Filing Date (YYYY-MM-DD) |
|                                                                                                                                                                                                                                                                                                                                                                                                        |                 | 61144676                 | 2009-01-14               |
| Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the <b>Add</b> button.                                                                                                                                                                                                                                                                                  |                 |                          | <a href="#">Add</a>      |

**Foreign Priority Information:**

|                                                                                                                                                                                                                                                                                                             |                      |                                 |                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------|---------------------------------------------------------------|
| This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. 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(a). |                      |                                 |                                                               |
|                                                                                                                                                                                                                                                                                                             |                      |                                 | <a href="#">Remove</a>                                        |
| Application Number                                                                                                                                                                                                                                                                                          | Country <sup>i</sup> | Parent Filing Date (YYYY-MM-DD) | Priority Claimed                                              |
|                                                                                                                                                                                                                                                                                                             |                      |                                 | <input checked="" type="radio"/> Yes <input type="radio"/> No |

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|                                           |                                                                                  |                        |             |
|-------------------------------------------|----------------------------------------------------------------------------------|------------------------|-------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                                                                  | Attorney Docket Number | E080048USU1 |
|                                           |                                                                                  | Application Number     |             |
| Title of Invention                        | Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network |                        |             |

|                                                                                                        |            |
|--------------------------------------------------------------------------------------------------------|------------|
| Additional Foreign Priority Data may be generated within this form by selecting the <b>Add</b> button. | <b>Add</b> |
|--------------------------------------------------------------------------------------------------------|------------|

## Assignee Information:

|                                                                                                                                                                                                 |                               |                |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------|---------------|
| Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office. |                               |                |               |
| <b>Assignee 1</b>                                                                                                                                                                               |                               |                | <b>Remove</b> |
| If the Assignee is an Organization check here. <input checked="" type="checkbox"/>                                                                                                              |                               |                |               |
| Organization Name                                                                                                                                                                               | Entropic Communications, Inc. |                |               |
| <b>Mailing Address Information:</b>                                                                                                                                                             |                               |                |               |
| Address 1                                                                                                                                                                                       | 6290 Sequence Drive           |                |               |
| Address 2                                                                                                                                                                                       |                               |                |               |
| City                                                                                                                                                                                            | San Diego                     | State/Province | CA            |
| Country <sup>i</sup>                                                                                                                                                                            | US                            | Postal Code    | 92121         |
| Phone Number                                                                                                                                                                                    | 858-768-3835                  | Fax Number     | 858-768-3601  |
| Email Address                                                                                                                                                                                   | patentteam@entropic.com       |                |               |
| Additional Assignee Data may be generated within this form by selecting the <b>Add</b> button.                                                                                                  |                               |                | <b>Add</b>    |

## Signature:

|                                                                                                                                                              |                      |           |           |                     |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------|-----------|---------------------|------------|
| A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature. |                      |           |           |                     |            |
| <b>Signature</b>                                                                                                                                             | /Bruce W. Greenhaus/ |           |           | Date (YYYY-MM-DD)   | 2009-10-15 |
| First Name                                                                                                                                                   | Bruce W.             | Last Name | Greenhaus | Registration Number | 37339      |

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.**

## 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 the Freedom of Information Act requires disclosure of these records.
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).
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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**PATENT APPLICATION**

**Title:**

**METHOD AND APPARATUS FOR USING RANGING MEASUREMENTS IN A  
MULTIMEDIA HOME NETWORK**

**Inventor(s):**

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Attorney Docket No.: E080048USU1

Sheets of Drawings: Fourteen (14)

## **SYSTEMS AND METHODS FOR USING RANGING TO IMPROVE NETWORK EFFICIENCY**

### **Related Applications**

[0001] This application claims the benefit of U.S. Provisional Patent Applications Serial Number 61/105,942 filed October 16, 2008, and Serial Number 61/144,061 filed January 12, 2009, and Serial Number 61/144,676 filed January 14, 2009, each of which is hereby incorporated herein by reference in the respective entirety of each.

### **Field of the Disclosure**

[0002] The present disclosure relates to networks, and more particularly, some embodiments relate to using range estimates to improve efficiency in networks, particularly networking over coaxial cable.

### **Description of the Related Art**

[0003] With the many continued advancements in communications and data transfer technology, more and more devices are being introduced in both the consumer and commercial sectors with advanced, high bandwidth communications capabilities. Additionally, advances in processing power and low-power consumption technologies have led to the proliferation of communications capabilities in various products on a widespread basis.

[0004] For example, communication networks are now commonplace in many home and office environments. Such networks allow various previously independent devices to share data and other information to enhance productivity or simply to improve their convenience to the user. Against this backdrop, home networking has become

central to the evolving home “infotainment” market. Indeed, there is a growing demand for the ability to connect content devices (e.g., televisions, DVD players and recorders, digital cameras, speakers, video cameras, etc.), computing devices, I/O devices, home appliances and modems.

[0005] Home entertainment networks are typically provided in one of two topologies. The first is an Access topology, which can be best analogized to a tree structure wherein a base node communicates with nodes in its branches, but branch nodes do not typically communicate directly with other branches. The second is a Mesh topology in which any node can communicate directly with any other node in the network. Access topologies are typically found in apartment or office settings where a master node at the ‘source’ is used to distribute data to a plurality of downstream nodes (e.g., to the various apartments in an apartment building) and the downstream nodes (e.g., apartments) do not need to share content with one another. Mesh topologies, on the other hand, might be more typically found in a home environment where, although there may be a common source of broadband data (e.g., the main cable feed into the home), the homeowners may wish to share content originating from a device in one room with other devices in other rooms in their home.

[0006] To address the growing demand for a digital home networking market, a consortium of industry leading companies formed the Multimedia over Coax Alliance (MoCA™). MoCA has provided a technical standard (referred to as “MoCA 1.0”) which defines a protocol for distributing digital entertainment over the available bandwidth on coaxial cable previously installed in households for cable or satellite TV service. The initial MoCA standard was approved in February 2006, and routers with built-in MoCA

capabilities (i.e., that conform to the MoCA 1.0 standard), MoCA set-top boxes and MoCA adapters followed shortly thereafter. Accordingly, one Mesh topology is defined by the MoCA 1.0 standard.

[0007] Architects of these and other networks, and indeed communications channels in general, have long struggled with the challenge of managing multiple communications from various devices across a limited channel. Accordingly, network architects have come up with various solutions to arbitrate disputes or otherwise allocate bandwidth among the various communicating devices, or clients, on the network. Schemes used in well known network configurations such as token rings, Ethernet, and other configurations have been developed to allow sharing of the available bandwidth.

[0008] Figure 1 is a diagram illustrating one example of a home cable network. The example of a home environment illustrated in Figure 1 also includes examples of equipment and other electronic devices or nodes that might be found in a typical home-networking environment such as the network defined by MoCA 1.0. The network of Figure 1 includes set-top boxes 111 and televisions (TVs) 110 found in the master bedroom 115, the bedroom 114, and the family room 113. Also, a typical home network might include computing systems such as a desktop computing system 117 and peripherals as illustrated in the den 113, and a laptop computer 118 such as that illustrated in the kitchen 112. Other content devices or network devices might also be provided.

[0009] A MoCA network includes a plurality of client nodes, such as TVs 110, set top boxes 111 and computers 117, 118. It should be noted that TVs, 110, set top

boxes 111 and computers 117, 118 are configured with a communication device that allows these devices to operate as a client node on the MoCA network. The protocol established by MoCA includes a layered approach, in which the first layer is the physical (PHY) layer and the second layer is the Media Access Control (MAC) layer. Initially, upon setting up a MoCA network, one of the client nodes is automatically selected to be a network coordinator (NC). The network coordinator (NC) is relied upon to schedule all traffic on the network, thereby allocating the network bandwidth and avoiding packet collisions. The NC communicates the schedule to each client node in “Media Access Packets” (MAPs), where each MAP is a packet of information. One MAP is sent by the NC during each “MAP cycle”.

**[0010]** In order to facilitate the scheduling, the NC and each node in the network maintains a local channel time clock (CTC) counter and all nodes are responsible for synchronizing their CTC counts to that of the NC. The period of each CTC tick is referred to as a “SLOT\_TIME.” The CTC is encoded in either MAC header or payload of MoCA network packets, depending on the type of data or link control packet. Additionally, the CTC resolution under the MoCA 1.x specification is 20 nsec. The encoded CTC count of the MoCA network packet represents the time instant that the first sample of the PHY preamble is transmitted on to the network medium. When receiving MAP packets (or any other packet from the NC), each node records the instant in time when it received the first sample of the PHY preamble of the MAP packet using its local CTC count. The receiver then adjusts its own CTC count to synchronize it to the NC’s counter.

**[0011]** Figure 2 is a diagram illustrating such a CTC synchronization process between a node (Node 1) and a NC (Node 0) under the MoCA 1.x standard. Based on the MoCA 1.x specification, the CTC of any node may not lead the NC's CTC more than 0.2  $\mu\text{sec}$  (in the case of -200 PPM offset) or lag the NC's CTC any more than 2.2  $\mu\text{sec}$  (110 SLOT\_TIMES). The diagram of Figure 2 accounts for the 2.1  $\mu\text{sec}$ , with the remaining 0.1  $\mu\text{sec}$  being accounted for by sampling drift due to frequency offsets. Based on MoCA, inaccuracies to the CTC are can be introduced by several factors, including but not limited to: delay in transmission (0.4  $\mu\text{sec}$ ), propagation delay (i.e., time it takes for the NC's packet to propagate through the medium to the receiver -  $\sim 0.9 \mu\text{sec}$ ), receive delay ( variances in the manner packet arrival time is estimated -  $\sim 0.8 \mu\text{sec}$ ), clock drifts between nodes ( $\sim 0.2 \mu\text{sec}$ , given a drift up to  $\pm 200/1\text{e}6 \times 50\text{e}6 \text{ SLOT\_TIMES/sec} \times 1\text{e-}3 \text{ sec/MAP} = \pm 10 \text{ SLOT\_TIMES per } 1 \text{ msec MAP cycle}$ ), implementation delays (delay through the PHY and analog circuitry in the transmit direction and the receive direction; often negligible), noise (often negligible), and vendor implementation differences in estimating packet transmission time (often negligible).

**[0012]** Figure 3 is a diagram illustrating the ambiguity in packet arrival time between two nodes (Node 1 and Node 2) under the MoCA 1.x standard. Specifically, the diagram illustrates a consequence of the 0 to 2.2  $\mu\text{sec}$  CTC time ambiguity described above. In order to compensate for the CTC time ambiguity, the packet transmission time variability requires an extra 2.6  $\mu\text{sec}$  in inter-frame gap (IFG), which is the amount of time between network packets. In addition, the packet arrival time will have  $-2.2$  to  $+3.5 \mu\text{sec}$  of unpredictability.

**[0013]** Figure 4 is a diagram illustrating the “true” inter-frame gap for a particular node under the MoCA 1.x standard. The “true” inter-frame gap indicates the amount of time the node has after processing a first packet to prepare for the next packet. The local  $CTC_{Start}$  and  $CTC_{End}$  times noted in the diagram indicate the expected start and end times for the node (as computed from the MAP) using the local CTC of the node. The hash marks in each line of the diagram indicate the variability in the times at which packets arrive and are transmitted with respect to the local  $CTC_{Start}$  and  $CTC_{End}$ . Transmissions occur with a 0 to +0.4  $\mu\text{sec}$  ambiguity. There is also an assumed  $-1.3$  to  $+3.5$   $\mu\text{sec}$  packet arrival ambiguity. Accordingly, the transmission of a first packet 401 is completed at sometime between  $CTC_{Start}$  and 0.4  $\mu\text{sec}$  after  $CTC_{Start}$ . Likewise, transmission of the next packet 403 begins sometime between  $CTC_{End}$  and 0.4  $\mu\text{sec}$  after  $CTC_{End}$ . Packet 405 is received sometime between  $CTC_{End}$  minus 1.3  $\mu\text{sec}$  and  $CTC_{End}$  plus 3.5  $\mu\text{sec}$ . Likewise, assuming that there is no error in the local CTC clock, packet 407 is received sometime between  $CTC_{Start}$  and 3.5  $\mu\text{sec}$  later. Therefore, the “true” inter-frame gap can be defined as the ‘guaranteed’ quiet portion of the IFG, which is 3.5  $\mu\text{sec}$  after  $CTC_{Start}$  and 1.3  $\mu\text{sec}$  before the  $CTC_{End}$  or equivalently  $IFG - 4.8$   $\mu\text{sec}$ . Accordingly, there is a relatively large IFG that is required to account of the ambiguities.

#### **Brief Summary of Embodiments of the Disclosure**

**[0014]** According to various embodiments of the disclosure, systems, methods and apparatuses are provided for using ranging to improve network efficiency. In particular, various embodiments of the disclosure provide ranging to improve local clock time synchronization. Ranging is a method by which nodes measure and/or estimate the propagation delays to and from other nodes in the network. Depending on the

embodiment, ranging can result in reduced inter-frame gap (IFG) by more accurately controlling the expected start and end times for arriving network packets. Ranging thus provides more predictable network packet arrival times that can be used to decrease the IFG without decreasing the “true” IFG.

[0015] Furthermore, for orthogonal frequency division multiple access (OFDMA) schemes, such as those used in MoCA standards, multiple packets are transmitted simultaneously. As such, it is desirable for all OFDMA packets to arrive at the OFDMA receiver at roughly the same time, otherwise network performance suffers with the need for longer cyclic prefix lengths to synchronize multiple OFDMA packets. With some embodiments, the ranging results in clock synchronization that allows for substantially simultaneous arrival of OFDMA packets at the receiver, thereby reducing the cyclic prefix length needed. Ranging can also result in improvements to a receiver’s automatic gain control (AGC) and burst detection performance.

[0016] Additionally, further embodiments can provide finer local clock resolution than has been traditionally provided. For example, as previously stated, in MoCA 1.x the CTC resolution is 20nsec. With the use of some embodiments, a CTC resolution of 5nsec can be attached given a 200MHz high-RF sampling rate (i.e., the CTC counter is incremented by 0.25 SLOT\_TIMES at the 200 MHz sampling rate).

[0017] According to one embodiment, a method for synchronizing a plurality of nodes on a communication network is provided, comprising: exchanging local clock times between a first node and a second node over the communication network; performing a ranging method between the first and second nodes based on the local clock

times exchanged between the first and second nodes, wherein the ranging method results in an estimated propagation delay between the first and second nodes; and adjusting the local clock times of the one or both of the nodes based on the estimated propagation delay, thereby resulting in a synchronized local clock time at the first and second nodes. In some such embodiments, the method further comprises using the synchronized local clock time in subsequent packet transmissions between the first and second nodes.

**[0018]** In some embodiments, the steps of exchanging local clock times, performing the ranging method, and adjusting the local clock times comprises: transmitting from the first node and receiving at the second node a first packet, wherein the first packet comprises a first packet clock time comprising the local clock time of the first node at transmission time, and a scheduled arrival clock time; setting the local clock time of the second node to the first packet clock time; transmitting from the second node and receiving at the first node a second packet at the first scheduled arrival clock time, wherein the second packet is received by the first node at an actual arrival clock time; calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the first scheduled arrival clock time and the first actual time; transmitting from the first node and receiving at the second node a third packet, wherein the third packet comprises the estimated propagation delay; and storing the estimated propagation delay at the second node. In an alternative embodiment, the delay is used to adjust the clock without storing.

**[0019]** For various embodiments, a transmission time of a transmitted packet is measured at 90% of peak amplitude of a transmission signal, 90% of peak power of a transmission signal, 90% of total power of a transmission signal, the first arrival instant

of the packet, the last arrival instant of a packet (different than the first arrival instant in the case of mediums comprising multiple different length paths between the transmitter and receiver) or a mean delay of a transmission signal. For yet other embodiments, an arrival time of a received packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of a received signal, 90% of total power of a received signal, or a mean delay of the received signal.

**[0020]** In various embodiments, the first node may be a network coordinator, and the second node is a new node and the method is performed as part of admission of the second node to the communication network. Additionally, in some embodiments, the method is performed periodically to maintain synchronization between the first and second nodes.

**[0021]** For some embodiments, the communication network is a mesh network. For yet further embodiments, the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard.

**[0022]** Additional embodiments of the disclosure provide computer program products, network devices, and network interface modules incorporating functions or features similar to those described above with respect to method embodiments of the disclosure.

**[0023]** Other features and aspects of the disclosure will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the features in accordance with embodiments of the

disclosure. The summary is not intended to limit the scope of the invention, which is defined solely by the claims attached hereto.

### **Brief Description of the Drawings**

[0024] The present disclosure, in accordance with one or more various embodiments, is described in detail with reference to the following figures. The drawings are provided for purposes of illustration only and merely depict typical or example embodiments of the disclosure. These drawings are provided to facilitate the reader's understanding of the disclosure and shall not be considered limiting of the breadth, scope, or applicability of the disclosure. It should be noted that for clarity and ease of illustration these drawings are not necessarily made to scale.

[0025] Figure 1 is a diagram illustrating an example implementation of a home cable network in accordance with one example of an environment for the disclosure.

[0026] Figure 2 is a diagram illustrating a CTC synchronization process between a node and a NC under the MoCA 1.x standard.

[0027] Figure 3 is a diagram illustrating the ambiguity in packet arrival time between two nodes (Node 1 and Node 2) under the MoCA 1.x standard.

[0028] Figure 4 is a diagram illustrating the “true” inter-frame gap for a particular node under the MoCA 1.x standard.

[0029] Figure 5 is a flowchart of a method for synchronizing a plurality of nodes in accordance with one embodiment of the disclosure.

**[0030]** Figure 6 is a flowchart of a method for synchronizing a plurality of nodes on a MoCA network in accordance with one embodiment of the disclosure.

**[0031]** Figure 7 is a diagram illustrating a clock synchronization example using ranging in accordance with one embodiment of the disclosure.

**[0032]** Figure 8 is a diagram illustrating an example of communication between a node and a NC after a clock synchronization and ranging operation in accordance with one embodiment of the disclosure.

**[0033]** Figure 9 is a diagram illustrating a clock synchronization example using maintenance synchronization and ranging in accordance with one embodiment of the disclosure.

**[0034]** Figure 10 is a diagram illustrating a clock synchronization example using maintenance synchronization and ranging in accordance with one embodiment of the disclosure.

**[0035]** Figure 11 is a diagram illustrating a clock synchronization example using node-to-node synchronization and ranging in accordance with one embodiment of the disclosure.

**[0036]** Figure 12 are graphs illustrating example points for measuring packet transmission time in accordance with one embodiment of the disclosure.

**[0037]** Figure 13 is a graph illustrating example points for measuring packet arrival time in accordance with one embodiment of the disclosure.

[0038] Figure 14 is a diagram illustrating the “true” inter-frame gap for an example node in accordance with one embodiment of the disclosure.

[0039] Figure 15 is a diagram illustrating an example of a generalized architecture for a network device in accordance with one embodiment of the disclosed system, method and apparatus.

[0040] The figures are not intended to be exhaustive or to limit the disclosure to the precise form disclosed. It should be understood that the disclosure can be practiced with modification and alteration, and that the invention should be limited only by the claims and the equivalents thereof.

#### **Detailed Description of the Embodiments of the Disclosure**

[0041] The present disclosure is directed toward systems, methods and apparatuses for using ranging to improve network efficiency. In some embodiments, ranging is utilized to improve local clock time synchronization. In doing so, various embodiments of the disclosure are capable of reducing the inter-frame gap (IFG), increased predictability of packet arrival times, reducing the cyclic prefix length for some frequency division multiple access schemes, such as OFDMA. For additional embodiments, the disclosure allows for receiver analog components to have more settling time (IFG minus 2  $\mu$ sec); an automatic gain control (AGC) to ensure that it does not track on pre-packet noise or interference; a burst detector to have a reduced search window time (e.g., to  $\pm 10$  samples) thereby eliminating false or missed detection; and a high-throughput unicast preamble that uses just a portion of the channel estimation symbols

for burst detection. For OFDMA, ranging can limit or eliminate burst detection (which is advantageous given that OFDMA preambles are a blend from multiple transmitters).

**[0042]** One example environment in which embodiments of the disclosure can be implemented is a home cable network, such as the example network previously described with respect to Figure 1.

**[0043]** Figure 5 is a flowchart of a method 50 for synchronizing a plurality of nodes in accordance with one embodiment of the disclosure. The method begins at operation 52, with a first node (Node#1) transmitting a first network packet P1 to a second node (Node#2) over a communication network. The network packets can be one of several different packet types including, but not limited to, data packets, control packets, and probe packets. The type of packet will vary depending on the type of communication network involved. For example, on a MoCA network, packet P1 could be an error vector magnitude packet (EVM), Beacon packet, Admission Request Packet, Admission Response Packet, or a MAP packet. Additionally, the packet may be transmitted in a variety of different modes, including, but in no way limited to, one-to-many 'broadcast' packets, many-to-one packets (e.g., OFDMA packets), one-to-one 'unicast' packets.

**[0044]** Continuing with operation 52, the network packet P1 comprises: (1) Node#1's local channel time clock count (CTC<sub>1</sub>) at the time of the P1's transmission (CTC<sub>1,TX</sub>); and (2) a scheduled channel time clock count at which Node#2 is to transmit a second network packet P2 to Node#1 (CTC<sub>SCHED</sub>). For example, within the context of a MoCA network, the CTC count is encoded in either the MAC header or payload of each

MoCA network packet, where the encoded CTC count represent the time instant that the first sample of the PHY preamble is transmitted on to the MoCA network medium (i.e., coaxial cable). In one alternative embodiment, the scheduled channel time clock count at which Node#2 is to transmit may be in another packet.

**[0045]** After Node#2 receives the network packet P1 from Node#1 (operation 55), Node#2 at operation 58 sets its local channel time clock count ( $CTC_{2,LOCAL}$ ) to the channel time clock count of Node#1 as reported within P1 (i.e.,  $CTC_{1,TX}$ ). Subsequently, at operation 61, Node#2 sets its estimated propagation delay ( $d_2$ ) to a predetermined estimated value, such as zero (i.e.,  $d_2 = 0$ ). At operation 64, Node#2 then transmits a network packet P2 to Node#1 at the scheduled channel time clock count ( $CTC_{SCHED}$ ) indicated in network packet P1.

**[0046]** Once Node#1 receives network packet P2 at operation 67, Node#1 sets its estimated propagation delay ( $d_1$ ) to half delay between the expected packet arrival time ( $CTC_{SCHED}$ ) and the actual packet arrival time ( $CTC_{ACTUAL}$ ). Accordingly,

$$d_1 = \frac{CTC_{ACTUAL} - CTC_{SCHED}}{2}.$$

Node#1 then transmits this calculated estimated propagation delay ( $d_1$ ) to Node#2 in a third network packet P3 at operation 73. The third network packet P3 stores the calculated delay ( $d_1$ ) within its payload as delay value  $d_{BEACON}$ , which once received by Node#2 at operation 76, is set as the estimated propagation delay ( $d_2$ ) of Node#2 at operation 79. The estimated propagation delay  $d_2$  is the propagation delay stored locally

by Node#2. In one alternative embodiment, the delay value is not stored locally, but rather is used without having been stored.

[0047] At the conclusion of method 50, both Node#1 and Node#2 have knowledge of the estimated propagation delay for network packets between them. Using this knowledge, Node#1 can accurately predict when network packets scheduled for a specific local channel time clock count ( $CTC_{\text{SCHED}}$ ) will arrive from Node#2, and Node#2 can accurately synchronize its local channel time clock count ( $CTC_2$ ) to that of Node#1 ( $CTC_1$ ).

[0048] Depending on the embodiment and the network environment, method 50 may be performed as part of or during other processes that facilitate the communication network. For example, in a MoCA network, the method 50 can be performed such that: a new node as part of admission to the MoCA network performs synchronization and ranging to the NC (e.g., Beacon method); a new node as part of admission to the MoCA network performs synchronization and ranging to another, non-NC node that has already completed this admission process (e.g., “new node to existing node”); and periodic maintenance synchronizing and ranging is performed to track slow changes in the propagation delay (e.g., performed in conjunction with EVM maintenance).

[0049] Figure 6 is a flowchart of a method 100 for synchronizing a plurality of nodes on a MoCA network in accordance with one embodiment of the disclosure. In particular, method 100 illustrates synchronizing a Node#1 to a network coordinator (NC), where Node#1 is a new node being admitting into a MoCA network. The method begins with operation 103, where new node Node#1 receives a Beacon packet from a network

Coordinator (NC). In operation 106, Node A sets its local channel time clock count ( $CTC_{NODE1}$ ) to the channel time clock count of the NC as reported by the Beacon Packet ( $CTC_{NC,BEACON}$ ). At this point, Node#1 estimates its propagation delay ( $d_0$ ) to be zero at operation 109.

**[0050]** At operation 112, Node#1 transmits an admission request packet to the NC at the time scheduled in the Beacon packet ( $CTC_{SCHED}$ ). The NC, in turn, receives the admission request packet at operation 115, and sets its estimated propagation delay ( $d_1$ ) to half the delay between the expected packet arrival time ( $CTC_{SCHED}$ ) and the actual packet arrival time ( $CTC_{ACTUAL}$ ). Accordingly, similar to method 50 of Figure 5,

$$d_1 = \frac{CTC_{ACTUAL} - CTC_{SCHED}}{2}.$$

**[0051]** The NC then transmits an admission response packet to Node#1 at operation 118 containing a delay value ( $d$ ) set to the estimated propagation delay of the NC ( $d_1$ ). Once Node#1 receives the admission response packet at operation 121, Node#1 sets its estimated propagation delay value ( $d_0$ ) to the delay value set in the admission response packet (i.e.,  $d$ ).

**[0052]** Referring now to Figures 7 through 11, these diagrams provide for examples of clock synchronization using ranging in a MoCA network accordance with various embodiments of the disclosure. Before describing these diagrams further, it should be noted that the following naming conventions are utilized:  $CTC_k$  represents the scheduled CTC time for the k-th packet;  $Err_n$  represents the relative error of the n-th node's local  $CTC_{NODEn}$  to the NC's  $CTC_{NC}$ ;  $D_{nm}$  is the actual propagation delay between

the n-th node and the m-th node; and,  $d_m$  is the propagation delay estimated by the n-th node to/from the m-th node. It should be noted that in these embodiments, the network coordinator (NC) is Node #0, and that its relative error  $Err_0$  by definition is zero (i.e.,  $Err_0 = 0$ ).

**[0053]** Turning now to Figure 7, a diagram is provided illustrating a clock synchronization example using ranging in accordance with method 100 of Figure 6. In this diagram, Node#1 is requesting admission to the communications network during the Beacon period. Node#1 at the beginning of this admission process has a local  $CTC_{NODE1}$  that is unsynchronized with that of the NC (local  $CTC_{NC}$ ). At this point, both the Node#1 and NC assume the propagation delay is zero (i.e.,  $d_1$  and  $d_0$ , are respectively set to zero). Once the NC broadcasts a Beacon packet to all the available nodes on the network, which contains the Beacon packet's transmission time of  $CTC_1$ , Node#1 receives the Beacon packet and sets its local  $CTC_{NODE1}$  to  $CTC_1$ . The relative error between local  $CTC_{NODE1}$  and local  $CTC_{NC}$  is  $D_{01}$ . Node#1 subsequently transmits an Admission Request packet when its local  $CTC_{NODE1}$  is equal to the scheduled time of  $CTC_2$ , which is indicated in the Beacon packet.

**[0054]** The Admission Request packet arrives at the NC at  $CTC_2 + D_{01} + D_{10}$ , where  $D_{01} + D_{10}$  is the propagation delay to and propagation delay from Node#1. Assuming the propagation to and from Node#1 is reciprocal, the NC estimates the propagation delay to the new node Node#1 ( $d_1$ ) is half the delay between the expected (i.e.,  $CTC_2$ ) and actual packet arrival time (i.e.,  $CTC_2 + D_{01} + D_{10}$ ), resulting in

$$d_1 = \frac{D_{01} + D_{10}}{2}$$

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**[0055]** The NC stores this propagation delay locally as  $d_1$ , subsequently sets the delay value  $d = d_1$  in the Admission Response packet, and transmits the Admission Response to the new node Node#1 at the scheduled CTC time ( $CTC_3$ ). The new node Node#1, upon receiving the Admission Response, reads the NC-specified delay ( $d$ ), sets its  $d_0$  to the value  $d$ , and adds the value  $d$  to its local CTC time ( $local\ CTC_{NODE1}$ ).

**[0056]** Upon completion of the foregoing ranging and synchronization operation of Figure 7, the CTC time of Node#1 will lag the NC's CTC time by exactly  $(D_{01} - D_{10})/2$ . If the channel is reciprocal, then this error will be zero. Note that regardless of channel reciprocity, the packets will always arrive at the NC or Node#1 exactly when that node expects the packet to arrive. Depicted after the CTC synchronization and ranging (i.e., after reception of the Admission Response packet by Node#1) are other packets that illustrate various usage cases.

**[0057]** Figure 8 is a diagram illustrating an example of communication between a node and a NC after the clock synchronization and ranging operation illustrated in Figure 7. It should be noted that the CTC encoded in network packets transmitted to Node#1 from the NC will be off by  $Err_1$  once they arrive at Node#1.

**[0058]** Figure 9 is a diagram illustrating a clock synchronization example using maintenance synchronization and ranging in accordance with one embodiment of the disclosure. For embodiments implemented in a MoCA network, once a node (e.g., Node#1) has been admitted to the network, the node must periodically update its ranging and synchronization information to accommodate slow channel variations. Referring now to Figure 9, the diagram illustrates a sequence of operations that a node must follow

in order to track the propagation delay between itself and the NC, as well to maintain CTC synchronization with the NC. It should be noted that, in some embodiments implemented in a MoCA network, this maintenance process is performed only once per EVM session. Although the messages are different, the maintenance synchronization and ranging illustrated in Figure 9 is very similar to the initial acquisition method illustrated in Figure 7. In addition, the NC may average the propagation delay estimates over time to reduce the jitter due to jitter in packet transmission time as well as due to jitter in packet arrival time estimation.

[0059] Depending on the embodiment utilized in a MoCA network, the synchronization and ranging operations illustrated in Figures 7 through 11 may be performed as part of only the EVM function, only the Beacon period, or as part of both. When the synchronization and ranging operations in accordance with this disclosure are implemented as only part of the EVM function, there are minimal changes needed to the MAC protocol in that only the EVM Probe response of the EVM function would require a delay field to transport the estimated propagation delay. Figure 10 is diagram similar to Figure 9 illustrating usage cases after a CTC synchronization and ranging is complete during an EVM function.

[0060] Figure 11 is a diagram illustrating a clock synchronization example using node-to-node synchronization and ranging in accordance with one embodiment of the disclosure. Once a new node (e.g., Node#1) has completed admission to the network and has synchronized and ranged with the NC, it must perform ranging with all other nodes in the network. The purpose of this is to enable ranging to carry forward in the case of NC hand-off (i.e., the role of the NC is transferred from one network node to another), and to

enable receivers to predict packet arrival time to improve automatic gain control (AGC) and burst detection functions. Ranging also enables tighter turn-on/turn-off times for the analog front end/radio-frequency (AFE/RF) circuitry which enables a shorter IFG's. Referring now to Figure 11, the diagram illustrates a method of synchronization and ranging between two nodes, Node#1 and Node#2, already admitted in the MoCA network. In doing so, the periodic updating accounts for slow drifts in each node's local CTC count, as well as possible changes in propagation delay. Depending on the embodiment, the nodes update the ranging estimates at least once every EVM probe session or, optionally, on every EVM report. As noted above, these ranging estimates can be averaged over time to reduce the variability of packet start time and estimated packet arrival time.

**[0061]** Turning now to the accuracy of transmission and arrival times, according to some embodiments of the disclosure, a node synchronizes its local channel time clock (CTC) to that of another node by comparing the local receive time of a network packet to that of the CTC transmit time as indicated in the payload of that network packet. For example, in a MoCA network, a node synchronizes its CTC time to that of the NC by comparing the local receive time of a Beacon or MAP packet to the NC's CTC transmit time as reported by the Beacon or MAP packet. To ensure accuracy of the transmission and arrival times, the nodes within the network must accurately measure the transmission time and the arrival time of network packets.

**[0062]** Accordingly, in some embodiments, the transmission time of a transmitted network packet is measured at 90% of peak amplitude of a transmission signal, 90% of peak power of the transmission signal, 90% of total power of the transmission signal, the

first arrival instant of the packet, the last arrival instant of a packet (different than the first arrival instant in the case of mediums comprising multiple different length paths between the transmitter and receiver), referenced to CP start, referenced to CP end, or a mean delay of the transmission signal carrying the transmitted network packet. In yet other embodiments, the arrival time of a received network packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of the received signal, 90% of total power of the received signal, or a mean delay of the received signal carrying the received network packet. In accordance with these embodiments, Figure 12 and Figure 13 are graphs illustrating some of the example points for measuring packet transmission time and received time respectively.

**[0063]** Referring now to Figure 12, the top graph shows an example transmitter impulse response, while the bottom graph shows the corresponding power (solid plotted curve) and integrated power (dashed curve). Time zero represents the time instant that the first sample of the preamble is inserted into an interpolator. The impulse response is measured between the interpolator input and the transmitter's interface to the transmission medium. The transmit time of this impulse will change depending on the method used to measure it. Figure 12 shows three different possible transmit times: 90% of peak, mean time, or 90% of power. It should be noted that the 90% threshold is arbitrary and, depending on the embodiment, can be replaced with any other threshold.

**[0064]** Referring now to Figure 13, the graph shows an example receiver power delay profile that is obtained from a echo profile probing mechanism. The graph shows the corresponding power (solid plotted curve) and integrated power (dashed curve). Time zero represents the time instant that the first sample of the preamble arrives at the

RF connector. Figure 13 shows three examples of the received time for this signal. Note that the receive times are dependent on the measurement method.

[0065] Figure 14 is a diagram illustrating the “true” inter-frame gap for an example node in accordance with one embodiment of the disclosure. Specifically, Figure 14 illustrates the impact of the CTC and packet arrival time variability for c.LINK+ in a MoCA network, and the effect of delay spread for received packets. The delay spread accounts for the amount of time after the mean packet arrival time of the channel that echoes continue to arrive. In some embodiments, this delay spread can be subsequently accounted for in the IFG for the purposes of avoiding channel collisions, without impacting the amount of time the receiver has after a first packet to prepare for the next packet. In this example, the maximum delay spread is 800 nsec. In one embodiment in which the signals are modulated using OFDMA, the use of ranging to allows the accuracy and synchronization of the clocks in each node to be adjusted. In addition, knowing the amount of time it takes a packet to traverse the medium from each node to the NC allows the transmission times of nodes in the network to be delayed by an amount that will ensure that packets transmitted by various nodes in the network all arrive at the NC at the same time.

[0066] While various embodiments of the disclosed concepts have been described above, it should be understood that they have been presented by way of example only, and not of limitation. Likewise, the various diagrams may depict an example architectural or other configuration for the disclosed concepts, which is done to aid in understanding the features and functionality that can be included in the concept. Accordingly, the claimed invention is not restricted to the illustrated example

architectures or configurations, but the desired features can be implemented using a variety of alternative architectures and configurations. Indeed, it will be apparent to one of skill in the art how alternative functional, logical or physical partitioning and configurations can be implemented to implement the desired features. Also, a multitude of different constituent module names other than those depicted herein can be applied to the various partitions. Additionally, with regard to flow diagrams, operational descriptions and method claims, the order in which the steps are presented herein shall not mandate that various embodiments be implemented to perform the recited functionality in the same order unless the context dictates otherwise.

[0067] With MoCA and other network environments, the network nodes typically include a network device with a processor, controller or other processing module configured to perform device functions. The scheduling and other network management features discussed above might be performed by the device processing module, or a dedicated network module might be provided with the device to enable it to function as a network node. One example configuration of a network device that can be used with a communication network, such as the MoCA network is illustrated in Figure 15. Referring now to Figure 15, the example network device 520 includes a controller 522, memory 525 and a system bus 540.

[0068] Controller 522 might be implemented using a general-purpose or special-purpose processing engine such as, for example, a microprocessor, controller, or other control logic. In one embodiment, some or all of device 520 functionality can be implemented using an ASIC, PLD or other circuit device, including a processor core and memory blocks. Accordingly, controller 522 might be implemented using a processing

core such as, for example, a RISC microprocessor core. Examples of RISC processor cores include ARM cores available from Advanced RISC Machines Ltd, located in Cambridge, England, and MIPS RISC cores available from MIPS Technologies, Inc., of Mountain View, Calif., although other cores are available as well. In the example illustrated in Figure 8, controller 522 is connected to a bus 540 or other communication medium to facilitate interaction with other components of the device. Although a central bus structure is depicted, other communication media and architectures are acceptable.

[0069] Controller 522 operates to execute program code that would typically be stored, for example, in ROM 524, and generally controls the functionality for the network device. RAM 526 can also be included to serve as working memory for controller operations and other storage. Network device 520 may further include secondary storage devices 538, such as but not limited to hard drives, floppy drives, CD and DVD ROM and RWM drives, removable memory or storage devices.

[0070] For external communications, the network device can also include communications capabilities. For instance, the example illustrated in Figure 8 includes a network transceiver 536 and an external interface 532. As a practical example, in the case of the example environment, network transceiver 536 could be a MoCA transceiver that enables the device to share data with other MoCA nodes.

[0071] The communications interfaces might also be used to allow software and data to be transferred between network device 520 and other devices or nodes. Examples of communications interface might include a modem or soft-modem, a network interface (such as an Ethernet, network interface card, WiMedia, 802.11, MoCA or other

interface), a communications port (such as for example, a USB port, IR port, RS232 port Bluetooth interface, or other port), or other communications interface. Software and data transferred via communications interfaces might typically be carried on signals, which can be electronic, electromagnetic, optical or other signals capable of being exchanged by a given communications interface. These signals might be provided to communications the interface via a compatible channel, which might carry signals and might be implemented using a wired or wireless medium. Some examples of a channel might include a phone line, a cellular link, an RF link, an optical link, a network interface, a local or wide area network, and other wired or wireless communications channels.

**[0072]** In this document, the terms "computer program medium" and "computer usable medium" are used to generally refer to media such as, for example, memory or storage units, storage media, and signals on channel. These and other various forms of computer media may be involved in carrying one or more sequences of one or more instructions to a processing device for execution. Such instructions embodied on the medium, are generally referred to as "computer program code" or a "computer program product" (which may be grouped in the form of computer programs or other groupings). When executed, such instructions can enable the device to perform features or functions as discussed herein.

**[0073]** Device module 562 is a black-box representation of the functionality that can be performed by the network device 520 and that may vary depending on that the nature of the actual device. For example, assume that network device 520 in this example is a digital video camera. In this implementation, device module 562 might include imaging optics, an image sensor, image buffers, and other like functionality.

Device module 562 can further include processing and memory capabilities, or can use controller 522, and memory 525 for some or all of its operational abilities. As this example illustrates, network device 520 might be implemented as other devices having other components, configurations or functionality.

[0074] As used herein, the term module might describe a given unit of functionality that can be performed. As used herein, a module might be implemented utilizing any form of hardware, software, or a combination thereof. For example, one or more processors, controllers, ASICs, PLAs, logical components, software routines or other mechanisms might be implemented to make up a module. In implementation, the various modules described herein might be implemented as discrete modules or the functions and features described can be shared in part or in total among one or more modules. In other words, as would be apparent to one of ordinary skill in the art after reading this description, the various features and functionality described herein may be implemented in any given application and can be implemented in one or more separate or shared modules in various combinations and permutations. Even though various features or elements of functionality may be individually described or claimed as separate modules, one of ordinary skill in the art will understand that these features and functionality can be shared among one or more common software and hardware elements, and such description shall not require or imply that separate hardware or software components are used to implement such features or functionality.

[0075] Although the concepts are described above in terms of various embodiments and implementations, it should be understood that the various features, aspects and functionality described in one or more of the individual embodiments are not

limited in their applicability to the particular embodiment with which they are described, but instead can be applied, alone or in various combinations, to one or more of the other embodiments consistent with the disclosed concepts, whether or not such embodiments are described and whether or not such features are presented as being a part of a described embodiment. Thus, the breadth and scope of the claimed invention should not be limited by any of the above-described embodiments, but rather will find support from the disclosure to the full extent of the concepts exemplified by the disclosed embodiments.

[0076] Terms and phrases used in this document, and variations thereof, unless otherwise expressly stated, should be construed as open ended as opposed to limiting. As examples of the foregoing: the term “including” should be read as meaning “including, without limitation” or the like; the term “example” is used to provide selected instances of the item in discussion, not an exhaustive or limiting list thereof; the terms “a” or “an” should be read as meaning “at least one,” “one or more” or the like; and adjectives such as “conventional,” “traditional,” “normal,” “standard,” “known” and terms of similar meaning should not be construed as limiting the item described to a given time period or to an item available as of a given time, but instead should be read to encompass conventional, traditional, normal, or standard technologies that may be available or known now or at any time in the future. Likewise, where this document refers to technologies that would be apparent or known to one of ordinary skill in the art, such technologies encompass those apparent or known to the skilled artisan now or at any time in the future.

[0077] A group of items linked with the conjunction “and” should not be read as requiring that each and every one of those items be present in the grouping, but rather should be read as “and/or” unless expressly stated otherwise. Similarly, a group of items linked with the conjunction “or” should not be read as requiring mutual exclusivity among that group, but rather should also be read as “and/or” unless expressly stated otherwise. Furthermore, although items, elements or components disclosed may be described or claimed in the singular, the plural is contemplated to be within the scope thereof unless limitation to the singular is explicitly stated.

[0078] The presence of broadening words and phrases such as “one or more,” “at least,” “but not limited to” or other like phrases in some instances shall not be read to mean that the narrower case is intended or required in instances where such broadening phrases may be absent. The use of the term “module” does not imply that the components or functionality described or claimed as part of the module are all configured in a common package. Indeed, any or all of the various components of a module, whether control logic or other components, can be combined in a single package or separately maintained and can further be distributed in multiple groupings or packages or across multiple locations.

[0079] Additionally, the various embodiments set forth herein are described as examples of block diagrams, flow charts and other illustrations. As will become apparent to one of ordinary skill in the art after reading this document, the illustrated embodiments and their various alternatives can be implemented without confinement to the illustrated examples. For example, block diagrams and their accompanying description should not be construed as mandating a particular architecture or configuration.

**Claims**

What is claimed is:

1. A method for synchronizing a plurality of nodes on a communication network, comprising:
  - exchanging a local clock time between a first node and a second node over the communication network;
  - performing a ranging method between the first and second nodes based on the local clock time exchanged, wherein the ranging method results in an estimated propagation delay between the first and second node; and
  - adjusting the local clock time either the first or second node based on the estimated propagation delay, thereby resulting in a synchronized local clock time between the first and second node.
2. The method of claim 1, further comprising using the synchronized local clock time in subsequent packet transmissions between the first and second nodes.
3. The method of claim 1, wherein exchanging local clock times, performing the ranging method, and adjusting the local clock times comprises:
  - transmitting from the first node and receiving at the second node a first packet, wherein the first packet comprises a first packet clock time comprising the local clock time of the first node at transmission time, and a scheduled arrival clock time;
  - setting the local clock time of the second node to the first packet clock time;
  - transmitting from the second node and receiving at the first node a second packet at the first scheduled arrival clock time, wherein the second packet is received by the first node at an actual arrival clock time;
  - calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the first scheduled arrival clock time and the first actual time;

transmitting from the first node and receiving at the second node a third packet, wherein the third packet comprises the estimated propagation delay; and storing the estimated propagation delay at the second node.

4. The method of claim 3, wherein a transmission time of a transmitted packet is measured at 90% of peak amplitude of a transmission signal, 90% of peak power of a transmission signal, 90% of total power of a transmission signal, or a mean delay of a transmission signal.

5. The method of claim 3, wherein an arrival time of a received packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of a received signal, 90% of total power of a received signal, or a mean delay of a received signal.

6. The method of claim 1, wherein the first node is a network coordinator.

7. The method of claim 1, wherein the second node is a new node and the method is performed as part of admission of the second node to the communication network.

8. The method of claim 1, wherein the method is performed periodically to maintain synchronization between the first and second nodes.

9. The method of claim 1, wherein the communication network is a mesh network.

10. The method of claim 1, wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard.

11. A network device, comprising:

- a controller;
- a device module;
- memory coupled to the controller;
- computer executable program code on a computer readable medium configured to cause the controller to perform the functions of:
  - exchanging local clock times between a first node and a second node over a communication network;
  - performing a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes, wherein the ranging method results in an estimated propagation delay between the first and second nodes; and
  - adjusting the local clock times of the first and second nodes based on the estimated propagation delay, thereby resulting in a synchronized local clock time at the first and second nodes.

12. The network device of claim 11, wherein the computer executable program code is further configured to cause the controller to use the synchronized local clock time in subsequent packet transmissions between the first and second nodes.

13. The network device of claim 11, wherein the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times comprises:

- transmitting from the first node and receiving at the second node a first packet, wherein the first packet comprises a first packet clock time comprising the local clock time of the first node at transmission time, and a scheduled arrival clock time;
- setting the local clock time of the second node to the first packet clock time;

transmitting from the second node and receiving at the first node a second packet at the first scheduled arrival clock time, wherein the second packet is received by the first node at an actual arrival clock time;

calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the first scheduled arrival clock time and the first actual time;

transmitting from the first node and receiving at the second node a third packet, wherein the third packet comprises the estimated propagation delay; and

storing the estimated propagation delay at the second node.

14. The network device of claim 13, wherein a transmission time of a transmitted packet is measured at 90% of peak amplitude of a transmission signal, 90% of peak power of a transmission signal, 90% of total power of a transmission signal, or a mean delay of a transmission signal.

15. The network device of claim 13, wherein an arrival time of a received packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of a received signal, 90% of total power of a received signal, or a mean delay of a received signal.

16. The network device of claim 11, wherein the first node is a network coordinator.

17. The network device of claim 11, wherein the second node is a new node and the functions are performed as part of admission of the second node to the communication network.

18. The network device of claim 11, wherein the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times are performed periodically to maintain synchronization between the first and second nodes.

19. The network device of claim 11, wherein the communication network is a mesh network.

20. The network device of claim 11, wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard.

21. A computer program product comprising a computer usable medium having computer readable program code embodied therein for synchronizing a plurality of nodes on a communication network, the computer program product comprising computer readable program code configured to cause a device to:

exchange local clock times between a first node and a second node over a communication network;

perform a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes, wherein the ranging method results in an estimated propagation delay between the first and second nodes; and

adjust the local clock times of the first and second nodes based on the estimated propagation delay, thereby resulting in a synchronized local clock time at the first and second nodes.

22. The computer program product of claim 21, wherein the computer executable program code is further configured to cause the device to use the synchronized local clock time in subsequent packet transmissions between the first and second nodes.

23. The computer program product of claim 21, wherein the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times comprises:

transmitting from the first node and receiving at the second node a first packet, wherein the first packet comprises a first packet clock time comprising the local clock time of the first node at transmission time, and a scheduled arrival clock time;

setting the local clock time of the second node to the first packet clock time;

transmitting from the second node and receiving at the first node a second packet at the first scheduled arrival clock time, wherein the second packet is received by the first node at an actual arrival clock time;

calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the first scheduled arrival clock time and the first actual time;

transmitting from the first node and receiving at the second node a third packet, wherein the third packet comprises the estimated propagation delay; and

storing the estimated propagation delay at the second node.

24. The computer program product of claim 23, wherein a transmission time of a transmitted packet is measured at 90% of peak amplitude of a transmission signal, 90% of peak power of a transmission signal, 90% of total power of a transmission signal, or a mean delay of a transmission signal.

25. The computer program product of claim 23, wherein an arrival time of a received packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of a received signal, 90% of total power of a received signal, or a mean delay of a received signal.

26. The computer program product of claim 21, wherein the first node is a network coordinator.

27. The computer program product of claim 21, wherein the second node is a new node and the functions are performed as part of admission of the second node to the communication network.

28. The computer program product of claim 21, wherein the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times are performed periodically to maintain synchronization between the first and second nodes.

29. The computer program product of claim 21, wherein the communication network is a mesh network.

30. The computer program product of claim 21, wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard.

31. A network interface module, comprising:  
a controller;  
memory coupled to the controller;  
computer executable program code on a computer readable medium configured to cause the controller to perform the functions of:  
exchanging local clock times between a first node and a second node over a network;  
performing a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes, wherein the ranging method results in an estimated propagation delay between the first and second nodes; and

adjusting the local clock times of the first and second nodes based on the estimated propagation delay, thereby resulting in a synchronized local clock time at the first and second nodes.

32. The network interface module of claim 31, wherein the computer executable program code is further configured to cause the controller to use the synchronized local clock time in subsequent packet transmissions between the first and second nodes.

33. The network interface module of claim 31, wherein the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times comprises:

transmitting from the first node and receiving at the second node a first packet, wherein the first packet comprises a first packet clock time comprising the local clock time of the first node at transmission time, and a scheduled arrival clock time;

setting the local clock time of the second node to the first packet clock time;

transmitting from the second node and receiving at the first node a second packet at the first scheduled arrival clock time, wherein the second packet is received by the first node at an actual arrival clock time;

calculating and storing the estimated propagation delay at the first node, wherein calculating the estimated propagation delay is based on the first scheduled arrival clock time and the first actual time;

transmitting from the first node and receiving at the second node a third packet, wherein the third packet comprises the estimated propagation delay; and

storing the estimated propagation delay at the second node.

34. The network interface module of claim 33, wherein a transmission time of a transmitted packet is measured at 90% of peak amplitude of a transmission signal, 90%

of peak power of a transmission signal, 90% of total power of a transmission signal, or a mean delay of a transmission signal.

35. The network interface module of claim 33, wherein an arrival time of a received packet is measured at 90% of peak amplitude of a received signal, 90% of peak power of a received signal, 90% of total power of a received signal, or a mean delay of a received signal.

36. The network interface module of claim 31, wherein the first node is a network coordinator.

37. The network interface module of claim 31, wherein the second node is a new node and the functions are performed as part of admission of the second node to the communication network.

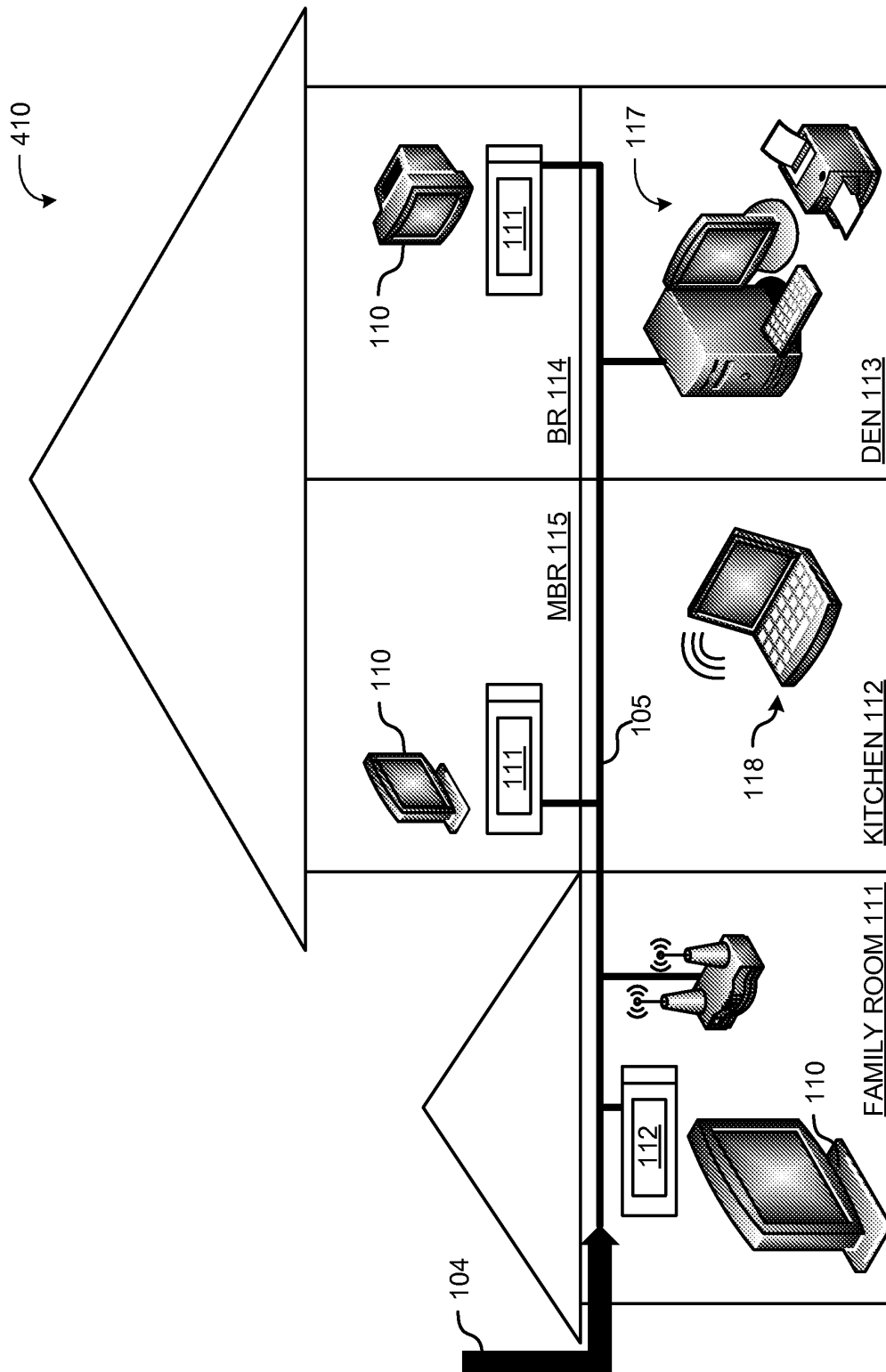
38. The network interface module of claim 31, wherein the functions of exchanging local clock times, performing the ranging method, and adjusting the local clock times are performed periodically to maintain synchronization between the first and second nodes.

39. The network interface module of claim 31, wherein the communication network is a mesh network.

40. The network interface module of claim 31, wherein the communication network operates in accordance with a Multimedia over Coax Alliance (MoCA) standard.

**Abstract of the Disclosure**

According to various embodiments of the disclosure, systems, methods and apparatuses are provided for using ranging to improve network efficiency. In particular, various embodiments of the disclosure provide ranging to improve local clock time synchronization. According to one embodiment, a method for synchronizing a plurality of nodes on a communication network is provided, comprising: exchanging local clock times between a first node and a second node over the communication network; performing a ranging method between the first and second nodes based on the local clock times exchanged between the first and second nodes, wherein the ranging method results in an estimated propagation delay between the first and second nodes; and adjusting the local clock times of the first and second nodes based on the estimated propagation delay, thereby resulting in a synchronized local clock time at the first and second nodes.



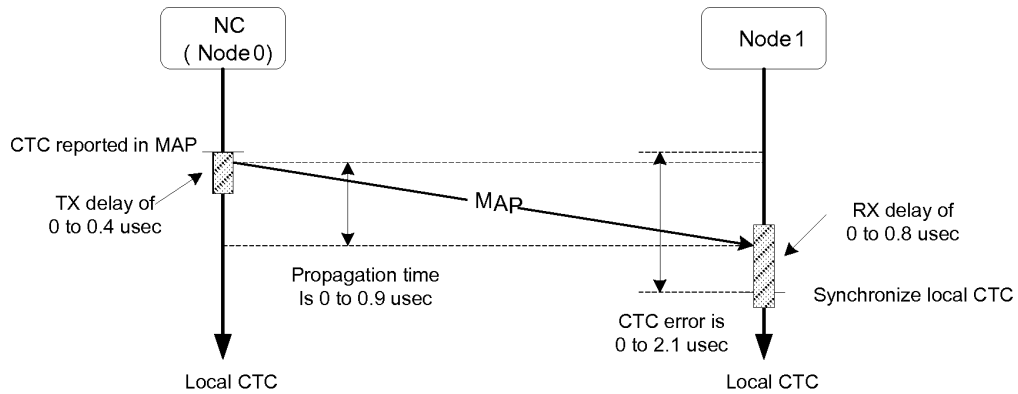


**FIG. 2**  
**(Prior Art)**

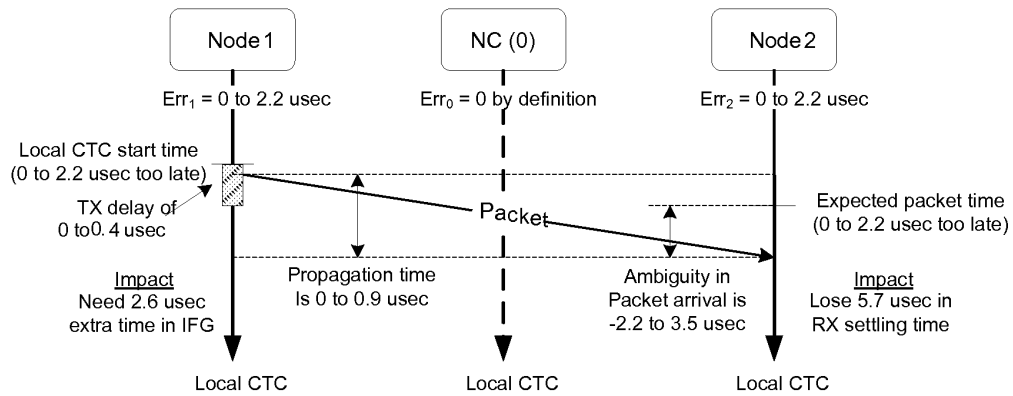


**FIG. 3**  
**(Prior Art)**

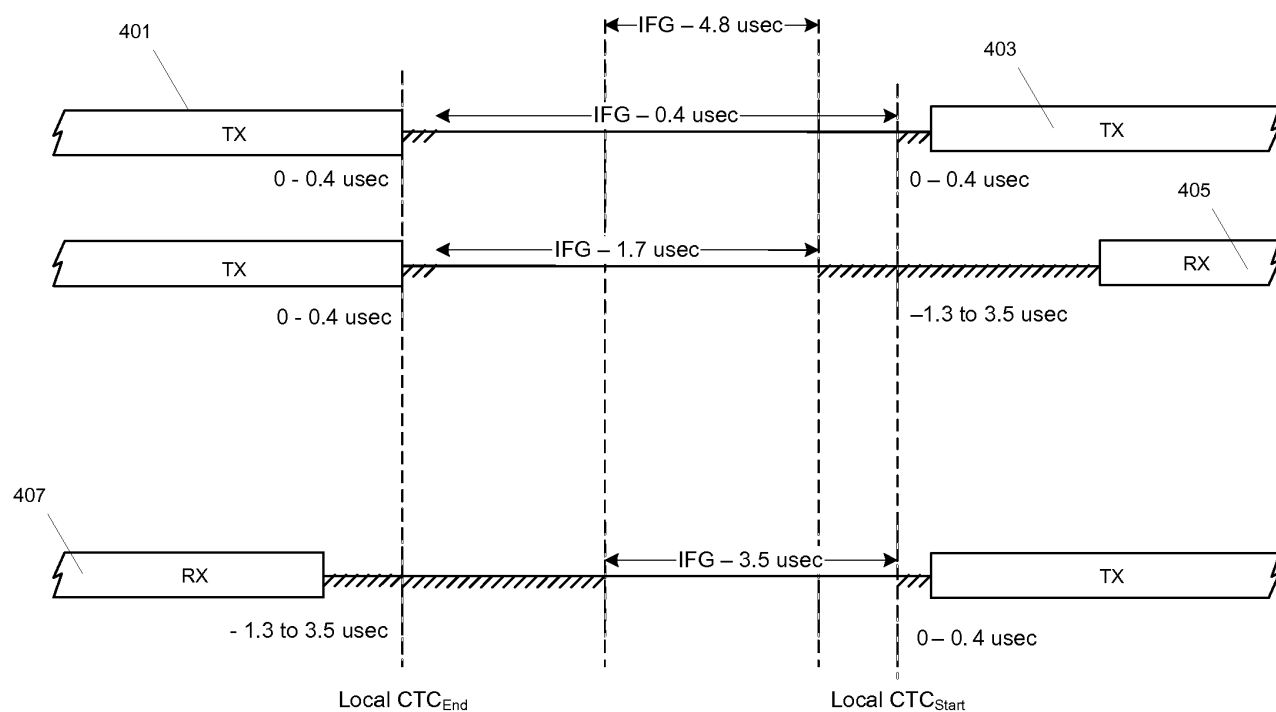


**FIG. 4**  
**(Prior Art)**

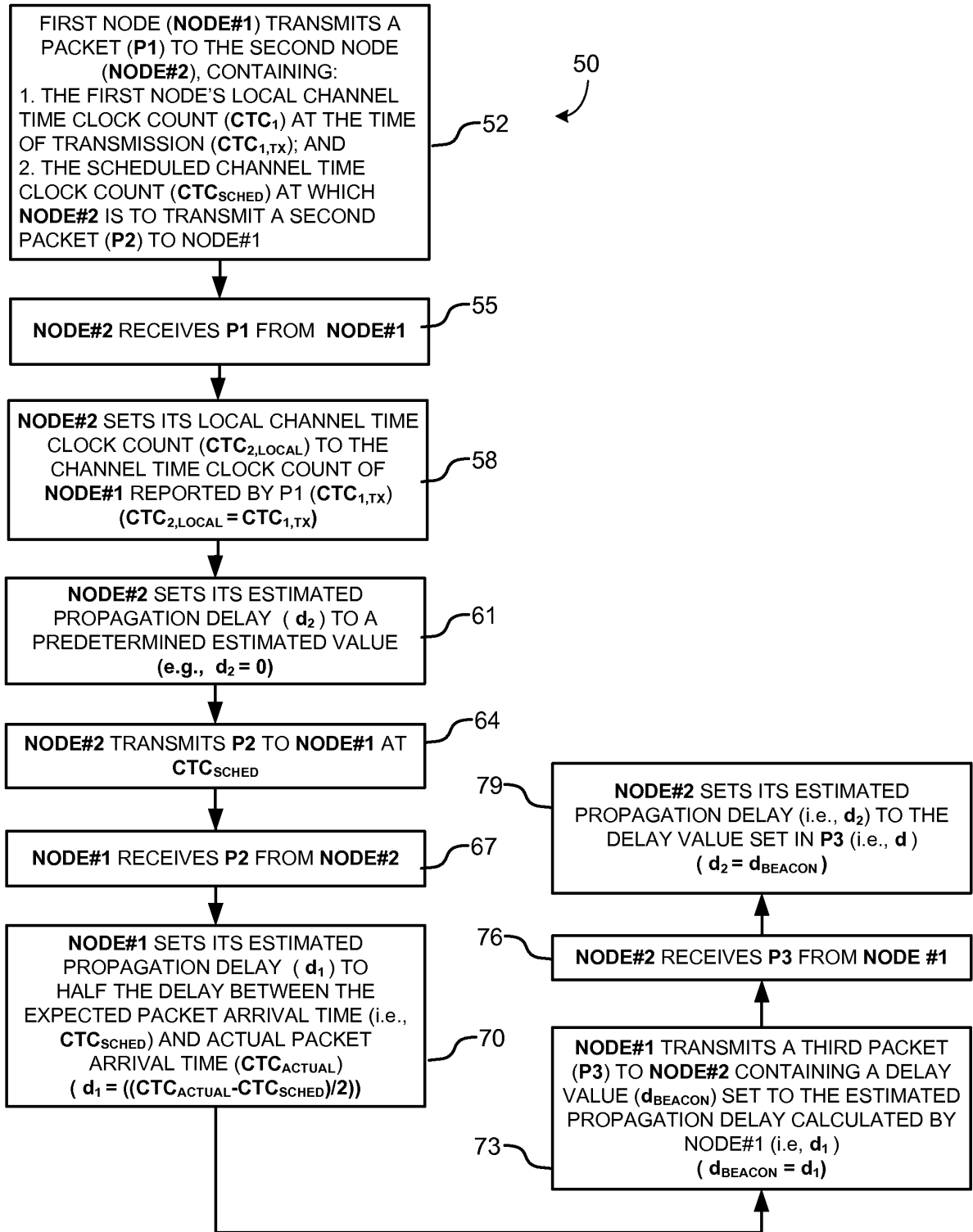


FIG. 5

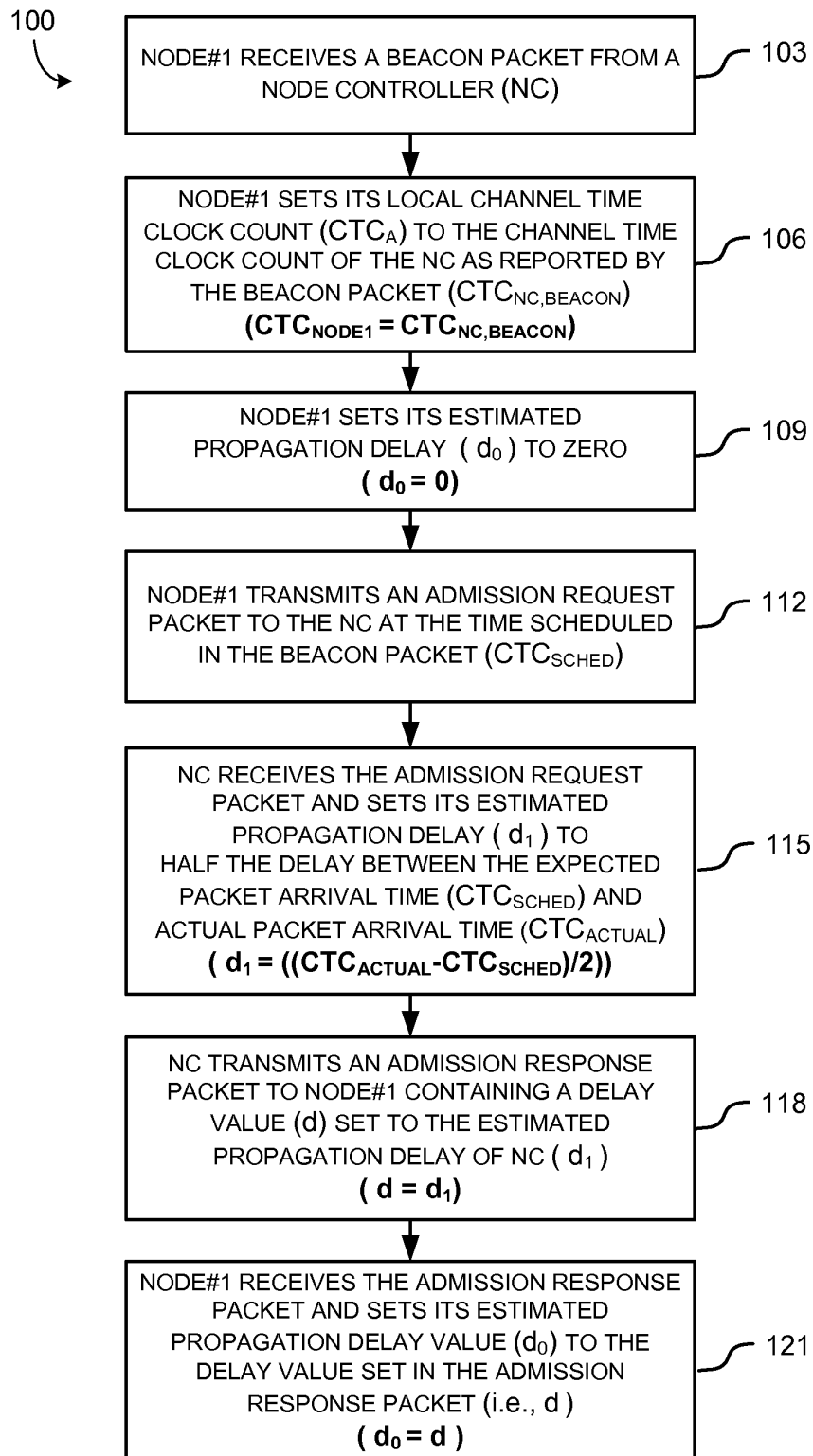


FIG. 6

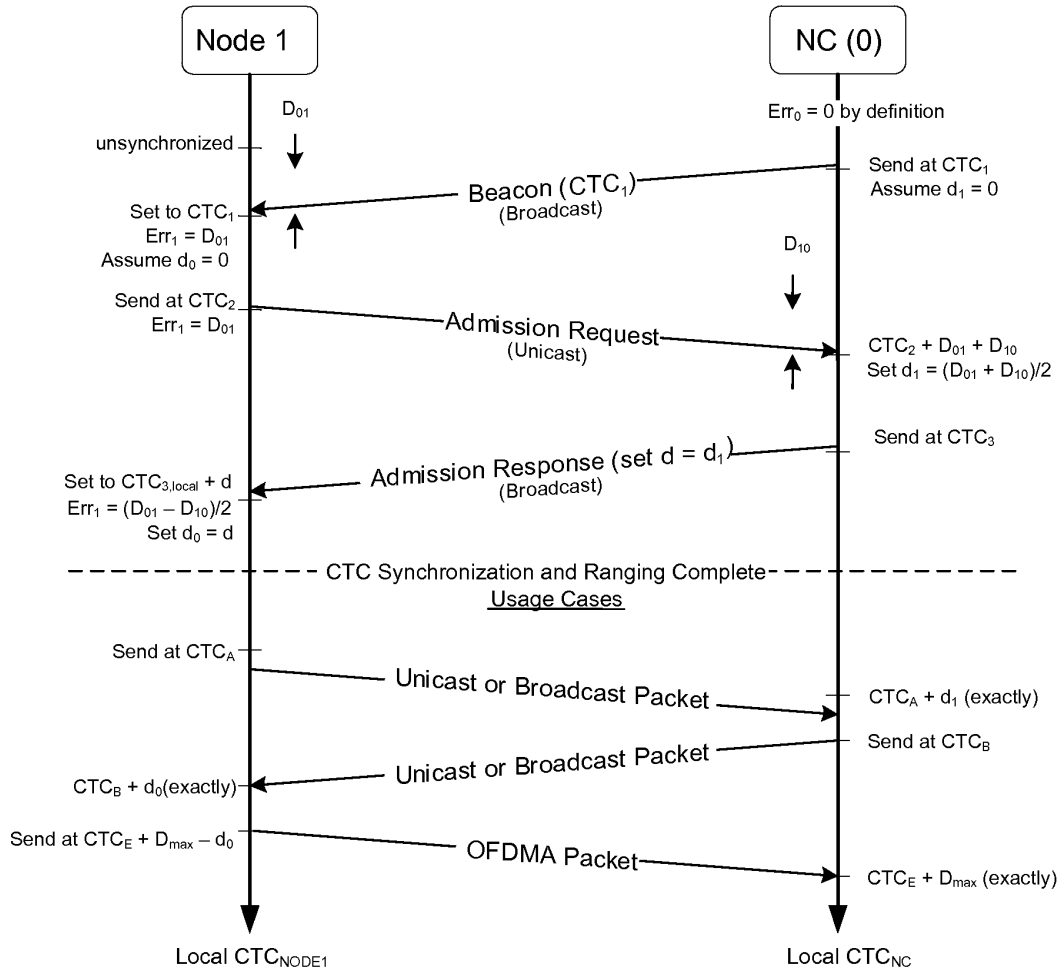


FIG. 7

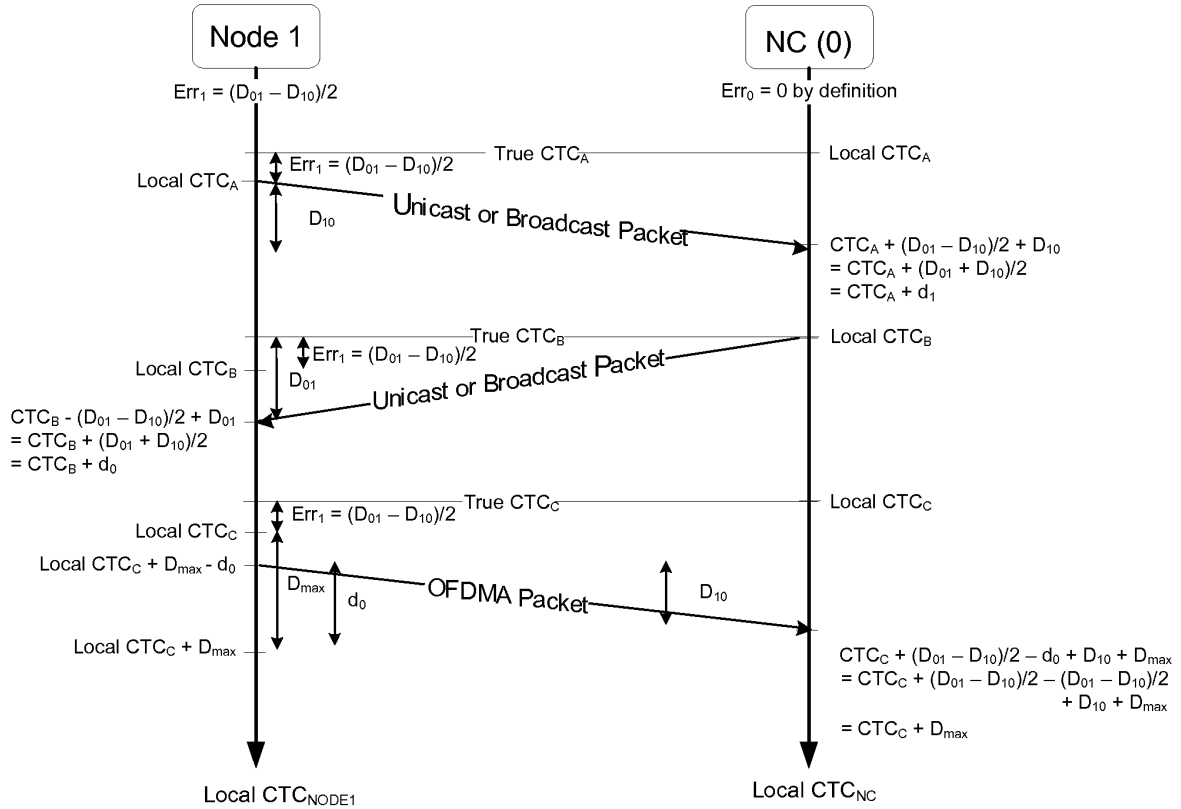


FIG. 8

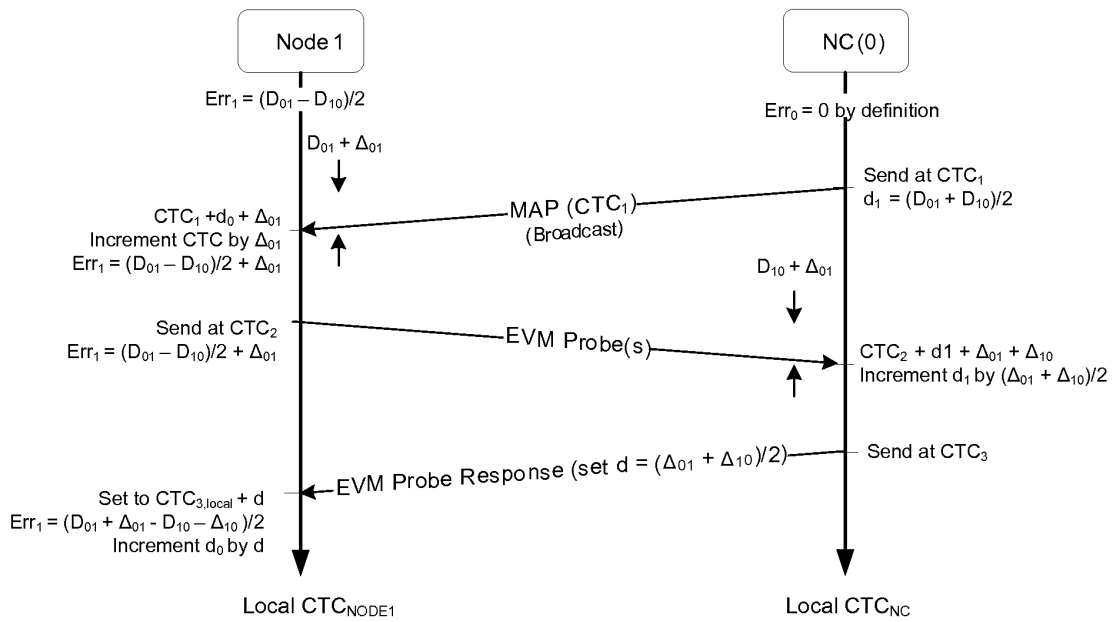


FIG. 9

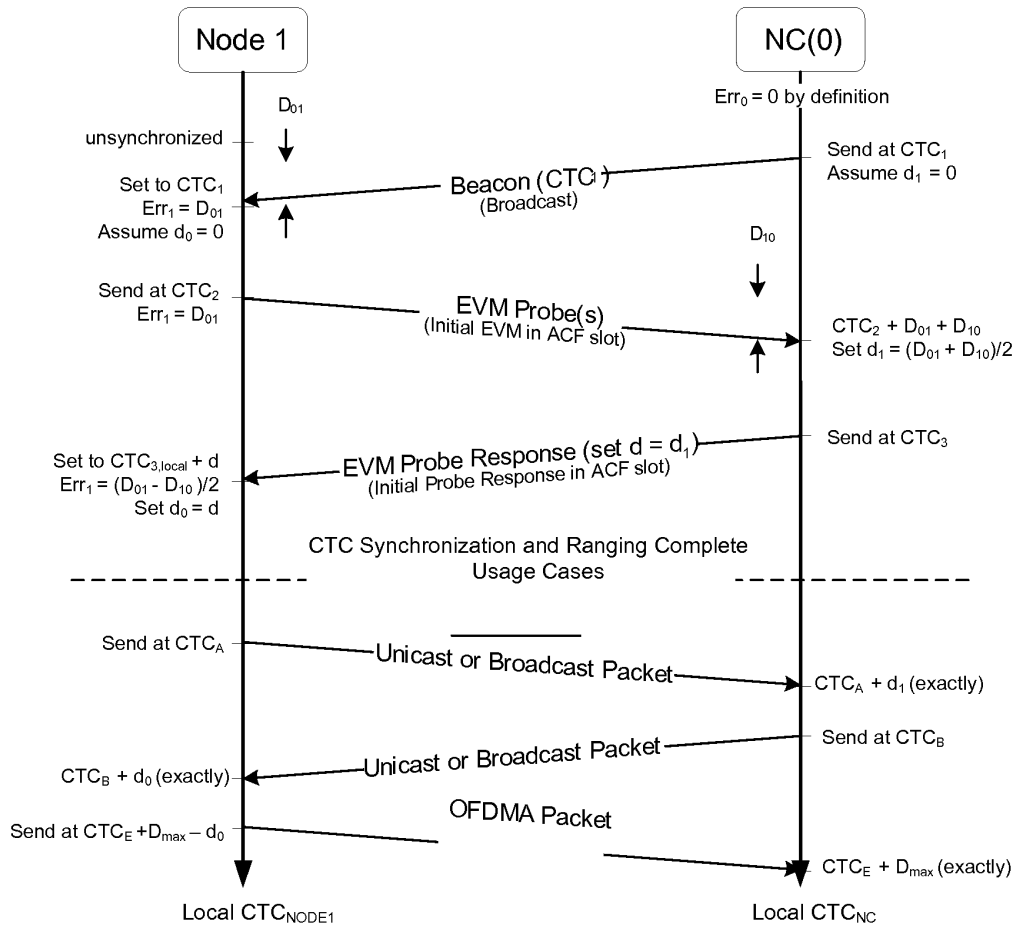


FIG. 10

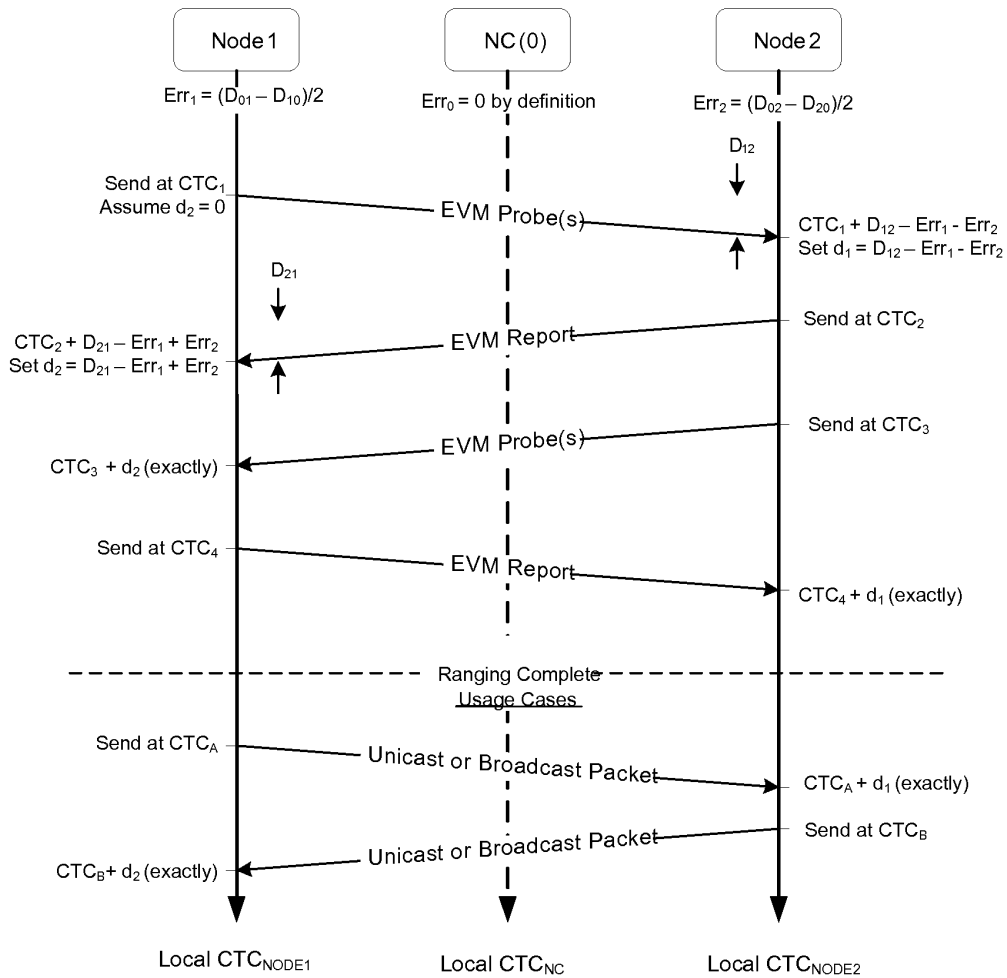


**FIG. 11**

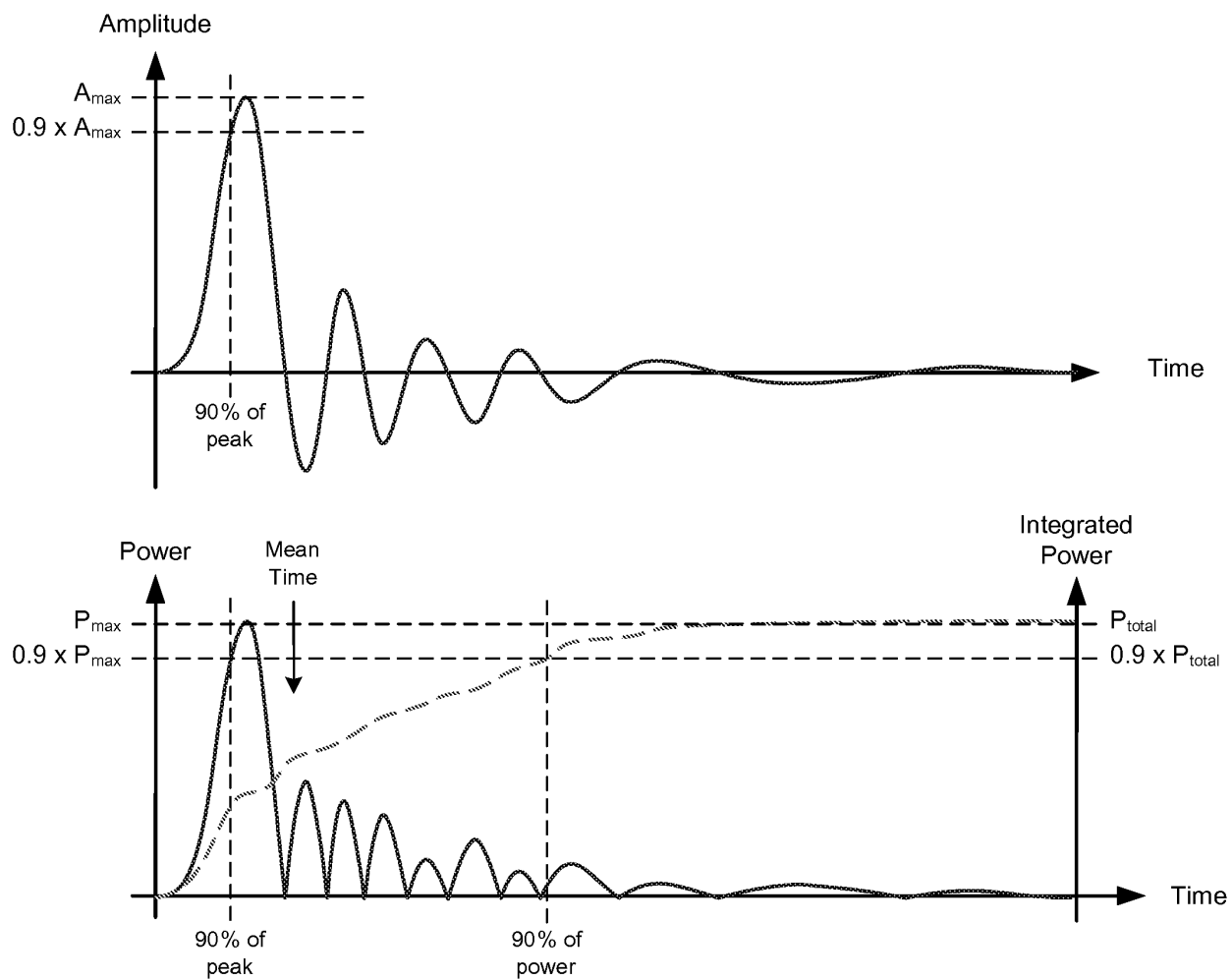


FIG. 12

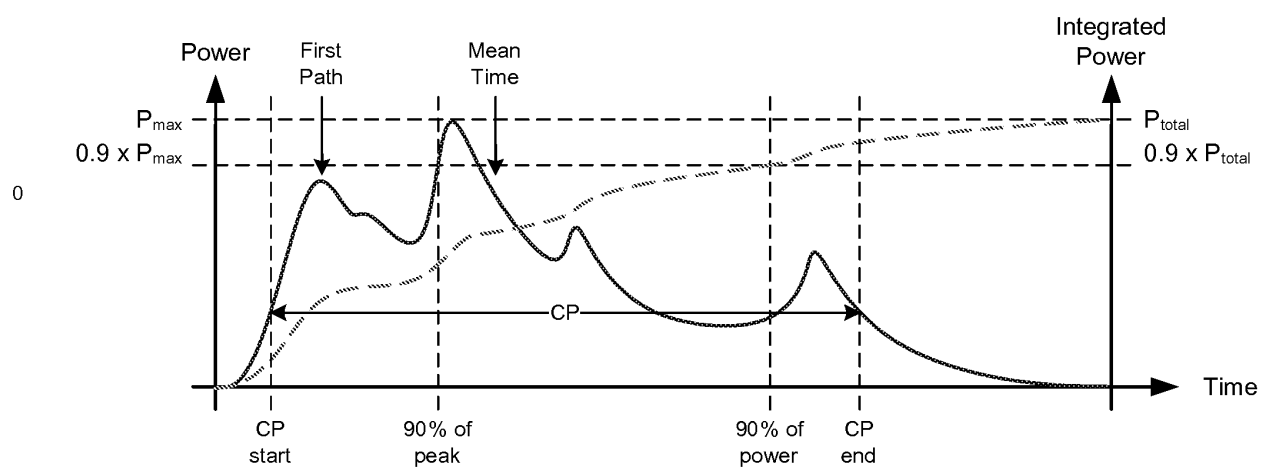


FIG. 13

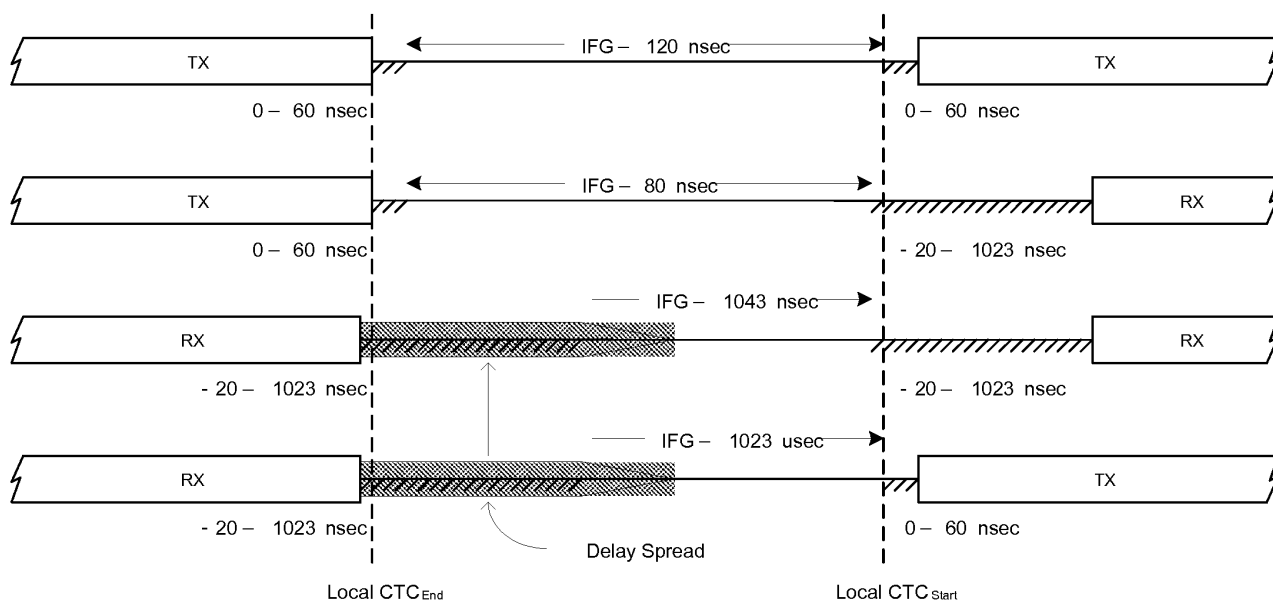


FIG. 14

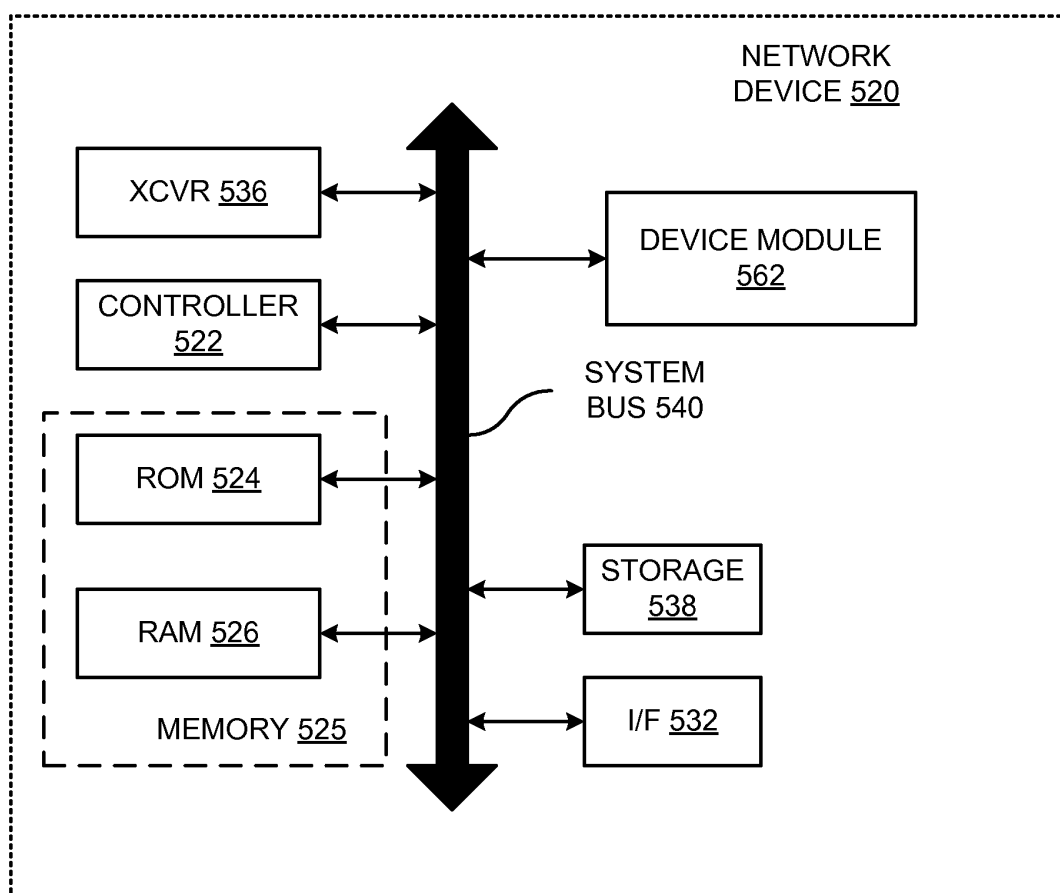


FIG. 15

## COMBINED DECLARATION / POWER OF ATTORNEY

AS BELOW NAMED INVENTOR, I HEREBY DECLARE THAT: This Declaration is of the following type:

☒ Original
 ☐ Supplemental
 ☐ Continuation-In-Part
 ☐ Divisional  
☐ Continuation
 ☐ National Stage of PCT

My residence, post office address and citizenship are as stated below next to my name: I believe I am an original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention **Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network**. The specification of which:

☐ is attached hereto.  
☒ was filed on October 15, 2009 as Serial No. \_\_\_\_\_  
☐ was amended on \_\_\_\_\_ (if applicable).  
☐ was described and claimed in PCT International Application No. \_\_\_\_\_ filed on \_\_\_\_\_ and as amended under PCT Article 19 on \_\_\_\_\_.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Sec. 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, Sec. 119 of any foreign application(s) for patent or inventor's certificate or of any PCT International application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT International application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

|           |                   |                        | Priority Claimed |      |
|-----------|-------------------|------------------------|------------------|------|
| (Country) | (Application No.) | (Day/Month/Year/Filed) | (Yes)            | (No) |

I hereby claim the benefit under Title 35 USC 119(e) of any United States provisional application(s) listed below:

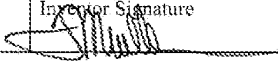
|                            |                                   |
|----------------------------|-----------------------------------|
| 61/105,942<br>(Serial No.) | October 16, 2008<br>(Filing Date) |
| 61/144,061<br>(Serial No.) | January 12, 2009<br>(Filing Date) |
| 61/144,676<br>(Serial No.) | January 14, 2009<br>(Filing Date) |

I hereby claim the benefit under Title 35 USC 120 of the United States application(s) listed below, and insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35 USC 112, I acknowledge the duty to disclose material information as defined in Title 37 CFR 1.56(a) which occurred between the filing date of the prior application and the national or PCT International filing date of this application:

| (Serial No.) | (Filing Date) | (Status) |
|--------------|---------------|----------|
|--------------|---------------|----------|

I, the undersigned, hereby appoint the attorneys and/or agents associated with Customer No. 77330 to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith. Please direct all telephone calls to Tim Ellis at (858) 768-3835 and address all correspondence to: Entropic Communications, Inc., C/O Tim Ellis, 6290 Sequence Drive, San Diego, California 92121.

I, the undersigned, hereby declare under penalty of perjury that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

|                                                                   |                                                                                                           |                           |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------|
| Full Name of First or Joint Inventor<br><b>Arndt MUELLER</b>      | Inventor Signature<br> | Date<br><b>10/15/2009</b> |
| Residence<br><b>12631 La Tortola, San Diego, California 92129</b> | Citizenship<br><b>CA</b>                                                                                  |                           |
| Post Office Address                                               |                                                                                                           |                           |

| Electronic Patent Application Fee Transmittal  |          |                                                                                  |        |                      |
|------------------------------------------------|----------|----------------------------------------------------------------------------------|--------|----------------------|
| <b>Application Number:</b>                     |          |                                                                                  |        |                      |
| <b>Filing Date:</b>                            |          |                                                                                  |        |                      |
| <b>Title of Invention:</b>                     |          | Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network |        |                      |
| <b>First Named Inventor/Applicant Name:</b>    |          | Arndt MUELLER                                                                    |        |                      |
| <b>Filer:</b>                                  |          | Bruce Wayne Greenhaus/Tim Ellis                                                  |        |                      |
| <b>Attorney Docket Number:</b>                 |          | E080048USU1                                                                      |        |                      |
| Filed as Large Entity                          |          |                                                                                  |        |                      |
| <b>Utility under 35 USC 111(a) Filing Fees</b> |          |                                                                                  |        |                      |
| Description                                    | Fee Code | Quantity                                                                         | Amount | Sub-Total in USD(\$) |
| <b>Basic Filing:</b>                           |          |                                                                                  |        |                      |
| Utility application filing                     | 1011     | 1                                                                                | 330    | 330                  |
| Utility Search Fee                             | 1111     | 1                                                                                | 540    | 540                  |
| Utility Examination Fee                        | 1311     | 1                                                                                | 220    | 220                  |
| <b>Pages:</b>                                  |          |                                                                                  |        |                      |
| <b>Claims:</b>                                 |          |                                                                                  |        |                      |
| Claims in excess of 20                         | 1202     | 20                                                                               | 52     | 1040                 |
| Independent claims in excess of 3              | 1201     | 1                                                                                | 220    | 220                  |
| <b>Miscellaneous-Filing:</b>                   |          |                                                                                  |        |                      |

| Description                              | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|------------------------------------------|----------|----------|--------|----------------------|
| <b>Petition:</b>                         |          |          |        |                      |
| <b>Patent-Appeals-and-Interference:</b>  |          |          |        |                      |
| <b>Post-Allowance-and-Post-Issuance:</b> |          |          |        |                      |
| <b>Extension-of-Time:</b>                |          |          |        |                      |
| <b>Miscellaneous:</b>                    |          |          |        |                      |
| <b>Total in USD (\$)</b>                 |          |          |        | <b>2350</b>          |

| Electronic Acknowledgement Receipt          |                                                                                  |
|---------------------------------------------|----------------------------------------------------------------------------------|
| <b>EFS ID:</b>                              | 6272500                                                                          |
| <b>Application Number:</b>                  | 12580127                                                                         |
| <b>International Application Number:</b>    |                                                                                  |
| <b>Confirmation Number:</b>                 | 9702                                                                             |
| <b>Title of Invention:</b>                  | Method and Apparatus for Using Ranging Measurements in a Multimedia Home Network |
| <b>First Named Inventor/Applicant Name:</b> | Arndt MUELLER                                                                    |
| <b>Customer Number:</b>                     | 77330                                                                            |
| <b>Filer:</b>                               | Bruce Wayne Greenhaus/Tim Ellis                                                  |
| <b>Filer Authorized By:</b>                 | Bruce Wayne Greenhaus                                                            |
| <b>Attorney Docket Number:</b>              | E080048USU1                                                                      |
| <b>Receipt Date:</b>                        | 15-OCT-2009                                                                      |
| <b>Filing Date:</b>                         |                                                                                  |
| <b>Time Stamp:</b>                          | 18:39:30                                                                         |
| <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                                                                                                                                                                                                                                                                                                                                                 | \$2350          |
| RAM confirmation Number                                                                                                                                                                                                                                                                                                                                                                  | 4696            |
| Deposit Account                                                                                                                                                                                                                                                                                                                                                                          | 504613          |
| Authorized User                                                                                                                                                                                                                                                                                                                                                                          |                 |
| <p>The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:</p> <p>Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)</p> <p>Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)</p> |                 |

| Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)           |                                                            |                                            |                                          |                  |                  |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------|------------------------------------------|------------------|------------------|
| Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges) |                                                            |                                            |                                          |                  |                  |
| <b>File Listing:</b>                                                                              |                                                            |                                            |                                          |                  |                  |
| Document Number                                                                                   | Document Description                                       | File Name                                  | File Size(Bytes)/<br>Message Digest      | Multi Part /.zip | Pages (if appl.) |
| 1                                                                                                 | Application Data Sheet                                     | E080048USU1_App-Data-Sheet_10-15-09.pdf    | 1807308                                  | no               | 4                |
|                                                                                                   |                                                            |                                            | 0ab9e2069e3ba1490036b1913a187a45bf810035 |                  |                  |
| <b>Warnings:</b>                                                                                  |                                                            |                                            |                                          |                  |                  |
| <b>Information:</b>                                                                               |                                                            |                                            |                                          |                  |                  |
| 2                                                                                                 |                                                            | E080048USU1_App-as-Filed_10-15-09.pdf      | 229482                                   | yes              | 39               |
|                                                                                                   |                                                            |                                            | 1391995dad595f496fc52747898f982a702f55ca |                  |                  |
|                                                                                                   | <b>Multipart Description/PDF files in .zip description</b> |                                            |                                          |                  |                  |
|                                                                                                   | <b>Document Description</b>                                |                                            | <b>Start</b>                             | <b>End</b>       |                  |
|                                                                                                   | Specification                                              |                                            | 1                                        | 29               |                  |
|                                                                                                   | Claims                                                     |                                            | 30                                       | 38               |                  |
|                                                                                                   | Abstract                                                   |                                            | 39                                       | 39               |                  |
| <b>Warnings:</b>                                                                                  |                                                            |                                            |                                          |                  |                  |
| <b>Information:</b>                                                                               |                                                            |                                            |                                          |                  |                  |
| 3                                                                                                 | Drawings-only black and white line drawings                | E080048USU1_Drwgs-as-Filed_10-15-09.pdf    | 331001                                   | no               | 14               |
|                                                                                                   |                                                            |                                            | c2aa4b9bf387a748c45a4548c4e95fac89ed60d  |                  |                  |
| <b>Warnings:</b>                                                                                  |                                                            |                                            |                                          |                  |                  |
| <b>Information:</b>                                                                               |                                                            |                                            |                                          |                  |                  |
| 4                                                                                                 | Oath or Declaration filed                                  | E080048USU1_Combined-Decl-PoA_10-15-09.pdf | 491471                                   | no               | 1                |
|                                                                                                   |                                                            |                                            | fa20702f4c714c6515db04337308a58372acfd67 |                  |                  |
| <b>Warnings:</b>                                                                                  |                                                            |                                            |                                          |                  |                  |
| <b>Information:</b>                                                                               |                                                            |                                            |                                          |                  |                  |
| 5                                                                                                 | Fee Worksheet (PTO-875)                                    | fee-info.pdf                               | 37674                                    | no               | 2                |
|                                                                                                   |                                                            |                                            | bfc8742c4891c7bf2f842703a1251515c2137461 |                  |                  |
| <b>Warnings:</b>                                                                                  |                                                            |                                            |                                          |                  |                  |
| <b>Information:</b>                                                                               |                                                            |                                            |                                          |                  |                  |
| <b>Total Files Size (in bytes):</b>                                                               |                                                            |                                            | 2896936                                  |                  |                  |

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.

## **SCORE Placeholder Sheet for IFW Content**

Application Number: 12580127 Document Date: 10/15/2009

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

- Drawings – Other than Black and White Line Drawings

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

To access the documents in the SCORE database, refer to instructions developed by SIRA.

At the time of document entry (noted above):

- Examiners may access SCORE content via the eDAN interface.
- Other USPTO employees can bookmark the current SCORE URL (<http://es/ScoreAccessWeb/>).
- External customers may access SCORE content via the Public and Private PAIR interfaces.

Form Revision Date: February 8, 2006

Filing Date: 10/15/09

Approved for use through 7/31/2006. OMB 0651-0032

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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.

| PATENT APPLICATION FEE DETERMINATION RECORD<br>Substitute for Form PTO-875                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                      |                                    |               |              | Application or Docket Number<br><b>12/580,127</b> |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------|--------------|---------------------------------------------------|-----------|
| <b>APPLICATION AS FILED – PART I</b>                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                      |                                    |               |              |                                                   |           |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                      | (Column 2)                         |               | SMALL ENTITY |                                                   | OR        |
| 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                                               | 330       |
| SEARCH FEE<br>(37 CFR 1.16(k), (l), or (m))                                                                                                                                                                                                                                                                                                                                                                       | N/A                                                                                                                                                                                                                  | N/A                                | N/A           |              | N/A                                               | 540       |
| EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q))                                                                                                                                                                                                                                                                                                                                                                  | N/A                                                                                                                                                                                                                  | N/A                                | N/A           |              | N/A                                               | 220       |
| TOTAL CLAIMS<br>(37 CFR 1.16(i))                                                                                                                                                                                                                                                                                                                                                                                  | 40                                                                                                                                                                                                                   | minus 20 = 20                      | x\$26         |              | x\$52                                             | 1040      |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h))                                                                                                                                                                                                                                                                                                                                                                            | 4                                                                                                                                                                                                                    | minus 3 = 1                        | x\$110        |              | x\$220                                            | 220       |
| 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 \$270 (\$135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR |                                    |               |              |                                                   |           |
| MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                      |                                    | 195           |              | 390                                               |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                      |                                    | TOTAL         |              | TOTAL                                             | 2350      |
| * If the difference in column 1 is less than zero, enter "0" in column 2.                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                      |                                    |               |              |                                                   |           |
| <b>APPLICATION AS AMENDED – PART II</b>                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                      |                                    |               |              |                                                   |           |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                      | (Column 2)                         |               | (Column 3)   |                                                   |           |
| AMENDMENT A                                                                                                                                                                                                                                                                                                                                                                                                       | CLAIMS REMAINING AFTER AMENDMENT                                                                                                                                                                                     | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | SMALL ENTITY |                                                   | OR        |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Total<br>(37 CFR 1.16(i))                                                                                                                                                                                            | Minus **                           | =             | RATE (\$)    | ADDITIONAL FEE (\$)                               | RATE (\$) |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Independent<br>(37 CFR 1.16(h))                                                                                                                                                                                      | Minus ***                          | =             | X =          |                                                   | X =       |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Application Size Fee (37 CFR 1.16(s))                                                                                                                                                                                |                                    |               | X =          |                                                   | X =       |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))                                                                                                                                                      |                                    |               | N/A          |                                                   | N/A       |
|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                      |                                    | TOTAL         |              | TOTAL                                             |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                      |                                    | ADD'T FEE     |              | ADD'T FEE                                         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                      |                                    |               |              |                                                   |           |
| AMENDMENT B                                                                                                                                                                                                                                                                                                                                                                                                       | CLAIMS REMAINING AFTER AMENDMENT                                                                                                                                                                                     | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | SMALL ENTITY |                                                   | OR        |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Total<br>(37 CFR 1.16(i))                                                                                                                                                                                            | Minus **                           | =             | RATE (\$)    | ADDITIONAL FEE (\$)                               | RATE (\$) |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Independent<br>(37 CFR 1.16(h))                                                                                                                                                                                      | Minus ***                          | =             | X =          |                                                   | X =       |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Application Size Fee (37 CFR 1.16(s))                                                                                                                                                                                |                                    |               | X =          |                                                   | X =       |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))                                                                                                                                                      |                                    |               | N/A          |                                                   | N/A       |
|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                      |                                    | TOTAL         |              | TOTAL                                             |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                      |                                    | ADD'T FEE     |              | ADD'T 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 number found in the appropriate box in column 1. |                                                                                                                                                                                                                      |                                    |               |              |                                                   |           |

This collection of information is required by 37 CFR 1.16. 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, 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.