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United States Patent and Trademark Office
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/159,753	03/27/2012	8144717	263935	1409

23460 7590 03/07/2012
LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6731

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 784 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):

Marinus Johannes Blange, Nootdorp, NETHERLANDS;
Miodrag Djurica, Rotterdam, NETHERLANDS;

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23460 7590 11/23/2011
LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6731

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/159,753	12/02/2008	Marinus Johannes Blange	263935	1409

TITLE OF INVENTION: INITIALIZATION OF A WIRELESS COMMUNICATION 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	02/23/2012

EXAMINER	ART UNIT	CLASS-SUBCLASS
REGO, DOMINIC E	2618	370-402000

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.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Leydig, Voit & Mayer Ltd.

2 _____

3 _____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

Nederlandse Organisatie Voor Toegepast-natuurwetenschappelijk Onderzoek TNO

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

Delft, Netherlands

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

4a. The following fee(s) are submitted:

- ☒ Issue Fee
- ☒ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 121216 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ 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).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date February 17, 2012

Typed or printed name

Mark Joy

Registration No. 35,562

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.

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.

Electronic Patent Application Fee Transmittal

Application Number:	12159753			
Filing Date:	02-Dec-2008			
Title of Invention:	INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK			
First Named Inventor/Applicant Name:	Marinus Johannes Blange			
Filer:	Mark Joy			
Attorney Docket Number:	263935			
Filed as Large Entity				
U.S. National Stage under 35 USC 371 Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl issue fee	1501	1	1740	1740
Publ. Fee- early, voluntary, or normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				2040

Electronic Acknowledgement Receipt

EFS ID:	12102729
Application Number:	12159753
International Application Number:	
Confirmation Number:	1409
Title of Invention:	INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK
First Named Inventor/Applicant Name:	Marinus Johannes Blange
Customer Number:	23460
Filer:	Mark Joy
Filer Authorized By:	
Attorney Docket Number:	263935
Receipt Date:	17-FEB-2012
Filing Date:	02-DEC-2008
Time Stamp:	13:36:09
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 2040
RAM confirmation Number	11171
Deposit Account	121216
Authorized User	

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

Charge any Additional Fees required under 37 C.F.R. 1.492 (National application filing, search, and examination fees)

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

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	263935iffee_001.pdf	102367 9d7ddf2fd5dfd6896b7e62bc6971a675ad2db162	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32253 5c3efa8ad354f6de237ffb863a6688f1b4e5823b	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			134620		
<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><u>New Applications Under 35 U.S.C. 111</u> 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><u>National Stage of an International Application under 35 U.S.C. 371</u> 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><u>New International Application Filed with the USPTO as a Receiving Office</u> 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>					



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www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

23460 7590 11/23/2011
LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6731

EXAMINER

REGO, DOMINIC E

ART UNIT

PAPER NUMBER

2618

DATE MAILED: 11/23/2011

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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12/159,753

12/02/2008

Marinus Johannes Blange

263935

1409

TITLE OF INVENTION: INITIALIZATION OF A WIRELESS COMMUNICATION 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	02/23/2012

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

23460 7590 11/23/2011
LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6731

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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12/159,753 12/02/2008 Marinus Johannes Blange 263935 1409

TITLE OF INVENTION: INITIALIZATION OF A WIRELESS COMMUNICATION 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 02/23/2012

EXAMINER	ART UNIT	CLASS-SUBCLASS
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REGO, DOMINIC E 2618 370-402000

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.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
3 _____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

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

4a. The following fee(s) are submitted:

- ☐ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s); (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ 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).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

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.
12/159,753	12/02/2008	Marinus Johannes Blange	263935	1409

23460 7590 11/23/2011
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CHICAGO, IL 60601-6731

EXAMINER

REGO, DOMINIC E

ART UNIT	PAPER NUMBER
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2618

DATE MAILED: 11/23/2011

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 575 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 575 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.
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.

Notice of Allowability	Application No.	Applicant(s)	
	12/159,753	BLANGE ET AL.	
	Examiner	Art Unit	
	DOMINIC E. REGO	2618	

-- 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 09/26/2011.
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 1-13 and 16-22.
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"> 1. ☒ Notice of References Cited (PTO-892) 2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 3. ☒ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date <u>07/14/2008</u> 4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material | <ol style="list-style-type: none"> 5. ☐ Notice of Informal Patent Application 6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date ____. 7. ☒ Examiner's Amendment/Comment 8. ☒ Examiner's Statement of Reasons for Allowance 9. ☐ Other ____. |
|---|---|

DETAILED ACTION

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

In the claims:

Claims 14-15 have been cancelled.

(End of Amendment).

Allowable Subject Matter

2. Claims 1-13 and 16-22 are allowed.

3. The following is an examiner's statement of reasons for allowance:

Regarding claims 1, 11, and 16, the prior art of record, specifically non-patent literature, Runin I et al: "TBONE: a mobile –backbone protocol for ad hoc wireless networks" teaches a wireless communication network that comprises an association unit and a plurality of stations, each station being configured to start up in a not-associated state and to transmit association request messages in the not-associated state, each station being configured to switch to an associated state upon reception of an

Art Unit: 2618

association grant in response to one of its association request messages, the association request message and/or the association grant in response thereto establishing an operating route associated with the station for exchanging operating messages with the association unit during subsequent operation, the operating route associated with the station running through a source of the association grant in response to said one of the association request messages (Paragraphs A.1 and A.1.3).

However, none of the prior art cited alone or in combination provides the motivation to teach if the source of the association grant is not the association unit, the operating route between the source of the association grant and the association unit previously established for the source of the association grant in response to association request messages and/or the association grants for intermediate stations, in which network the association unit is configured to transmit association grants as responses to received ones of the association request messages; at least part of the stations is configured to become active to transmit association grants as responses to received ones of the association request messages, but only after switching to the associated state upon an association grant from the association unit or one of the at least part of the stations switched to the associated state directly or indirectly based on an association grant from the association unit.

Dependent claims 2-10, 12-13, and 17-22 are allowed for the same reason.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kim et al. (US 2006/0133266), Barker, JR. (US 2003/0174682), Herz et al. (US 2001/0014868), Ehrlich et al. (US 2007/0038346), Wang et al. (US 2006/0268756), Sharma et al. (US 2006/0166683), Hayashi (US 2005/0221803), Dowling (US 2005/0195842), Olkkonen et al. (US 2005/0088980), Jose et al. (US 2004/0223476), Yoon et al. (US 2004/0047307), Cheng et al. (US Patent #8,045,531), Oba et al. (US Patent #7,548,526), Levendel et al. (US 2006/0133328).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DOMINIC E. REGO whose telephone number is (571)272-8132. The examiner can normally be reached on Monday-Friday, 9:00 am-5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duc M. Nguyen can be reached on 571-272-7503. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2618

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.

/DOMINIC E REGO/
Primary Examiner, Art Unit 2618
Tel 571-272-8132

Notice of References Cited	Application/Control No. 12/159,753		Applicant(s)/Patent Under Reexamination BLANGE ET AL.	
	Examiner DOMINIC E. REGO		Art Unit 2618	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2006/0133266	06-2006	Kim et al.	370/228
*	B	US-2003/0174682	09-2003	Barker, Charles R. JR.	370/338
*	C	US-2001/0014868	08-2001	HERZ et al.	705/14
*	D	US-2007/0038346	02-2007	Ehrlich et al.	701/033
*	E	US-2006/0268756	11-2006	Wang et al.	370/310
*	F	US-2006/0166683	07-2006	Sharma et al.	455/456.5
*	G	US-2005/0221803	10-2005	Hayashi, Keichi	455/413
*	H	US-2005/0195842	09-2005	Dowling, Eric Morgan	370/401
*	I	US-2005/0088980	04-2005	Olkkonen et al.	370/255
*	J	US-2004/0223476	11-2004	Jose et al.	370/338
*	K	US-2004/0047307	03-2004	Yoon et al.	370/324
*	L	US-8,045,531	10-2011	Cheng et al.	370/338
*	M	US-7,823,199	10-2010	Rathi et al.	726/22

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 12/159,753		Applicant(s)/Patent Under Reexamination BLANGE ET AL.	
	Examiner DOMINIC E. REGO		Art Unit 2618	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-7,548,523	06-2009	Babbar et al.	370/331
*	B	US-2006/0133328	06-2006	Levendel et al.	370/338
	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 Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	125066	associat\$3 near2 (stage state mode)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:10
L4	106	(non\$associat\$3 not\$associat\$3 no\$2associat\$3) near2 (state mode stage)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:10
L5	99	L3 same L4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:10
L6	0	(ad\$hoc ad adj hoc cluster) same 5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:11
L11	3	5 same (cluster hop route)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:17
L12	3925	(non\$associat\$3 not\$associat\$3 no\$2associat\$3) same associat\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:20
L13	53	12 same (cluster ad\$hoc ad adj2 hoc pico\$net intra\$cell)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:22
L14	4	13 same route	US-	OR	ON	2011/11/14

			PGPUB; USPAT; USOCR; FPRS; EPO; JPO			16:22
L15	37	13 and (@ad <= "20051230" @rlad <= "20051230" @pd <= "20051230")	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:23
L16	185091	"455"/\$.ccls.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:26
L17	186633	"370"/\$.ccls.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:27
L18	350040	16 or 17	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:27
L19	53	12 same (cluster ad\$hoc ad adj2 hoc pico\$net intra\$cell blue\$tooth)	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:27
L20	298	12 and 18	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:28
L21	105	20 and (cluster ad\$hoc ad adj2 hoc pico\$net intra\$cell blue\$tooth)	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 16:28
L22	65	21 and (@ad <= "20051230" @rlad <= "20051230" @pd <= "20051230")	US- PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2011/11/14 16:29

			JPO			
L23	373	((non\$associat\$3 not\$associat\$3 no\$2associat\$3) same (associat\$3 join\$3)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 17:19
L24	38	23 and 18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 17:19
L25	21	24 and (@ad <= "20051230" @rlad <= "20051230" @pd <= "20051230")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 17:19
L28	277	stor\$3 with associat\$3 with route with transmi\$6 near3 (data messag\$3 information)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 17:52
L29	1	28 same (non\$associat\$3 not\$associat\$3 no\$2associat\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 17:54
L30	46175	stor\$3 same associat\$3 same rout\$3 same (data messag\$3 information)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 17:54
L31	10	30 same (non\$associat\$3 not\$associat\$3 no\$2associat\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 17:55
L32	9	31 and (@ad <= "20051230" @rlad <= "20051230" @pd <= "20051230")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 17:55
L33	70	((hop\$count\$3 hop near count\$3) same network same (non\$associat\$3 not\$associat\$3 no\$2associat\$3 \$5associat\$3)).clm.	US-PGPUB; USPAT; USOCR;	OR	ON	2011/11/14 18:02

			FPRS; EPO; JPO			
L34	32	((hop\$count\$3 hop near count\$3) same network same (non\$associat\$3 not\$associat\$3 no\$2associat\$3 \$5associat\$3) same rout\$3).clm.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 18:03
L35	25	34 and (@ad <= "20051230" @rlad <= "20051230" @pd <= "20051230")	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 18:03
L36	0	((hop\$count\$3 hop near count\$3) same network same (non\$associat\$3 not\$associat\$3 no\$2associat\$3) same (join\$3 associat\$3) same rout\$3).clm.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 18:07
L37	3	(network same (non\$associat\$3 not\$associat\$3 no\$2associat\$3) same (join\$3 associat\$3) same rout\$3).clm.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 18:07
L38	9712	455/41.2,435.1,445.ccls.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 18:38
L39	39254	370/338,328,329,341,395.2,395.21,400-402,406.ccls.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 18:38
L40	47614	38 or 39	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 18:39
L41	7	23 and 40	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 18:39
L42	6	41 and (@ad <= "20051230" @rlad <= "20051230" @pd <= "20051230")	US- PGPUB;	OR	ON	2011/11/14 18:39

			USPAT; USOCR; FPRS; EPO; JPO			
S6	125066	associat\$3 near2 (stage state mode)	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:06
S7	106	(non\$associat\$3 not\$associat\$3 no\$2associat\$3) near2 (state mode stage)	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:07
S8	99	S6 same S7	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:07
S9	1	S8 same grant same request\$3	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:09
S10	1	S8 same grant	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:09
S11	8	S8 same request\$3	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:10
S14	125066	associat\$3 near2 (stage state mode)	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:54
S15	106	(non\$associat\$3 not\$associat\$3 no\$2associat\$3) near2 (state mode stage)	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:54

S16	99	S14 same S15	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:54
S17	8	S16 same request\$3	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:54
S18	4	S17 and (@ad <= "20051230" @rlad <= "20051230" @pd <= "20051230")	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:54

11/ 14/ 2011 11:20:31 PM
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Substitute for form 1449A/B/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	12/159,753
				Filing Date	June 30, 2008
				First Named Inventor	Marinus Johannes Blange
				Group Art Unit	Unassigned
Examiner Name	Unassigned				
Attorney Docket Number	263935				
Sheet	1	of	1		

U.S. PATENT DOCUMENTS						
Examiner Initials	Doc. No.	U.S. Patent Document		Name of Patentee or Applicant	Date of Publication	Filing Date If Appropriate
		Application or Patent Number	Kind Code			
	AA	US2005/0122927	A1	Wentink	06/09/2005	
	AB	US2003/0151513	A1	Herrmann et al.	08/14/2003	

FOREIGN PATENT DOCUMENTS								
Examiner Initials	Doc. No.	Foreign Patent Document			Name of Patentee or Applicant	Date of Publication	Translation	
		Office	Application or Patent Number	Kind Code			Yes	No**
	AC	EP	1 471 693	A2	Samsung Electronics Co., Ltd	10/27/2004		

OTHER - NON PATENT LITERATURE DOCUMENTS					
Examiner Initials	Doc. 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, page(s), volume-issue number (s), publisher, city and/or country where published.	Translation		
			Yes	No**	
	AD	Forno et al., "Design and implementation of a Bluetooth ad hoc network for indoor positioning" IEE Proceedings: Software, IEE, vol. 152, No. 5, 10/07/2005 pages 223-228			
	AE	Rubin et al., "TBONE: A Mobile-Backbone Protocol for Ad Hoc Wireless Networks" Aerospace Conference Proceedings, IEEE Mar 9-16, 2002. vol. 6, pages 2727-2740			
	AF	International Search Report for PCT/NL/2007/0000001, dated June 6, 2007			

Examiner Signature	/Dominic Rego/	Date Considered	11/14/2011
--------------------	----------------	-----------------	------------

* A concise statement of relevance is being submitted in lieu of a translation. 37 CFR 1.98(a)(3).

+ An English-language equivalent/patent, or an English-language abstract, or an English-language version of the search report or action by a foreign patent office in a counterpart foreign application indicating the degree of relevance found by the foreign office is being submitted in lieu of a concise explanation of relevance under 37 CFR 1.98(a)(3).

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.R./



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BIB DATA SHEET

CONFIRMATION NO. 1409

SERIAL NUMBER 12/159,753	FILING or 371(c) DATE 12/02/2008 RULE	CLASS 455	GROUP ART UNIT 2618	ATTORNEY DOCKET NO. 263935		
APPLICANTS Marinus Johannes Blange, Nootdorp, NETHERLANDS; Miodrag Djurica, Rotterdam, NETHERLANDS; ** CONTINUING DATA ***** This application is a 371 of PCT/NL2007/000001 01/02/2007 ** FOREIGN APPLICATIONS ***** EUROPEAN PATENT OFFICE (EPO) 05078044.4 12/30/2005 ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 05/15/2009						
Foreign Priority claimed ☒ Yes ☐ No 35 USC 119(a-d) conditions met ☒ Yes ☐ No Verified and Acknowledged <u>/DOMINIC E REGO/</u> Examiner's Signature		☐ Met after Allowance DR Initials	STATE OR COUNTRY NETHERLANDS	SHEETS DRAWINGS 3	TOTAL CLAIMS 22	INDEPENDENT CLAIMS 4
ADDRESS LEYDIG VOIT & MAYER, LTD TWO PRUDENTIAL PLAZA, SUITE 4900 180 NORTH STETSON AVENUE CHICAGO, IL 60601-6731 UNITED STATES						
TITLE INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK						
FILING FEE RECEIVED 1370	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S19	5	(marinus near2 johannes near2 blange).in. (miodrag near2 djurica).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:56
S20	12	((non\$associat\$3 not\$associat\$3 no\$2associat\$3) near2 (state mode stage) same associat\$3 near2 (stage state mode)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:57
S21	1	S19 and S20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 13:58
S22	434	(nederlandse near organisatie near voor near toegepast).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 14:00
S23	1	S20 and S22	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2011/11/14 14:00

11/ 14/ 2011 11:19:05 PM

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Search Notes 	Application/Control No. 12159753	Applicant(s)/Patent Under Reexamination BLANGE ET AL.
	Examiner DOMINIC E REGO	Art Unit 2618

SEARCHED			
Class	Subclass	Date	Examiner
455	41.2, 435.1, 445	11/14/2011	DR
370	338, 328, 329, 341, 395.2, 395.21, 400-402, 406	11/14/2011	DR

SEARCH NOTES		
Search Notes	Date	Examiner
EAST, Assignee, and Inventor Search	11/14/2011	DR

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner
	PGPUB Text Search-See Interference Search Printout	11/14/2011	DR

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application No. 12/159,753

Confirmation No. 1409

Applicant: Blange et al.

Filed: June 30, 2008

TC/AU: 2618

Examiner: Dominic E. Rego

Docket No.: 263935 (Client Reference No. LH/P74240US00)

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

RESPONSE TO RESTRICTION REQUIREMENT

In response to the Restriction Requirement dated October 31, 2011, please note the following election and consider the following remarks.

REMARKS begin on page 2 of this paper.

REMARKS

The Office Action sets forth a restriction requirement under 35 U.S.C. § 121. Specifically, the Office Action stated that this application contains the following inventions or groups of inventions which are distinct from the other.

Group I, claim(s) 1-13 and 15-22;

Group II, claim 14.

In response to the Office Action, applicants elect, without traverse, the claims of Group I, namely claims 1-13 and 15-22, for further prosecution in this application. Applicants, however, reserve the right to present the non-elected claims in this or any other appropriate application.

CONCLUSION

The application is now in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue.

If, in the opinion of the examiner, a telephone conference would expedite the prosecution of the subject application, the examiner is invited to call the undersigned attorney.

Respectfully submitted,



Mark Joy, Reg. No. 35,562
LEYDIG, VOIT & MAYER, LTD.
Two Prudential Plaza, Suite 4900
180 North Stetson Avenue
Chicago, Illinois 60601-6780
(312) 616-5600 (telephone)
(312) 616-5700 (facsimile)

Date: September 26, 2011

Electronic Acknowledgement Receipt

EFS ID:	11050310
Application Number:	12159753
International Application Number:	
Confirmation Number:	1409
Title of Invention:	INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK
First Named Inventor/Applicant Name:	Marinus Johannes Blange
Customer Number:	23460
Filer:	Mark Joy
Filer Authorized By:	
Attorney Docket Number:	263935
Receipt Date:	26-SEP-2011
Filing Date:	02-DEC-2008
Time Stamp:	16:04:31
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		263935ROARR.pdf	101592 <small>53d99ef14008444ef7bc00c5abcec450f39c327d</small>	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Miscellaneous Incoming Letter	1	1
	Response to Election / Restriction Filed	2	4
Warnings:			
Information:			
Total Files Size (in bytes):		101592	
<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><u>New Applications Under 35 U.S.C. 111</u> 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><u>National Stage of an International Application under 35 U.S.C. 371</u> 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><u>New International Application Filed with the USPTO as a Receiving Office</u> 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>			

Attorney Docket No. 263935
 Client Reference No. P74240US00
 Date: September 26, 2011

In re Application of: Blange et al.
 Application No. 12/159,753
 Confirmation No. 1409
 Filed: December 2, 2008

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

Sir:

Transmitted herewith is a reply to office action in the subject application.

- ☐ Small entity status is claimed for this application under 37 CFR 1.27.
- ☒ Petition for an extension of time for the period noted below, as well as for any additional period necessary to render the present submission timely. Please charge Deposit Account No. 12-1216 for the appropriate petition fee.
- ☐ Other:
- ☒ Please charge Deposit Account No. 12-1216 in the total amount indicated below.

					SMALL ENTITY		OTHER THAN A SMALL ENTITY		
TIME EXTENSION PETITION FEE			none		\$ 0.00		\$ 0.00		
subtract time extension fee previously paid			none		(\$ 0.00)		(\$ 0.00)		
CLAIM FEE		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	EXTRA CLAIMS PRESENT	RATE	ADD'L CLAIM FEE	RATE	ADD'L CLAIM FEE
TOTAL		22	MINUS	22	= 0	x 30 =	\$	x 60 =	\$0.00
INDEPENDENT		4	MINUS	4	= 0	x 125 =	\$	x 250 =	\$0.00
☐	FIRST PRESENTATION OF MULTIPLE CLAIM					+ 225 =	\$	+ 450 =	\$0.00
OTHER FEES AS DESCRIBED:						\$		\$0.00	
TOTAL AMOUNT TO BE CHARGED TO DEPOSIT ACCOUNT						TOTAL	\$	TOTAL	\$0.00

- ☒ The Commissioner is hereby authorized to charge any deficiencies in the following fees associated with this communication or credit any overpayment to Deposit Account No. 12-1216.
- ☒ Any filing fees under 37 CFR 1.16 for the presentation of extra claims.
- ☒ Any patent application processing fees under 37 CFR 1.17.

Respectfully submitted,

LEYDIG, VOIT & MAYER, LTD.
 Two Prudential Plaza, Suite 4900
 180 North Stetson Avenue
 Chicago, Illinois 60601-6731
 (312) 616-5600 (telephone)
 (312) 616-5700 (facsimile)

LEYDIG, VOIT & MAYER, LTD.

By

Mark Joy, Reg. No. 35,562



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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12/159,753

12/02/2008

Marinus Johannes Blange

263935

1409

23460

7590

08/31/2011

LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6731

EXAMINER

REGO, DOMINIC E

ART UNIT

PAPER NUMBER

2618

NOTIFICATION DATE

DELIVERY MODE

08/31/2011

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

Chgpatent@leydig.com

Office Action Summary	Application No. 12/159,753	Applicant(s) BLANGE ET AL.	
	Examiner DOMINIC E. REGO	Art Unit 2618	

-- 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 1 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 02 December 2008.
- 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) 1-22 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☐ Claim(s) ____ is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☒ Claim(s) 1-22 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 ____ 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) ☐ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413) |
| 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) ☐ Information Disclosure Statement(s) (PTO/SB/08) | 5) ☐ Notice of Informal Patent Application |
| Paper No(s)/Mail Date ____. | 6) ☐ Other: ____. |

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-13 and 15-22 drawn to a processor circuit being configured to start up in a not-associated state, a transmitter to transmit association message in the not-associated state, the processor circuit being configured to switch to an associated state upon reception at the receiver arrangement of an association grant in response to one of the association request messages, the processor circuit being configured to establish an associated route for communication with an association unit during subsequent communication of operating messages to an association unit, the associated route including a source of the association grant, and, if the source of the association grant is not the association unit, the operating route between the source of the association grant and the association unit previously established for the source of the association grant in response to association request messages and/or the association grants for intermediate stations, the processor circuit being configured to cause the transmitter arrangement to initiate and transmit association grants in response to association request messages, but only after switching to the associated state, classified in class 455, subclass 517.
 - II. Claim 14 drawn to a station comprising a first unit and a second unit, each of the first and second unit comprising a transmitter and a receiver, the first and

Art Unit: 2618

second unit being configured to operate concurrently in mutually different frequency channels, a processor circuit coupled to the transmitters and the receivers of the first and second unit, the processor circuit being configured to awaken the receiver of the first unit in first periodic time slots, and to awaken the receiver of the second periodic time slots, the first and second time-slots being mutually asynchronous, and to relay messages received in the first unit for transmission by the second unit and vice versa, classified in class 455, subclass 78.

2. The inventions are distinct, each from the other because of the following reasons:

Subcombination-Usable Together

3. Inventions I and II are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct if they do not overlap in scope and are not obvious variants, and if it is shown that at least one subcombination is separately usable. In the instant case, inventions I has separate utility such as a processor circuit being configured to start up in a not-associated state, a transmitter to transmit association message in the not-associated state, the processor circuit being configured to switch to an associated state upon reception at the receiver arrangement of an association grant in response to one of the association request messages, the processor circuit being configured to establish an associated route for communication

Art Unit: 2618

with an association unit during subsequent communication of operating messages to an association unit, the associated route including a source of the association grant, and, if the source of the association grant is not the association unit, the operating route between the source of the association grant and the association unit previously established for the source of the association grant in response to association request messages and/or the association grants for intermediate stations, the processor circuit being configured to cause the transmitter arrangement to initiate and transmit association grants in response to association request messages, but only after switching to the associated state. Invention II has separate utility such as a station comprising a first unit and a second unit, each of the first and second unit comprising a transmitter and a receiver, the first and second unit being configured to operate concurrently in mutually different frequency channels, a processor circuit coupled to the transmitters and the receivers of the first and second unit, the processor circuit being configured to awaken the receiver of the first unit in first periodic time slots, and to awaken the receiver of the second periodic time slots, the first and second time-slots being mutually asynchronous, and to relay messages received in the first unit for transmission by the second unit and vice versa. See MPEP § 806.05(d).

4. Because these inventions are independent or distinct for the reasons given above and have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

Art Unit: 2618

5. Because these inventions are independent or distinct for the reasons given above and the inventions require a different field of search (see MPEP § 808.02), restriction for examination purposes as indicated is proper.

6. Because these inventions are independent or distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species or invention to be examined even though the requirement be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.

The election of an invention or species may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse.

Should applicant traverse on the ground that the inventions or species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions or species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C.103(a) of the other invention.

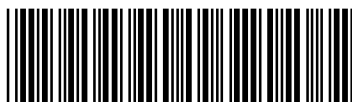
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DOMINIC E. REGO whose telephone number is (571)272-8132. The examiner can normally be reached on Monday-Friday, 9:00 am-5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duc M. Nguyen can be reached on 571-272-7503. 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.

/DOMINIC E REGO/
Primary Examiner, Art Unit 2618
Tel 571-272-8132

<p><i>Index of Claims</i></p> 	Application/Control No. 12159753	Applicant(s)/Patent Under Reexamination BLANGE ET AL.
	Examiner DOMINIC E REGO	Art Unit 2618

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant
 ☐ CPA
 ☐ T.D.
 ☐ R.1.47

CLAIM		DATE								
Final	Original	08/25/2011								
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/159,753	12/02/2008	Marinus Johannes Blange	263935

CONFIRMATION NO. 1409

PUBLICATION NOTICE



OC000000037542870

23460
LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6731

Title:INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK

Publication No.US-2009-0215482-A1

Publication Date:08/27/2009

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 publically available Searchable Databases via the Internet at 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 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



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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
12/159,753	12/02/2008	2617	1370	263935	22	4

CONFIRMATION NO. 1409

23460

LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6731

FILING RECEIPT



OC000000036018281

Date Mailed: 05/21/2009

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)

Marinus Johannes Blange, Nootdorp, NETHERLANDS;
Miodrag Djurica, Rotterdam, NETHERLANDS;

Assignment For Published Patent Application

Nederlandse Organisatie voor toegepast-natuurwetenschappelijk Onderzoek TNO, Delft,
NETHERLANDS

Power of Attorney: The patent practitioners associated with Customer Number 23460

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/NL2007/000001 01/02/2007

Foreign Applications

EUROPEAN PATENT OFFICE (EPO) 05078044.4 12/30/2005

If Required, Foreign Filing License Granted: 05/15/2009

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/159,753**

Projected Publication Date: 08/27/2009

Non-Publication Request: No

Early Publication Request: No

Title

INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK

Preliminary Class

455

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

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.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

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).



UNITED STATES PATENT AND TRADEMARK OFFICE

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P.O. Box 1450
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U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
12/159,753	Marinus Johannes Blange	263935

23460

LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6731

INTERNATIONAL APPLICATION NO.

PCT/NL2007/000001

I.A. FILING DATE	PRIORITY DATE
01/02/2007	12/30/2005

CONFIRMATION NO. 1409
371 ACCEPTANCE LETTER



OC000000036018282

Date Mailed: 05/21/2009

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office in its capacity as a Designated / Elected Office (37 CFR 1.495), has determined that the above identified international application has met the requirements of 35 U.S.C. 371, and is ACCEPTED for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above and the relevant dates are:

12/02/2008
DATE OF RECEIPT OF 35 U.S.C. 371(c)(1),
(c)(2) and (c)(4) REQUIREMENTS

12/02/2008
DATE OF COMPLETION OF ALL
35 U.S.C. 371 REQUIREMENTS

A Filing Receipt (PTO-103X) will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE " FILING DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1), (c)(2) and (c)(4) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN ABOVE.** The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363). Once the Filing Receipt has been received, send all correspondence to the Group Art Unit designated thereon.

The following items have been received:

- Copy of the International Application filed on 06/30/2008
- Copy of the International Search Report filed on 06/30/2008
- Preliminary Amendments filed on 06/30/2008
- Information Disclosure Statements filed on 07/14/2008
- Oath or Declaration filed on 12/02/2008
- Request for Immediate Examination filed on 06/30/2008
- U.S. Basic National Fees filed on 06/30/2008
- Priority Documents filed on 06/30/2008
- Specification filed on 06/30/2008
- Claims filed on 06/30/2008
- Abstracts filed on 06/30/2008
- Drawings filed on 06/30/2008

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

RODERICK M JONES

Telephone: (703) 756-1460

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application No. 12/159,753

Confirmation No. 1409

Applicant: Blange et al.

Filed: June 30, 2008

TC/AU: Unassigned

Examiner: Unassigned

Docket No.: 263935 (Client Reference No. LH/P74240US00)

Customer No.: 23460

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

RESPONSE TO NOTIFICATION OF MISSING REQUIREMENTS

Dear Sir

Applicant(s) hereby respond(s) to the Notification of Missing Requirements dated November 18, 2008.

The items checked below are appropriate:

1. Status of Applicant

This application is on behalf of ☒ other than a small entity or ☐ a small entity.

2. Documents Submitted Herewith

- a. ☒ Executed Declaration of inventor(s)
- b. ☐ Nucleotide and/or Amino Acid Sequence Submission:
 - i. ☐ Computer Readable Form (CRF)
 - ii. Specification Sequence Listing on:
 - (1) ☐ CD-ROM or CD-R (2 copies); or
 - (2) ☐ Paper Copy
 - iii. ☐ Statement verifying identity of above copies
- c. ☐ Verified English translation of application
- d. ☐ Copy of the Notification of Missing Requirements
- e. ☐ Substitute Drawings
- f. ☐ Other:

3. Application Filing Fee

- a. ☒ No application filing fee due
- b. ☐ Application filing fee due in amount calculated below:

APPLICATION FEES						
			SMALL ENTITY		OTHER THAN A SMALL ENTITY	
FILING FEE			\$82 (EFS)		\$330	
SEARCH FEE			\$270		\$540	
EXAM FEE			\$110		\$220	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	ADD'L CLAIM FEE	RATE	ADD'L CLAIM FEE
Total Claims	- 20 =		x 26 =		x 52 =	
Independent Claims	- 3 =		x 110 =		x 220 =	
☐ First Presentation of Multiple Dependent Claim			+ 195 =		+ 390 =	
☐ Application Size Fee – If the application transmittals, data sheet, specification, claims, abstract, drawings, and preliminary amendment exceed 100 sheets of paper, enter number of sheets here: - If application is filed in paper form, enter this number in Total Sheets, below. - If application is filed via EFS-Web, multiply this number by 0.75 and enter result in Total Sheets, below.						
Total Sheets =	- 100 =	÷ 50 =	x 135 =		x 270 =	
			(round <u>up</u> to a whole number)			
☐ Assignment Fee			+ 40 =		+ 40 =	
☐ Early Publication Fee			+ 300 =		+ 300 =	
MINUS FEE ALREADY PAID =						
TOTAL FEE DUE =			TOTAL		TOTAL	

4. Late Filing of Oath or Declaration Surcharge

Pursuant to 37 CFR 1.16(e), the surcharge for filing this Response is for

☒ other than a small entity or ☐ a small entity.**Fee Due** \$130.00**5.. Non-English Specification Surcharge**

Pursuant to 37 CFR 1.17(i), the surcharge for submitting an English translation of the non-English specification is included.

Fee Due \$ 0.00**6. (Provisional only) Surcharge for Late Submission**

Pursuant to 37 CFR 1.16(g), the surcharge for submitting an English translation of the non-English specification is included.

Fee Due \$ 0.00**7. Extension of Time**☐ Applicants petition for a one-month extension of time under 37 CFR 1.136, the fee for which is \$ 0.00.☒ Applicants believe that no extension of time is required. However, this conditional petition is being made to provide for the possibility that

applicants have inadvertently overlooked the need for a petition and fee for extension of time.

Extension fee due with this request: \$ 0.00

8. Total Fee Due

The total fee due is:

Application Filing Fee	
Late Filing of Declaration Surcharge	\$130.00
Non-English Specification Surcharge	\$ 0.00
(Provisional only) Surcharge for Late Submission	\$ 0.00
Extension of Time Fee	\$ 0.00

Total Fee Due: \$130.00

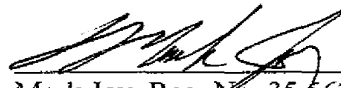
9. Fee Payment

- ☐ Attached is a check in the amount of \$.
- ☒ Charge Account No. 12-1216 in the amount of \$130.00.

10. Fee Deficiency

- ☒ If any additional fee is required in connection with this communication, charge Account No. 12-1216.

Respectfully submitted,


Mark Joy, Reg. No. 35,562
LEYDIG, VOIT & MAYER, LTD.
Two Prudential Plaza, Suite 4900
180 North Stetson Avenue
Chicago, Illinois 60601-6731
(312) 616-5600 (telephone)
(312) 616-5700 (facsimile)

Date: December 2, 2008

The undersigned, BOUDEWIJN HERMAN DYSERINCK, civil law notary, residing at The Hague, The Netherlands, hereby certifies that the attached document was signed by Mr **Marinus Johannes BLANGÉ** and Mr **Miodrag DJURICA**.

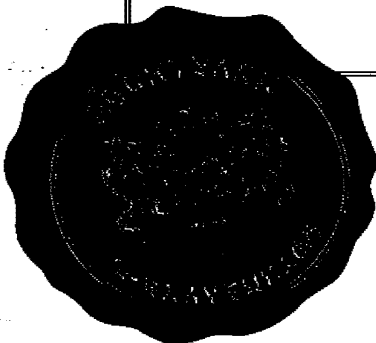
The Hague, this 23th day of September 2008.



Legalisatie

Gezien voor legalisatie der
handtekening van **mr B.H. Dyserinck**
door de president van de rechtbank
te 's-Gravenhage,

Datum: 23 september 2008
Nr: 2008/1240/8



Gezien voor legalisatie van de handtekening
van mr. F. Bakker
President van de Arrondissementsrechtbank te Den Haag
's-Gravenhage
De Minister van Justitie,
namens de Minister,
Hoofd van de directie Bedrijfsvoering en Ondersteuning
Bestuursdepartement,
voor deze,

Gezien voor legalisatie van de handtekening
van dhr/mw

• Den Haag,

24 SEP. 2008

Buitenlandse
Zaken

De minister van
Buitenlandse Zaken
voor deze,

6162

B.G. Vetter

**COMBINED DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION
AND POWER OF ATTORNEY**

- ☐ Declaration Submitted with Initial Filing OR
☒ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16(e)) required)

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name. I believe I am the original, first, and sole inventor (*if only one name is listed below*) or an original, first, and joint inventor (*if plural names are listed below*) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK

the specification of:

- ☐ is attached hereto.
☐ was filed on as Application No. and was amended on (*if applicable*).
☐ was filed by Express Mail No. as Application No. not known yet, and was amended on (*if applicable*).
☒ was filed on 1/2/2007 as PCT International Application No. PCT/NL2007/000001 and was amended on (*if any*).

I state that I have reviewed and understand the contents of the specification identified above, including the claim(s), as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I claim foreign priority benefits under 35 USC 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) 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, by checking the box, any foreign application(s) for patent, utility model, design registration, inventor's or plant breeder's rights certificate(s), 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 and having a filing date before that of the application(s) from which the benefit of priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Claimed		Certified Copy Attached?	
			YES	NO	YES	NO
05078044.4	EP	12/30/2005	☒	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐

In re Appln. of
Attorney Docket No.

As a named inventor, I hereby appoint Leydig, Voit & Mayer, Ltd. to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Customer Number 23460.

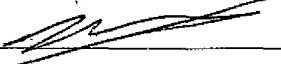
23460

I further direct that correspondence concerning this application be directed to Leydig, Voit & Mayer, Ltd.: Customer Number 23460.

23460

I declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true, 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 sole or first inventor: Marinus Johannes BLANGE

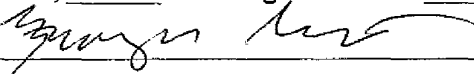
Inventor's signature 

Date 18-09-08 Country of Citizenship: NL

Residence: NOOTDORP, The Netherlands

Post Office Address: ~~Witbal~~ 19, 2631 SM NOOTDORP, The Netherlands
Witbal

Full name of second joint inventor, Miodrag DJURICA

Inventor's signature 

Date 18-09-08 Country of Citizenship: NL

Residence: ROTTERDAM, The Netherlands

Post Office Address: Schepenstraat 7C, 3039 NA ROTTERDAM, The Netherlands

Declaration_Blank (Rev. 7/18/03)

Electronic Patent Application Fee Transmittal

Application Number:	12159753			
Filing Date:				
Title of Invention:	INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK			
First Named Inventor/Applicant Name:	Marinus Johannes Blange			
Filer:	Mark Joy			
Attorney Docket Number:	263935			
Filed as Large Entity				
U.S. National Stage under 35 USC 371 Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Oath/decl > 30 months from priority date	1617	1	130	130
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				130

Electronic Acknowledgement Receipt

EFS ID:	4382515
Application Number:	12159753
International Application Number:	
Confirmation Number:	1409
Title of Invention:	INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK
First Named Inventor/Applicant Name:	Marinus Johannes Blange
Customer Number:	23460
Filer:	Mark Joy
Filer Authorized By:	
Attorney Docket Number:	263935
Receipt Date:	02-DEC-2008
Filing Date:	
Time Stamp:	17:19:21
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 130
RAM confirmation Number	2521
Deposit Account	121216
Authorized User	

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

Charge any Additional Fees required under 37 C.F.R. 1.492 (National application filing, search, and examination fees)

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

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		263935efsmisspts.pdf	163293 72172a374968c66a0cae500b607de22018f45bc4	yes	6
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Miscellaneous Incoming Letter		1	3	
	Oath or Declaration filed		4	6	
Warnings:					
Information:					
2	Fee Worksheet (PTO-06)	fee-info.pdf	29999 3fe04924559e5492b221664de48518b8bf19d0ee	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			193292		
<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><u>New Applications Under 35 U.S.C. 111</u> 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><u>National Stage of an International Application under 35 U.S.C. 371</u> 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><u>New International Application Filed with the USPTO as a Receiving Office</u> 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>					

DO/ EO WORKSHEET

Patent Application Specialist/ National Stage Division

U.S. Appl. No. 12/159,789

International Appl. No. PCT/

NL 2007/008801

WIPO PUBLICATION INFORMATION :

Publication No.: WO200716819

Publication Language : ☒ English (IA used as specification) ☐ German ☐ Japanese
☐ Chinese ☐ Korean ☐ French ☐ Spanish ☐ Russian ☐ Other : _____

Publication Date : 12 July 2007

Not Published : ☐ U.S. only ☐ Early Pub. Request

Published : ☐ Early Pub.

INTERNATIONAL APPLICATION PAPERS IN THE APPLICATION FILE :

- ☒ International Application (RECORD COPY)
☐ Article 19 Amendments
☐ PCT/IPEA/409 - IPER (check Examination Authority) :
☐ EP ☐ JP ☐ SE ☐ AU ☐ US ☐ FR ☐ CN ☐ ES
☐ RU ☐ AT ☐ CA ☐ KR ☐ _____

- ☐ PCT/IB/306
☐ Request form PCT/RO/101
☒ PCT/ISA/210 - Search Report (check Searching Authority) :
☒ EP ☐ JP ☐ SE ☐ AU ☐ US ☐ FR ☐ CN ☐ ES
☐ RU ☐ AT ☐ CA ☐ KR ☐ _____ ☐ NONE

- ☐ Annexes to 409
☐ PCT/ISA/237 (check Searching Authority) :
☐ EP ☐ JP ☐ SE ☐ AU ☐ US ☐ FR ☐ CN ☐ ES
☐ RU ☐ AT ☐ CA ☐ KR ☐ _____

- ☐ Search Report References
☒ Priority Document (s) No. 1
☐ N/A
☐ Priority Document was NOT AVAILABLE at the time of paralegal review

☐ Other : _____

☐ Other : _____

RECEIPTS FROM THE APPLICANT (filed with the application unless noted otherwise) :

- ☐ Basic National Fee (or authorization to charge)
☒ Description ☒ Claims ☒ Abstract

- ☒ Express Request to Begin Nat'l Examination Procedures

☒ Number of Drawing Sheets : 3

- ☒ Preliminary Amendment(s) Filed on :
1. ☐ same as 371 request date 2. _____ 3. _____

- ☐ Translation of Article 19 Amendments
☐ entered ☐ not entered :
☐ not a page for page substitution
☐ replaced by Article 34 Amendment

- ☒ Information Disclosure Statement(s) Filed on :
1. ☐ same as 371 request date 2. 7/19/08 3. _____

- ☐ Annexes to 409
☐ entered ☐ not entered :
☐ not a page for page substitution
☐ no translation ☐ other : _____

- ☐ Assignee Statement Under 37 CFR 3.73(b)
☐ Assignee PG Publication Notice

- ☒ Application Data Sheet
☐ Power of Attorney
☐ Change of Address
☐ PG Pub Early Publication Request

- ☐ Substitute Specification Filed on :
1. ☐ same as 371 request date 2. _____ 3. _____

- ☐ Verified Small Status Statement

- ☐ Oath/ Declaration (executed)
☐ Defective Oath/ Declaration ☐ unsigned ☐ no citizenship ☐ other
☐ DNA Diskette ☐ Sequence Listing
☐ Other : _____
☐ Other : _____

NOTES :

35 U.S.C. 371 - Receipt of Request (PTO-1390)

Date Acceptable Oath/ Declaration Received

Date of Completion of requirements under 35 U.S.C. 371

Date of Completion of DO/ EO 903 - Notification of Acceptance

Date of Completion of DO/ EO 905 - Notification of Missing Requirements

Date of Completion of DO/ EO 909 - Notification of Abandonment

Date of Completion of DO/ EO 916 - Notification of Defective Response

Date of Completion of DO/ EO 922 - Notification to Comply w/ Requirements for Patent Applications
Containing Nucleotide and/or Amino Acid Sequence Disclosures

Date of Completion of DO/ EO 923



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

U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
12/159,753	Marinus Johannes Blange	263935

23460

LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6731

INTERNATIONAL APPLICATION NO.

PCT/NL2007/000001

I.A. FILING DATE	PRIORITY DATE
01/02/2007	12/30/2005

CONFIRMATION NO. 1409
371 FORMALITIES LETTER



Date Mailed: 11/18/2008

**NOTIFICATION OF MISSING REQUIREMENTS UNDER 35 U.S.C. 371
IN THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)**

The following items have been submitted by the applicant or the IB to the United States Patent and Trademark Office as a Designated Office (37 CFR 1.494):

- Priority Document
- Copy of the International Application filed on 06/30/2008
- Copy of the International Search Report filed on 06/30/2008
- Preliminary Amendments filed on 06/30/2008
- Information Disclosure Statements filed on 07/14/2008
- Request for Immediate Examination filed on 06/30/2008
- U.S. Basic National Fees filed on 06/30/2008
- Priority Documents filed on 06/30/2008
- Specification filed on 06/30/2008
- Claims filed on 06/30/2008
- Abstracts filed on 06/30/2008
- Drawings filed on 06/30/2008

The applicant needs to satisfy supplemental fees problems indicated below.

The following items **MUST** be furnished within the period set forth below in order to complete the requirements for acceptance under 35 U.S.C. 371:

- Oath or declaration of the inventors, in compliance with 37 CFR 1.497(a) and (b), identifying the application by the International application number and international filing date.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.492(h) of \$130 for a non-small entity, must be submitted with the missing items identified in this letter.

SUMMARY OF FEES DUE:

Total additional fees required for this application is **\$130** for a Large Entity:

- **\$130** Surcharge.

ALL OF THE ITEMS SET FORTH ABOVE MUST BE SUBMITTED WITHIN TWO (2) MONTHS FROM THE DATE OF THIS NOTICE OR BY 32 MONTHS FROM THE PRIORITY DATE FOR THE APPLICATION, WHICHEVER IS LATER. FAILURE TO PROPERLY RESPOND WILL RESULT IN ABANDONMENT.

The time period set above may be extended by filing a petition and fee for extension of time under the provisions of 37 CFR 1.136(a).

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.

<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

RODERICK M JONES

Telephone: (703) 308-9140 EXT 181

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application No. 12/159,753

Confirmation No. 1409

Applicant: Blange et al.

Filed: June 30, 2008

TC/AU: Unassigned

Examiner: Unassigned

Docket No.: 263935 (Client Reference No. LH/P74240US00)

Customer No.: 23460

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

INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 CFR 1.97 and 1.98, the references listed on the enclosed Form PTO-1449 and/or Substitute Form PTO-1449 ("Form 1449") are submitted for consideration by the Examiner in the examination of the above-identified patent application.

The full consideration of the references in their entirety by the Examiner is respectfully requested and encouraged. Also, it is respectfully requested that the references be entered into the record of the present application and that the Examiner initial the appropriate area on the enclosed Form 1449, thereby indicating the Examiner's consideration of each of the references.

The submission of the references listed on the Form 1449 is for the purpose of providing a complete record and is not a concession that the references listed thereon are prior art to the invention claimed in the patent application. The right is expressly reserved to establish an invention date earlier than the above-identified filing date in order to remove any reference submitted herewith as prior art should it be deemed appropriate to do so.

Further, the submission of the references is not to be taken as a concession that any reference represents art that is relevant or analogous to the claimed invention. Accordingly, the right to argue that any reference is not properly within the scope of prior art relevant to an examination of the claims in the above-identified application is also expressly reserved.

The Information Disclosure Statement is being filed:

- ☒ **within** any one of the following time periods: (a) within three months of the filing date of a national application other than a continued prosecution application under 37 CFR 1.53(d); (b) within three months of the date of entry of the national stage as set forth in 37 CFR 1.491 of an international application; (c) before the mailing date of a first Office Action on the merits; or (d) before the mailing of a first Office Action after the filing of a request for continued examination under 37 CFR 1.114.
- ☐ **after** (a), (b), (c) or (d) above, 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 includes *one* of:
- ☐ the Statement under 37 CFR 1.97(e) (see "Statement under 37 CFR 1.97(e)" below).
- or –
- ☐ the fee of \$180 set forth in 37 CFR 1.17(p) (see "Fees" below).
- ☐ **after** the mailing date of a final action under 37 CFR 1.113 or a Notice of Allowance under 37 CFR 1.311, or an action that otherwise closes prosecution in the application, and on or before payment of the issue fee, and includes the Statement under 37 CFR 1.97(e) (see "Statement under 37 CFR 1.97(e)" below), and the fee of \$180 as set forth in 37 CFR 1.17(p) (see "Fees" below).
- ☐ **after** the mailing date of a Notice of Allowance under 37 CFR 1.311, and on or before payment of the issue fee, and **within** thirty days of receiving each item of information contained in the Information Disclosure Statement, and includes the Statement under 37 CFR 1.704(d) (see "Statement under 37 CFR 1.704(d)" below), and the fee of \$180 as set forth in 37 CFR 1.17(p) (see "Fees" below). NOTE: This is for original applications except applications for a design patent, filed on or after May 29, 2000, wherein a paper containing only an Information Disclosure Statement in compliance with 37 CFR 1.97 and 1.98 is being filed.

Copies of the References

- ☐ Copies of all of the references listed on the enclosed Form 1449 are enclosed herewith.
- ☒ Copies of U.S. patents and patent applications that are listed on the accompanying Form 1449 are not enclosed herewith. Copies of other references identified on the accompanying Form 1449 are enclosed herewith.
- ☒ For each reference not in the English language, attached is an English translation, a concise explanation of relevance, an English-language equivalent/patent, an English-language abstract, or an English-language version of the search report or action by a foreign patent office in a counterpart foreign application indicating the degree of relevance found by the foreign office pursuant to 37 CFR 1.98(a)(3).

- ☒ A copy of the foreign search report is enclosed herewith.
- ☐ The references listed on the enclosed Form 1449 were previously identified in the parent application(s) of the present application, and copies of the references were furnished at that time. Accordingly, additional copies of the references are not submitted herewith, so as not to burden the file with duplicate copies of references. The Examiner is respectfully requested to carefully review the references in accordance with the requirements set out in the Manual of Patent Examining Procedure. In accordance with 37 CFR 1.98(d), the details of the parent application(s) relied upon for an earlier filing date under 35 USC 120 in which copies of the references were previously furnished are set out below:

U.S. APPLICATIONS		STATUS (check one)		
U.S. APPLICATIONS	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
1.				
2.				
3.				

Statement under 37 CFR 1.97(e)

- ☐ The **undersigned** hereby states 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 patent application not more than three months prior to the filing of the Information Disclosure Statement.
- ☐ The **undersigned** hereby states 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 patent application, and, to the knowledge of the undersigned 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.

Statement under 37 CFR 1.704(d)

- ☐ The **undersigned** hereby states that each item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart application and that this communication was not received by any individual designated in 37 CFR 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement.

Fees

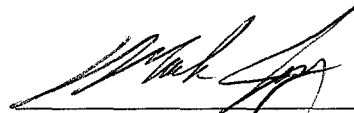
- ☒ **No fee** is owed by the applicant(s).
- ☐ Charge Deposit Account No. 12-1216 in the amount of **\$180.00** (37 CFR 1.17(p)). (A duplicate copy of this communication is enclosed for that purpose, unless submitted via EFS-Web.)

Authorization to Charge Additional Fees

- ☒ If any additional fees are owed in connection with this communication, please charge Deposit Account No. 12-1216. (A duplicate copy of this communication is enclosed for that purpose, unless submitted via EFS-Web.)

Instructions as to Overpayment

- ☒ Credit Account No. 12-1216.
☐ Refund



Mark Joy, Reg. No. 35,562
LEYDIG, VOIT & MAYER, LTD.
Two Prudential Plaza, Suite 4900
180 North Stetson Avenue
Chicago, Illinois 60601-6731
(312) 616-5600 (telephone)
(312) 616-5700 (facsimile)

Date: July 14, 2008

Please type a plus sign (+) inside this box → 

Substitute for form 1449A/B/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	12/159,753
				Filing Date	June 30, 2008
				First Named Inventor	Marinus Johannes Blange
				Group Art Unit	Unassigned
				Examiner Name	Unassigned
Sheet	1	of	1	Attorney Docket Number	263935

U.S. PATENT DOCUMENTS						
Examiner Initials	Doc. No.	U.S. Patent Document		Name of Patentee or Applicant	Date of Publication	Filing Date If Appropriate
		Application or Patent Number	Kind Code			
	AA	US2005/0122927	A1	Wentink	06/09/2005	
	AB	US2003/0151513	A1	Herrmann et al.	08/14/2003	

FOREIGN PATENT DOCUMENTS								
Examiner Initials	Doc. No.	Foreign Patent Document			Name of Patentee or Applicant	Date of Publication	Translation	
		Office	Application or Patent Number	Kind Code			Yes	No**
	AC	EP	1 471 693	A2	Samsung Electronics Co., Ltd	10/27/2004		

OTHER - NON PATENT LITERATURE DOCUMENTS					
Examiner Initials	Doc. 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, page(s), volume-issue number (s), publisher, city and/or country where published.	Translation		
			Yes	No**	
	AD	Forno et al., "Design and implementation of a Bluetooth ad hoc network for indoor positioning" IEE Proceedings: Software, IEE, vol. 152, No. 5, 10/07/2005 pages 223-228			
	AE	Rubin et al., "TBONE: A Mobile-Backbone Protocol for Ad Hoc Wireless Networks" Aerospace Conference Proceedings, IEEE Mar 9-16, 2002. vol. 6, pages 2727-2740			
	AF	International Search Report for PCT/NL/2007/0000001, dated June 6, 2007			

Examiner Signature		Date Considered	
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* A concise statement of relevance is being submitted in lieu of a translation. 37 CFR 1.98(a)(3).
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(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.10.2004 Bulletin 2004/44

(51) Int Cl.7: **H04L 12/28**

(21) Application number: **04252388.6**

(22) Date of filing: **23.04.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR
 Designated Extension States:
AL HR LT LV MK

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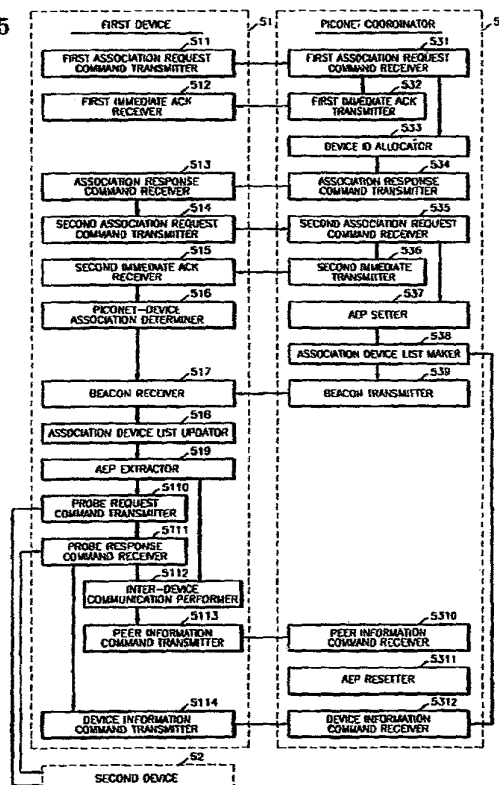
(30) Priority: **25.04.2003 KR 2003026425**

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(54) **System and method for managing the association of a device with a piconet**

(57) A system that manages associations of devices with a piconet is provided. The system includes a piconet-device association coordinator (53), which receives, from a first device (51), a second association request command that indicates a proper allocation of a device ID to the first device (51), sets an association elapsed period of the first device (51) to an initial value, and registers the first device (51) and records the association elapsed period to an association device list so that the first device (51) corresponds to the association elapsed period; and a piconet-device associator (51), which updates an association device list of the first device (51) by referring to the association device list, extracts an association elapsed period of a second device (52) registered on the updated association device list when the first device (51) requests communication with the second device (52), and performs the communication between the first and second devices if the extracted association elapsed period is shorter than an association timeout period.

FIG. 5



Description

[0001] The present invention relates to a system and method for managing the association of a device with a piconet.

[0002] Figure 1 is a block diagram of a piconet according to IEEE 802.12.3 standards.

[0003] According to IEEE 802.12.3 standards, a piconet is a wireless ad-hoc data communication system in which individual data devices can communicate with one another. The piconet is distinguished from other types of data networks due to its communication availability within a range of 10m. In other words, the piconet is discerned from conventional Local Area Networks (LANs), Metropolitan Area Networks (MANs), and Wireless Area Networks (WANs).

[0004] Referring to Figure 1, the piconet includes a plurality of devices, one of which is a piconet coordinator. The piconet coordinator provides timing of the piconet via a beacon. The piconet coordinator also manages requests for Quality of Service (QOS), manages a power save mode, and controls access to the piconet. IEEE 802.12.3 standards prescribe that a device can constitute a subsidiary piconet. An IEEE 802.15.3 Media Access Control (MAC) provides for a fast connection, an ad-hoc network, data transmission to support QOS, security, dynamic membership, and efficient data transmission.

[0005] Devices which request to be involved in the piconet must undergo an association process. The association of the devices with the piconet requires device identifications (IDs), i.e., unique piconet identifiers, to be allocated to the devices. In order to reduce overhead in the wireless ad-hoc data communication system (piconet), instead of 8-octet addresses, 1-octet address is allocated to each of the devices. When a new device associates with the piconet, the piconet coordinator broadcasts a beacon containing information regarding the existing devices and the new device to all of the devices associated with the piconet. The broadcasting of the beacon provides the new device with information regarding the existing devices and allows the existing devices to recognize the new device. When a device requests to dissociate from the piconet or the piconet coordinator requests a dissociation of the device from the piconet, the device must undergo a disassociation process.

[0006] Figure 2 is a block diagram illustrating the structure of a piconet superframe according to IEEE 802.15.3 standards.

[0007] The timing of the piconet is based on a superframe. The superframe includes three parts, i.e., a beacon, a contention access period, and a channel time allocation period. The beacon is used to set time allocation and transmit management information regarding the piconet. The contention access period is used to transmit command and/or asynchronous data. The channel time allocation period is used to connect a com-

mand, an isochronous stream, and asynchronous data. The contention access period uses Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) for media access, while the channel time allocation period uses Time Division Multiple Access (TDMA) for the media access. The channel time allocating period includes management channel time allocation slots (MCTAs), which are used for communication between the piconet coordinator and the devices, and channel time allocation slots (CTAs) which are for communication among the devices.

[0008] Figure 3 illustrates a process of associating a device with the piconet according to IEEE 802.15.3 standards. Referring to Figure 3, a first device transmits a first association request command to a piconet coordinator to request an allocation of an ID. When the piconet coordinator receives the first association request command from the first device, the piconet coordinator transmits a first immediate acknowledgement (ACK) to the first device that indicates that the first association request command has been properly received, allocates a device ID to the first device, and transmits an association response command which includes the device ID, to the first device. Thereafter, the first device receives the first immediate acknowledgement (ACK) and the association response command from the piconet coordinator and then transmits a second association request command to the piconet coordinator that indicates that the device ID has been properly allocated to the first device. The piconet coordinator transmits a second immediate acknowledgement (ACK) to the first device that indicates that the second association request command has been properly received. When the first device receives the second immediate ACK from the piconet coordinator, it is determined that the first device has associated with the piconet. The piconet coordinator then broadcasts a beacon that includes the device ID to all devices associated with the piconet. After all devices associated with the piconet receive the beacon, they become aware of the association of the first device with the piconet. As illustrated in Figure 3, Device Management Entities (DMEs) manage devices, and MAC Layer Management Entities (MLMEs) manage MAC layers. According to IEEE 802.15.3 standards, communications within the piconet can be achieved via the MLMEs.

[0009] Figure 4 illustrates a process of disassociating a device from the piconet, according to IEEE 802.15.3 standards.

[0010] In order to maintain association with the piconet, all devices must transmit frames to the piconet coordinator within a predetermined period of time, i.e., an Association Timeout Period (ATP). If the piconet coordinator does not receive a frame from a device within the ATP, the piconet coordinator disassociates the device from the piconet. In particular, devices in an Asynchronous Power Save (APS) mode must transmit frames to the piconet coordinator within the ATP to

maintain their association with the piconet and prevent their disassociation from the piconet.

[0011] Referring to Figure 4, when the piconet coordinator does not receive a frame from the first device within the ATP, the piconet coordinator transmits a disassociation request command which includes the device ID, to the first device. The first device receives the disassociation request command from the piconet coordinator and transmits an immediate ACK to the piconet coordinator that indicates that the disassociation request command has been properly received. When the piconet coordinator receives the immediate ACK, the piconet coordinator determines that the first device has disassociated from the piconet and broadcasts a beacon with the device ID to all devices associated with the piconet. When the devices receive the beacon, the devices become aware of the disassociation of the first device from the piconet. As previously described with reference to Figure 3, DMEs manage the devices, and MLMEs manage MAC layers.

[0012] As described above, association and disassociation processes according to IEEE 802.15.3 require the exchange of many frames between devices and a piconet coordinator, resulting in wasting an effective period and producing extra overhead.

[0013] According to the present invention there is provided an apparatus and method as set forth in the appended claims. Preferred features of the invention will be apparent from the dependent claims, and the description which follows.

[0014] The present invention provides a system and method for managing the association of a device with a piconet in which the devices remain associated with the piconet without transmitting frames to a piconet coordinator for a long period of time.

[0015] According to an aspect of the present invention, there is provided an apparatus that associates devices with a piconet. The apparatus includes an association device list updater, which updates an association device list of a first device by referring to an association device list, on which the devices associated with the piconet are registered and association elapsed periods of the devices are recorded; an association elapsed period extractor, which, when the first device requests communication with a second device registered on the updated association device list, extracts an association elapsed period of the second device from the updated association device list; and an inter-device communicator, which, if the extracted association elapsed period is shorter than an association timeout period, performs the communication between the first and second devices.

[0016] According to another aspect of the present invention, there is provided an apparatus that coordinates associations of devices with a piconet. The apparatus includes a second association request command receiver, which receives, from a first device, a second association request command that indicates that a device ID has been properly allocated to the first device; an in-

itial association elapsed period setter, which, when the second association request command receiver receives the second association request command, sets an association elapsed period of the first device to an initial value; and an association device list maker which registers the first device and records the set association elapsed period on an association device list so that the set association elapsed period corresponds to the first device.

[0017] According to still another aspect of the present invention, there is provided a system that manages associations of devices with a piconet. The system includes a piconet-device association coordinator, which receives, from a first device, a second association request command that indicates a proper allocation of a device ID to the first device, sets an association elapsed period of the first device to an initial value, and registers the first device and records the association elapsed period to an association device list so that the first device corresponds to the association elapsed period; and a piconet-device associator, which updates an association device list of the first device by referring to the association device list, extracts an association elapsed period of a second device registered on the updated association device list from the updated association device list when the first device requests communication with the second device, and performs the communication between the first and second devices if the extracted association elapsed period is shorter than an association timeout period.

[0018] According to yet another aspect of the present invention, there is provided a method of associating devices with a piconet. The method involves updating an association device list of a first device by referring to an association device list, on which the devices associated with the piconet are registered and association elapsed periods of the devices are recorded; if the first device requests communication with a second device registered on the updated association device list, extracting an association elapsed period of the second device from the updated association device list; and if the extracted association elapsed period is shorter than an association timeout period, performing the communication between the first and second devices.

[0019] According to yet another aspect of the present invention, there is provided a method of coordinating associations of devices with a piconet. The method involves receiving, from a first device, a second association request command that indicates that a device ID has been properly allocated to the first device; if the second association request command is received, setting an association elapsed period of the first device to an initial value; and registering the first device and recording the set association elapsed period to an association device list so that the set association elapsed period corresponds to the first device.

[0020] According to yet another aspect of the present invention, there is provided a method of managing as-

sociations of devices with a piconet. The method involves receiving, from a first device, a second association request command that indicates that a device ID has been properly allocated to the first device, setting an association elapsed period of the first device, and registering the first device and recording the set association elapsed period to an association device list so that the first device corresponds to the set association elapsed period; and updating the association device list of the first device by referring to the association device list, extracting an association elapsed period of a second device registered on the updated association device list from the updated association device list if the first device requests communication with the second device, and performing the communication between the first and second devices if the extracted association elapsed period is shorter than an association timeout period.

[0021] According to yet another aspect of the present invention, there is provided a beacon frame. The beacon frame includes a field in which devices associated with a piconet are registered and association elapsed periods of the devices are recorded.

[0022] According to yet another aspect of the present invention, there is provided a device information command frame. The device information command frame includes a field that comprises a value that indicates that a predetermined device does not associate with a piconet. Here, the predetermined device being registered on an association device list on which devices associated with the piconet are registered and association elapsed periods of the devices are recorded.

[0023] According to yet another aspect of the present invention, there is provided a peer information command frame. The peer information command frame includes a field that comprises a value that informs a piconet coordinator that communication between devices associated with a piconet has ended. Here, the piconet coordinator manages the piconet.

[0024] The above and other features and advantages of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

Figure 1 is a block diagram of a piconet according to IEEE 802.12.3 standards;

Figure 2 is a block diagram illustrating the structure of a piconet superframe according to IEEE 802.15.3 standards;

Figure 3 illustrates a process of associating a device with the piconet, according to IEEE 802.15.3 standards;

Figure 4 illustrates a process of disassociating a device from the piconet, according to IEEE 802.15.3 standards;

Figure 5 illustrates the structure of a system that manages associations of devices with a piconet, according to a first embodiment of the present invention;

Figure 6 illustrates the structure of an MAC header according to IEEE 802.15.3;

Figure 7 illustrates the structure of an association request command according to IEEE 802.15.3;

Figure 8 illustrates the structure of an immediate ACK according to IEEE 802.15.3;

Figure 9 illustrates the structure of an association response command according to IEEE 802.15.3;

Figure 10 illustrates the structure of a beacon according to IEEE 802.15.3;

Figure 11A illustrates the structure of an information element field according to a second embodiment of the present invention;

Figure 11B illustrates the structure of an association device list field included in the information element field of Figure 11A;

Figure 12 illustrates the structure of a probe request command according to IEEE 802.15.3;

Figure 13 illustrates the structure of a probe response command according to IEEE 802.15.3;

Figure 14 illustrates the structure of a device information command according to the second embodiment of the present invention;

Figure 15 illustrates the structure of a peer information command, according to the second embodiment of the present invention;

Figure 16 illustrates a process of maintaining associations of devices with a piconet according to a third embodiment of the present invention;

Figures 17A and 17B are flowcharts illustrating a method of associating a device with a piconet according to the third embodiment of the present invention; and

Figure 18 is a flowchart illustrating a method of coordinating an association of a device with a piconet according to a fourth embodiment of the present invention.

[0025] Hereinafter, preferred embodiments of the present invention will be described in detail with refer-

ence to the attached drawings.

[0026] Figure 5 is a block diagram illustrating the structure of a system that manages associations of devices with a piconet according to a first embodiment of the present invention. Referring to Figure 5, the system includes a first device 51 (which can also be called a piconet device associator) and a piconet coordinator 53 (which can also be called a piconet device association coordinator).

[0027] The piconet coordinator 53 receives a second association request command from the first device 51 that indicates that a device ID has been properly allocated to the first device 51. Next, the piconet coordinator 53 sets an association elapsed period (AEP) of the first device 51 to an initial value, registers the first device, and records the set AEP on an association device list so as to correspond the set AEP.

[0028] The first device 51 updates the association device list of the first device 51 by referring to the association device list registered and recorded by the piconet coordinator 53. For a communication between the first device and a second device 52 registered in the association device list, the first device 51 extracts an AEP of the second device 52 from the updated association device list. If the extracted AEP is shorter than an ATP, the first device 51 performs the communication with the second device 52.

[0029] A piconet device association apparatus 51 includes a first association request command transmitter 511, a first immediate ACK receiver 512, an association response command receiver 513, a second association request command transmitter 514, a second immediate ACK receiver 515, a piconet device association determiner 516, a beacon receiver 517, an association device list updater 518, an AEP extractor 519, a probe request command transmitter 5110, a probe response command receiver 5111, an inter-device communicator 5112, a peer information command transmitter 5113, and a device information command transmitter 5114.

[0030] A piconet device association coordination apparatus 53 includes a first association request command receiver 531, a first immediate ACK transmitter 532, a device ID allocator 533, an association response command transmitter 534, a second association request command receiver 535, a second immediate ACK transmitter 536, an AEP initializer 537, an association device list maker 538, a beacon frame transmitter 539, a peer information command receiver 5310, an AEP resetter 5311, and a device information command receiver 5312.

[0031] Figure 6 illustrates the structure of a MAC header according to IEEE 802.15.3. Referring to Figure 6, the MAC header includes 10 octets, and is added to a front portion of each frame transmitted within the piconet. The MAC header includes a frame type field, which indicates the type of a frame, a source ID field, which indicates a source ID of a received frame, and a destination ID field, which indicates a destination ID of

the received frame.

[0032] The first association request command transmitter 511 of the first device 51 transmits a first association request command to the piconet coordinator 53 to request an allocation of a device ID to the first device 51. The first association request command receiver 531 of the piconet coordinator 53 receives the first association request command from the first device 51.

[0033] Figure 7 illustrates the structure of an association request command according to IEEE 802.15.3. Referring to Figure 7, the MAC header of Figure 6 is added to the association request command of Figure 7. The association request command includes a source ID field with an unassociated ID, a destination ID field with a piconet coordinator ID, and a device address field with an address of a device transmitting the association request command. In other words, when a source ID is an unassociated ID, it means the device does not have an ID and requests an allocation of an ID to the device with the address recorded in the device address field.

[0034] When the first association request command receiver 531 receives the first association request command, the first immediate ACK transmitter 532 of the piconet coordinator 53 transmits a first immediate ACK to the first device 51 that indicates that the first association request command has been properly received. The first immediate ACK receiver 512 of the first device 51 receives the first immediate ACK from the piconet coordinator 53.

[0035] Figure 8 illustrates the structure of an immediate ACK according to IEEE 802.15.3. Referring to Figure 8, the immediate ACK includes a MAC header and informs a device that a piconet coordinator has properly received a frame transmitted by the device immediately before the immediate ACK was received by the device. In other words, when the first device 51 transmits a first association request frame and then receives the first immediate ACK, the first device 51 can determine that the piconet coordinator 53 has properly received the first association request frame.

[0036] When the first association request command receiver 531 receives the first association request command, the device ID allocator 533 of the piconet coordinator 53 allocates a device ID to the first device 51. The association response command transmitter 534 of the piconet coordinator 53 transmits an association response command, which includes the device ID, to the first device 51. The association response command receiver 513 receives the association response command from the piconet coordinator 53.

[0037] Figure 9 illustrates the structure of an association response command according to IEEE 802.15.3. Referring to Figure 9, the MAC header of Figure 6 is added to the association response command of Figure 9. The association response command includes a source ID field with a piconet coordinator ID, a destination ID field with an unassociated ID, and a device ID field with a device ID Qxxx that is allocated by the pi-

conet coordinator 53. In other words, when the destination ID is the unassociated ID and a device ID is recorded in the device ID field, then the recorded device ID is a newly allocated ID.

[0038] The second association request command transmitter 514 of the first device 51 transmits a second association request command to the piconet coordinator 53 to indicate that the device ID of the association response command has been properly allocated to the first device 51. The second association request command receiver 535 of the piconet coordinator 53 receives the second association request command. When the first device 51 receives the association response command, the first device 51 transmits the second association request command to the piconet coordinator 53 which informs the piconet coordinator 53 of the proper allocation of the device ID. Here, a source ID field of the second association request command includes the newly allocated device ID Qxxx.

[0039] When the second association request command receiver 535 receives the second association request command, the second immediate ACK transmitter 536 of the piconet coordinator 53 transmits a second immediate ACK to the first device 51 which indicates that the second association request command has been properly received. The second immediate ACK receiver 515 of the first device 51 receives the second immediate ACK from the piconet coordinator 53. Here, like the first immediate ACK, the second immediate ACK includes an MAC header, which informs a device that a piconet coordinator has properly received a frame transmitted by the device immediately prior to the reception of the second immediate ACK by the device. In other words, when the first device 51 transmits the second association request command and then receives the second immediate ACK, the first device 51 can determine that the piconet coordinator has properly received the second association request command.

[0040] When the second immediate ACK receiver 516 receives the second immediate ACK, the piconet device association determiner 516 of the first device 51 determines that the first device 51 has associated with the piconet. To be more specific, when the first device 51 receives the second immediate ACK, the first device 51 can determine that the piconet coordinator 53 has properly received the second association request command. Here, an MLME of the first device 51 informs a DME of the first device 51 that the device ID has been allocated to the first device 51, and the DME of the first device 51 determines that the first device 51 has associated with the piconet.

[0041] When the second association request command receiver 535 receives the second association request command, the AEP initializer 537 sets an AEP of the first device 51 to an initial value, i.e., "0". An IEEE 802.15.3 ATP according to the present invention refers to a critical period during which devices associate with a piconet in spite of their movements, breakdowns, and

so forth. However, when the piconet coordinator 53 does not receive a frame from a device within the existing IEEE 802.15.3 ATP, the piconet coordinator 53 disassociates the device from the piconet. The disassociated device must undergo an association process again to re-associate with the piconet. This results in loss of channel resources in a wireless communication environment in which channels are limited and there are many frames exchanged among devices. In order to solve these problems, the first embodiment of the present invention employs the AEP as a new information element. The AEP refers to an elapsed period after an instant in time when a device associates with the piconet. More broadly, the AEP refers to an elapsed period after an instant in time when a device informs the piconet that the device has associated with the piconet. When the piconet coordinator 53 receives the second association request command from the first device 51, the piconet coordinator 53 determines that the first device 51 has associated with the piconet. Thus, the AEP of the first device 51 is set to the initial value, i.e., "0". Devices associated with the piconet increase their AEPs using their local clocks. If an AEP of a device is shorter than an ATP, i.e., it can be assumed that the device has associated with the piconet, the device can immediately communicate with another device. However, if the AEP of the device is not shorter than the ATP, i.e., it cannot be assumed that the device has associated with the piconet, the device must undergo another process.

[0042] The association device list maker 538 of the piconet coordinator 53 registers the first device and records the set AEP on the association device list so as to correspond to the set AEP. The beacon transmitter 539 of the piconet coordinator 53 broadcasts a beacon which includes the association device list. The beacon receiver 517 of the first device 51 receives the beacon from the piconet coordinator 53. Thus, all devices associated with the piconet receive the beacon. As a result, the first device 51, the second device 52, and other devices associated with the piconet perceive that the first device 51 has re-associated with the piconet and the AEP has a value of "0". Thereafter, when both a device that requests a communication with the first device 51 and the first device 51 have associated with the piconet within the AEP, the device can immediately communicate with the first device 51.

[0043] Figure 10 illustrates the structure of a beacon according to IEEE 802.15.3. Referring to Figure 10, the beacon includes as many information element fields as devices associated with the piconet. Information for managing the devices associated with the piconet is recorded in the information element fields.

[0044] Figure 11A illustrates the structure of the information element field of Figure 10. Referring to Figure 11A, according to IEEE 802.15.3 standards, address 0x7F of the beacon is reserved. According to the second embodiment of the present invention, 0x7F of the beacon is used as an association device list field. The as-

sociation device list field registers the devices and the AEPs of the devices so that the devices correspond to the AEPs.

[0045] Figure 11B illustrates the structure of the association device list field of Figure 11A. Referring to Figure 11B, the association device list field includes an element ID field, a length field, and AEP fields of the devices. The association device list field registers the AEP of the first device 51 and AEPs of other devices that have already associated with the piconet. Since the first device 51 is a newly associated device, the AEP field of the first device 51 registers a value of "0". The AEP fields of the devices that have already associated with the piconet register AEPs at instants in time when the other devices associate with the piconet. As previously described, an AEP refers to the elapsed period after the instant in time when a device informs the piconet coordinator 53 that the device has associated with the piconet. An AEP of the device is set to an initial value, i.e., "0", at the instant in time when a device informs the piconet coordinator 53 that the device has associated with the piconet. The AEP of the device increases using a local clock of the piconet coordinator 53. The piconet coordinator 53 increases AEPs of other devices associated with the piconet using its local clock and checks current states of the other devices. The piconet coordinator 53 periodically informs all devices associated with the piconet of their current states, i.e., of whether the devices associate with the piconet. The devices associated with the piconet can accurately determine current states of other devices by receiving information elements from the piconet coordinator 53. As a result, the devices can reliably communicate with other devices. In particular, in a case of a device newly associated with the piconet, the device does not include information on existing devices associated with the piconet. However, since the device can receive information elements from the piconet coordinator 53, the device can determine current states of the other devices. As a result, the device can reliably communicate with the other devices.

[0046] The association device list updater 518 of the first device 51 updates the association device list of the first device 51 by referring to the association device list of the beacon. In other words, the association device list updater 518 updates the association device list of the first device 51 by referring to the association device list on which devices associated with the piconet are registered and AEPs of the devices are recorded. When the first device 51 receives a beacon frame from the piconet coordinator 53, the beacon frame includes updated information regarding the devices associated with the piconet. Each of the devices may have its own association device list and check its current AEP using its own local clock. This does not consider several conditions such as possible movements, breakdowns, and so on of the devices associated with the piconet. When a device informs the piconet coordinator 53 that the device is properly operating within the piconet, the piconet coordinator

53 must reset an AEP of the device to an initial value. However, this is also not considered. Thus, when the devices receive the beacon, they must update their association device lists by referring to updated information contained in the beacon, i.e., updated association device lists.

[0047] When the first device 51 requests communication with the second device 52, which is registered in the updated association device list, the AEP extractor 519 of the first device 51 extracts an AEP of the second device 52 from the updated association device list. More specifically, when the first device 51 requests the communication with the second device 52, the AEP extractor 519 must determine whether the second device 52 has associated with the piconet. In other words, the AEP extractor 519 extracts the AEP of the second device 52 from the association device list.

[0048] When the extracted AEP is shorter than the ATP, i.e., it can be assumed that the second device 52 has associated with the piconet, the inter-device communicator 5112 of the first device 51 performs the communication between the first device 51 and the second device 52.

[0049] If the extracted AEP is not shorter than the ATP, i.e., it cannot be assumed that the second device 52 has associated with the piconet, the probe request command transmitter 5110 of the first device 51 performs a peer discovery process according to IEEE 802.15.3 standards. In other words, the probe request command transmitter 5110 transmits a probe request command to the second device 52 to request confirmation regarding whether the second device 52 has associated with the piconet.

[0050] Figure 12 illustrates the structure of the probe request command according to IEEE 802.15.3. Referring to Figure 12, the probe request command includes a command type field, a length field, an information requested field, and a request index field.

[0051] The probe response command receiver 5111 of the first device 51 receives a probe response command from the second device 52 that indicates that the second device 52 has associated with the piconet.

[0052] Figure 13 illustrates the structure of a probe response command according to IEEE 802.15.3. Referring to Figure 13, the probe response command includes a command type field, a length field, and an information element provided field. When an ID of the second device 52 that is searched for is recorded in the information element provided field, the first device 51 can determine based on the ID of the second device 52, that the second device 52 has associated with the piconet.

[0053] When the probe response command receiver 5111 receives the probe response command, the inter-device communicator 5112 of the first device 51 performs the communication between the first device 51 and the second device 52. Here, the reception of the probe response command indicates that the second device 52 is properly operating within the piconet. There-

fore, the first device 51 can immediately communicate with the second device 52.

[0054] When the probe response command receiver 5111 does not receive the probe response command, the device information command transmitter 5114 of the first device 51 transmits a device information command to the piconet coordinator 53 that indicates that the second device 52 which is registered on the association device list, does not associate with the piconet or cannot associate with the piconet due to a breakdown.

[0055] The device information command receiver 5312 of the piconet coordinator 53 receives the device information command from the first device 51.

[0056] When the device information command receiver 5312 receives the device information command, the association device list maker 538 of the piconet coordinator 53 deletes the second device 52 from the association device list. The device information command has newly been suggested in the present invention.

[0057] Figure 14 illustrates the structure of a device information command according to the second embodiment of the present invention. Referring to Figure 14, the device information command includes a command type field, a length field, and a device ID field. A command type is set to 0x00FE, which is a reserved command. When the piconet coordinator 53 receives the command 0x00FE recorded in the command type field, the piconet coordinator 53 determines that a device with a device ID recorded in the device ID field has disassociated with the piconet. Here, the piconet coordinator 53 deletes the device with the device ID from the association device list and broadcasts the beacon to all devices associated within the piconet to inform them of the deletion. Each of the devices updates its own association device list and cancels communication with the deleted device. To re-associate with the piconet, the deleted device must again undergo the above-described association process. This re-association process replaces an existing IEEE 802.15.3 disassociation process which requires exchanges of frames. In the second embodiment of the present invention, such a disassociation process is omitted.

[0058] When the inter-device communicator 5112 terminates the communication between the first device 51 and the second device 52, the peer information command transmitter 5113 of the first device 51 transmits a peer information command to the piconet coordinator 53 that indicates that the communication between the first device 51 and the second device 52 has ended. The peer information command receiver 5310 of the piconet coordinator 53 receives the peer information command from the first device 51, and the AEP resetter 5311 of the piconet coordinator 53 resets the AEPs of the first device 51 and the second device 52 to initial values. The association device list maker 538 of the piconet coordinator 53 records the reset AEPs of the first device 51 and the second device 52 in the association device list. The peer information command has been newly sug-

gested in the present invention.

[0059] Figure 15 illustrates the structure of a peer information command according to the second embodiment of the present invention. Referring to Figure 15, the peer information command includes a command type field, a length field, a destination ID field, and a source ID field. A command type is set to 0x00FF, which is a reserved command. If the first device 51 finishes transmitting data to the second device 52, the first device 51 transmits a peer information command to the piconet coordinator 53, which includes the command type field including the command 0x00FF, a destination ID field including an ID of the second device 52, and a source ID field including an ID of the first device. The piconet coordinator 53 determines, by the receiving the peer information command, that the first and second devices 51 and 52 have associated with the piconet, and resets the AEPs of the first devices 51 and 52 for possible communication of the first device 51 with the second device 52. The piconet coordinator 53 records the reset AEPs of the first and second devices 51 and 52 in the association device list and broadcasts a beacon to all devices associated with the piconet to inform them of the recording. Each of the devices updates its association device list. Also, as previously described, a device which requests a communication with the first device 51 or the second device 52 can immediately communicate with the first device 51 or the second device 52 prior to the ATP.

[0060] Figure 16 illustrates a process of maintaining associations of devices with a piconet according to a third embodiment of the present invention. Referring to Figure 16, a first device receives a beacon with a reset AEP of the first device from a piconet coordinator. The first device increases the AEP using its local clock from this instant in time. The first device stays associated with a piconet for an ATP. If the first device receives the beacon with the AEP before the ATP elapses, the first device maintains association with the piconet, and the above process is repeated. However, when the first device does not receive the beacon before the ATP elapses, the first device performs an IEEE 802.15.3 peer discovery process and determines, based on the result of the IEEE 802.15.3 peer discovery process, whether the first device has associated with the piconet.

[0061] Figures 17A and 17B are flowcharts illustrating a method of associating a device with a piconet according to the third embodiment of the present invention. Referring to Figures 17A and 17B, in step 171, a first device associated with a piconet transmits a first association request command to a piconet coordinator, which manages the piconet, to request an allocation of a device ID to the first device. In step 172, the first device receives a first immediate ACK from the piconet coordinator that indicates that the first association request command has been properly received. In step 173, the first device receives an association response command with the device ID allocated to the first device from the piconet co-

ordinator. In step 174, the first device transmits a second request command to the piconet coordinator that indicates that the ID of the association response command has been properly allocated to the first device. In step 175, the first device receives a second immediate ACK from the piconet coordinator that indicates that the second association request command has been properly received. In step 176, the first device determines that the first device has associated with the piconet. In step 177, the first device receives a beacon including an association device list from the piconet coordinator, on which an AEP of the first device has been recorded. In step 178, the first device updates its association device list by referring to the association device list of the beacon. In other words, the first device updates its association device list by referring to an association device list, on which a device associated with the piconet has been registered and an AEP of the device have been recorded. In step 179, a determination is made as to whether the first device requests communication with a second device registered on the updated association device list. If, in step 179, it is determined that the first device has requested the communication with the second device, then the first device extracts an AEP of the second device from the updated association device list, in step 1710. In step 1711, a determination is made as to whether the extracted AEP is shorter than an ATP. If, in step 1711, it is determined that the extracted AEP is shorter than the ATP, then the first device performs the communication with the second device in step 1712. If, in step 1711, it is determined that the extracted AEP is not shorter than the ATP, the first device transmits a probe request command to the second device to request confirmation regarding whether the second device has associated with the piconet, in step 1713. In step 1714, the first device receives a probe response command from the second device that indicates that the second device has associated with the piconet. In step 1715, a determination is made as to whether the first device has properly received the probe response command. If, in step 1715, it is determined that the first device has properly received the probe response command, then the first device performs the communication with the second device, in step 1716. If, in step 1715, it is determined that the first device has not properly received the probe response command, then the first device transmits a device information command to the piconet coordinator that indicates that the second device does not associate with the piconet, in step 1717. In step 1718, the first device transmits a peer information command to the piconet coordinator that indicates that the communication with the second device has ended.

[0062] Figure 18 is a flowchart illustrating a method of managing an association of a device with a piconet according to a fourth embodiment of the present invention. Referring to Figure 18, in step 181, a piconet coordinator receives a first association request command from a first device to request an allocation of a device ID to the first

device. In step 182, the piconet coordinator transmits a first immediate ACK to the first device that indicates that the first association request command has been properly received. In step 183, the piconet coordinator allocates the device ID to the first device. In step 184, the piconet coordinator transmits an association response command including the device ID allocated to the first device. In step 185, the piconet coordinator receives a second association request command from the first device that indicates the proper allocation of the device ID to the first device. In step 186, the piconet coordinator transmits a second immediate ACK to the first device that indicates that the second association request command has been properly received. In step 187, the piconet coordinator sets an AEP of the first device to an initial value. In step 188, the piconet coordinator registers the first device and records the set AEP on an association device list so that that the set AEP corresponds to the first device. In step 189, the piconet coordinator broadcasts a beacon including the association device list. In step 1810, the piconet coordinator receives a device information command from the first device that indicates that the second device does not associate with the piconet. In step 1812, a determination is made as to whether the piconet coordinator has properly received the device information command. If, in step 1812, it is determined that the piconet coordinator has properly received the device information command, then the piconet coordinator deletes the second device from the association device list, in the step 1814. In step 1811, the piconet coordinator receives a peer information command from the first device that indicates that the communication between the first and second devices has ended. In step 1813, a determination is made as to whether the piconet coordinator has properly received the peer information command. If, in step 1813, it is determined that the piconet coordinator has properly received the peer information command, then the AEP of the first device and an AEP of the second device are reset to initial values, in step 1815. In step 1816, the AEPs of the first and second devices are recorded.

[0063] As described above, in an apparatus and method for managing associations of devices with a piconet according to exemplary embodiments of the present invention, an AEP can be introduced as a new information element. Thus, devices can remain associated with the piconet without transmitting frames to a piconet coordinator for a long period of time. That is, devices in an asynchronous power save mode can maintain their membership in the piconet so that they can remain associated with the piconet without periodically transmitting frames to the piconet coordinator within an ATP. As a result, existing disassociation and re-association processes are not required, thereby limiting the number of unnecessary exchanges of the frames. Therefore, the piconet coordinator and the devices can secure effective periods, and a load on the system can be reduced.

[0064] The exemplary embodiments of the present invention can be embodied as a computer-executable program on a computer-readable recording medium and then executed in a general-purpose computer.

[0065] Also, a data structure used to perform the method according to exemplary embodiments of the present invention can be recorded on the computer-readable recording medium using several means.

[0066] The computer-readable recording medium includes storage media such as magnetic storage media (e.g., ROMs, floppy disks, hard disks, etc.), optically readable media (e.g., CD-ROMs, DVDs, etc.) and carrier waves (e.g., transmissions over the Internet).

[0067] Although a few preferred embodiments have been shown and described, it will be appreciated by those skilled in the art that various changes and modifications might be made without departing from the scope of the invention, as defined in the appended claims.

[0068] Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0069] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0070] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0071] The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. An apparatus that associates devices with a piconet, the apparatus comprising:

an association device list updater (518), which updates an association device list of a first device (51) by referring to an association device list, on which the devices associated with the piconet are registered and association elapsed periods of the devices are recorded;

an association elapsed period extractor (519), which, when the first device (51) requests communication with a second device (52) registered on the updated association device list, extracts an association elapsed period of the second device (52) from the updated association device list; and

an inter-device communicator (5112), which, if the extracted association elapsed period is shorter than an association timeout period, performs the communication between the first and second devices.

2. The apparatus of claim 1, further comprising:

a beacon receiver (517), which receives a beacon that comprises the association device list from a piconet coordinator (53), which manages the piconet, wherein the association device list updater (518) updates the association device list of the first device (51) by referring to the association device list of the beacon.

3. The apparatus of claim 2, further comprising:

a first association request command transmitter (511), which transmits, to the piconet coordinator (53), a first association request command to request an allocation of a device ID to the first device (51);

a first immediate ACK receiver (512) which receives, from the piconet coordinator (53), a first immediate ACK that indicates that the first association request command has been properly received;

an association response command receiver (513), which receives an association response command that comprises the device ID allocated to the first device (51) from the piconet coordinator (53);

a second association request command transmitter (514), which transmits, to the piconet coordinator (53), a second association request command that indicates the proper allocation of the device ID to the first device (51); and

a second immediate ACK receiver (515) which receives, from the piconet coordinator (53), a second immediate ACK that indicates that the second association request command has been properly received.

4. The apparatus of claim 3, further comprising:

a piconet device association determiner (516), which, if the second immediate ACK receiver (515) receives the second immediate ACK, determines that the first device (51) has associated with the piconet, wherein the beacon receiver (517) receives, from the piconet coordinator (53), the beacon with the association device list, on which the association elapsed period of the first device (51) is recorded.

5. The apparatus of any preceding claim, further comprising:

a probe request command transmitter (5110), which, if the extracted association elapsed period is not shorter than the association timeout period, transmits, to the second device (52), a probe request command to request confirmation whether the second device (52) has associated with the piconet; and

a probe response command receiver (5111), which receives, from the second device (52), a probe response command that indicates that the second device has associated with the piconet, wherein when the probe response command receiver (5111) receives the probe response command, the inter-device communication performer (5112) performs the communication between the first and second devices (51, 52).

6. The apparatus of claim 5, further comprising a device information command transmitter (5114), which, when the probe response command receiver (5111) does not receive the probe response command, transmits, to the piconet coordinator (53), a device information command that indicates that the second device (52) does not associate with the piconet.

7. The apparatus of claim 5 or 6, further comprising a peer information command transmitter (5113), which, when the inter-device communication performer (5112) terminates the communication between the first and second devices, transmits a peer information command to the piconet coordinator (53) that indicates that the communication between the first and second devices has ended.

8. An apparatus that coordinates associations of devices with a piconet, the apparatus comprising:

a second association request command receiver (535), which receives, from a first device (51), a second association request command that indicates that a device ID has been properly allocated to the first device (51);

an initial association elapsed period setter (537), which, when the second association request command receiver (535) receives the second association request command, sets an association elapsed period of the first device (51) to an initial value; and

an association device list maker (538) which registers the first device (51) and records the set association elapsed period on an association device list so that the set association elapsed period corresponds to the first device (51).

9. The apparatus of claim 8, further comprising a beacon frame transmitter (539) which broadcasts a beacon with the association device list.

10. The apparatus of claim 8 or 9, further comprising:

a first association request command receiver (531), which receives, from the first device (51), a first association request command that requests the allocation of the device ID to the first device (51);

a first immediate ACK transmitter (532), which, when the first association request command receiver (531) receives the first association request command, transmits, to the first device (51), a first immediate ACK that indicates that the first association request command has been properly received;

a device ID allocator (533), which, when the first association request command receiver (531) receives the first association request command, allocates the device ID to the first device (51);

an association response command transmitter (534), which transmits an association response command that comprises the device ID to the first device (51); and

a second immediate ACK transmitter (536), which, when the second association request command receiver (535) receives the second association request command, transmits, to the first device (51), a second immediate ACK that indicates that the second association request command has been properly received.

11. The apparatus of claim 8, 9 or 10, further comprising:

a device information command receiver (5312) which receives, from the first device (51), a de-

vice information command that indicates that a second device (52) registered on the association device list does not associate with the piconet, wherein when the device information command receiver (5312) receives the device information command, the association device list maker (538) deletes the second device (52) from the association device list.

12. The apparatus of any of claims 8 to 11, further comprising:

a peer information command receiver (5310), which receives, from the first device (51), a peer information command that indicates that communication between the first and second devices has ended; and

an association elapsed period resetter (5311), which, when the peer information command receiver (5310) receives the peer information command, resets association elapsed periods of the first and second devices, wherein the association device list maker (538) records the reset association elapsed periods of the first and second devices.

13. A system that manages associations of devices with a piconet, comprising:

a piconet-device association coordinator (53), which receives, from a first device (51), a second association request command that indicates a proper allocation of a device ID to the first device (51), sets an association elapsed period of the first device (51) to an initial value, and registers the first device (51) and records the association elapsed period to an association device list so that the first device (51) corresponds to the association elapsed period; and

a piconet-device associator (51), which updates an association device list of the first device (51) by referring to the association device list, extracts an association elapsed period of a second device (52) registered on the updated association device list from the updated association device list when the first device (51) requests communication with the second device (52), and performs the communication between the first and second devices if the extracted association elapsed period is shorter than an association timeout period.

14. A method of associating devices with a piconet, the method comprising:

updating an association device list of a first device (51) by referring to an association device list, on which the devices associated with the piconet are registered and association elapsed periods of the devices are recorded;

if the first device (51) requests communication with a second device (52) registered on the updated association device list, extracting an association elapsed period of the second device (52) from the updated association device list; and

if the extracted association elapsed period is shorter than an association timeout period, performing the communication between the first and second devices (51, 52).

15. The method of claim 14 further comprising:

receiving a beacon that comprises the association device list from a piconet coordinator (53), which manages the piconet, wherein the updating of the association device list of the first device (51) is updated by referring to the association device list of the beacon.

16. The method of claim 15 further comprising:

transmitting, to the piconet coordinator (53), a first association request command to request an allocation of a device ID to the first device (51);

receiving, from the piconet coordinator (53), a first immediate ACK that indicates that the first association request command has been properly received;

receiving, from the piconet coordinator (53), an association response command that comprises the device ID allocated to the first device (51);

transmitting, to the piconet coordinator (53), a second association request command that indicates that the device ID of the association device command has been properly allocated to the first device (51); and

receiving, from the piconet coordinator (53), a second immediate ACK that indicates that the second association request command has been properly received.

17. The method of claim 16 further comprising:

if the second immediate ACK is received, determining that the first device (51) has associ-

- ated with the piconet, wherein in the receiving of the beacon with the association device list from the piconet coordinator (53), the association device list on which the association elapsed period of the first device (51) has been recorded is received from the piconet coordinator (53).
18. The method of any of claims 14 to 17, further comprising:
- if the extracted association elapsed period is not shorter than the association timeout period, transmitting, to the second device (52), a probe request command to request confirmation whether the second device (52) has associated with the piconet;
- receiving, from the second device (52), a probe response command that indicates that the second device (52) has associated with the piconet; and
- if the probe response command is received, performing the communication between the first and second devices (51,52).
19. The method of claim 18 further comprising:
- transmitting a device information command that indicates that the second device (52) does not associate with the piconet to the piconet coordinator (53) if the probe response command is not received.
20. The method of claim 18 or 19, further comprising transmitting a peer information command that indicates that the communication between the first and second devices has ended to the piconet coordinator (53) if the communication between the first and second devices (51,52) ends.
21. A method of coordinating associations of devices with a piconet, the method comprising:
- receiving, from a first device (51), a second association request command that indicates that a device ID has been properly allocated to the first device (51);
- if the second association request command is received, setting an association elapsed period of the first device (51) to an initial value; and
- registering the first device (51) and recording the set association elapsed period to an association device list so that the set association elapsed period corresponds to the first device
- (51).
22. The method of claim 21, further comprising:
- broadcasting a beacon that comprises the association device list.
23. The method of claim 21 or 22, further comprising:
- receiving, from the first device (51), a first association request command to request the allocation of the device ID to the first device (51);
- if the first association request command is received, transmitting, to the first device (51), a first immediate ACK that indicates that the first association request command has been properly received;
- if the first association request command is received, allocating the device ID to the first device (51);
- transmitting an association response command that comprises the device ID to the first device (51); and
- if the second association request command is received, transmitting to the first device (51), a second immediate ACK that indicates that the second association request command has been properly received.
24. The method of claim 21, 22 or 23, further comprising:
- receiving, from the first device (51), a device information command that indicates that a second device (52) registered on the association device list does not associate with the piconet; and
- deleting the second device (52) on the association device list if the device information command is received.
25. The method of any of claims 21 to 25, further comprising:
- receiving, from the first device (51), a peer information command that indicates that communication between the first and second devices (51,52) has ended;
- if the peer information command is received, resetting the association elapsed period of the first device (51) to the initial value and resetting an association elapsed period of the second

device (52) to an initial value; and

recording the reset association elapsed periods of the first and second devices (51,52) on the association device list.

26. A method of managing associations of devices with a piconet, comprising:

receiving, from a first device (51), a second association request command that indicates that a device ID has been properly allocated to the first device (51), setting an association elapsed period of the first device (51), and registering the first device (51) and recording the set association elapsed period to an association device list so that the first device (51) corresponds to the set association elapsed period; and

updating the association device list of the first device (51) by referring to the association device list, extracting an association elapsed period of a second device (52) registered on the updated association device list from the updated association device list if the first device (51) requests communication with the second device (52), and performing the communication between the first and second devices (51,52) if the extracted association elapsed period is shorter than an association timeout period.

27. A computer-readable recording medium on which the method of any of claims 14 to 26 is recorded as a computer-executable program.

28. A beacon frame comprising a field in which devices associated with a piconet are registered and association elapsed periods of the devices are recorded.

29. A device information command frame comprising a field that comprises a value that indicates that a predetermined device does not associate with a piconet, wherein the predetermined device being registered on an association device list on which devices associated with the piconet are registered and association elapsed periods of the devices are recorded.

30. A peer information command frame comprising a field that comprises a value that informs a piconet coordinator (53) that communication between devices associated with a piconet has ended, wherein the piconet coordinator (53) manages the piconet.

31. A computer-readable recording medium on which a data structure comprising the beacon frame of claim 28 is recorded.

32. A computer-readable recording medium on which a data structure comprising the device information command frame of claim 29 is recorded.

33. A computer-readable recording medium on which a data structure comprising the peer information command frame of claim 30 is recorded.

FIG. 1

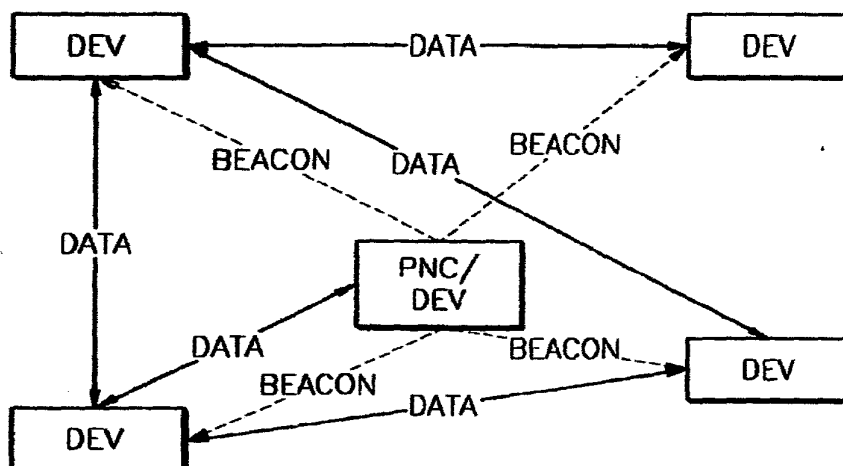


FIG. 2

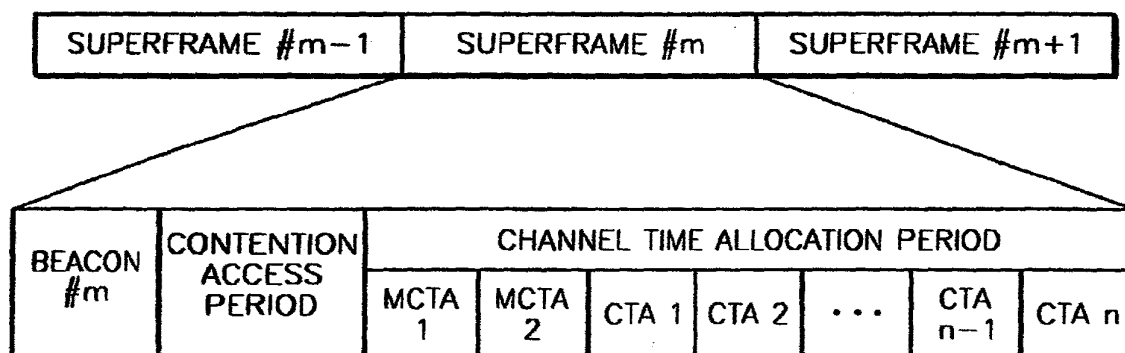


FIG. 3

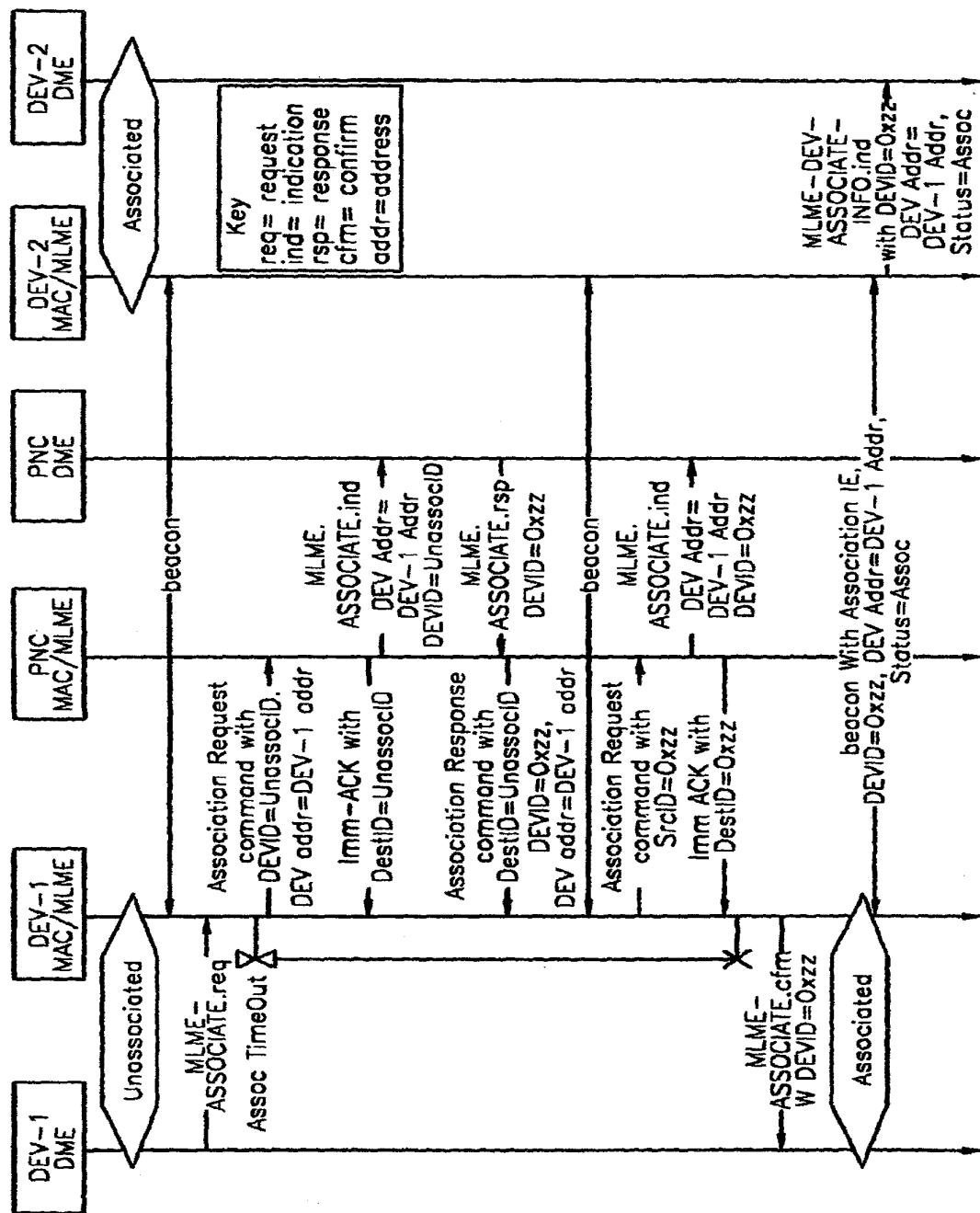


FIG. 4

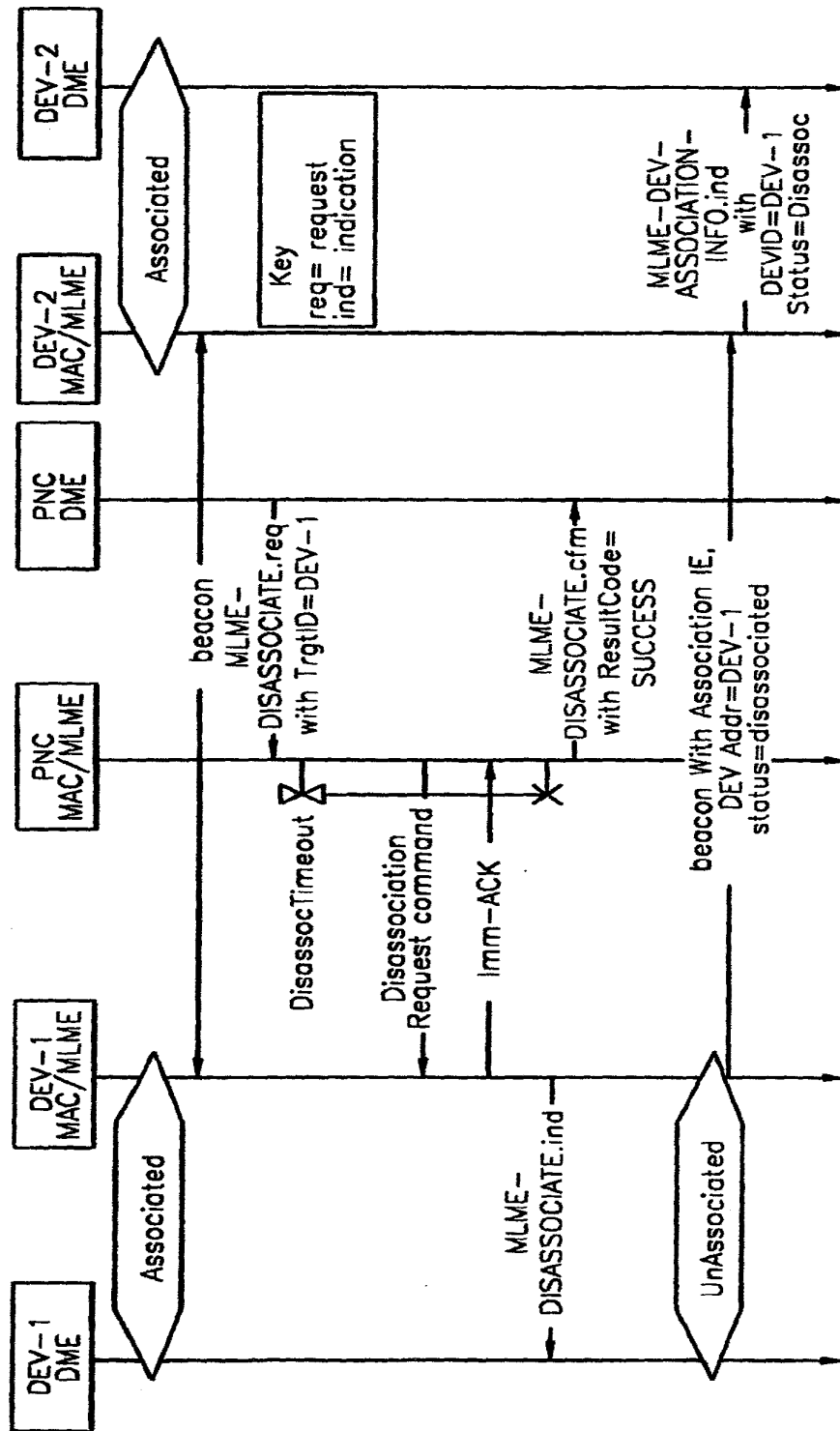


FIG. 5

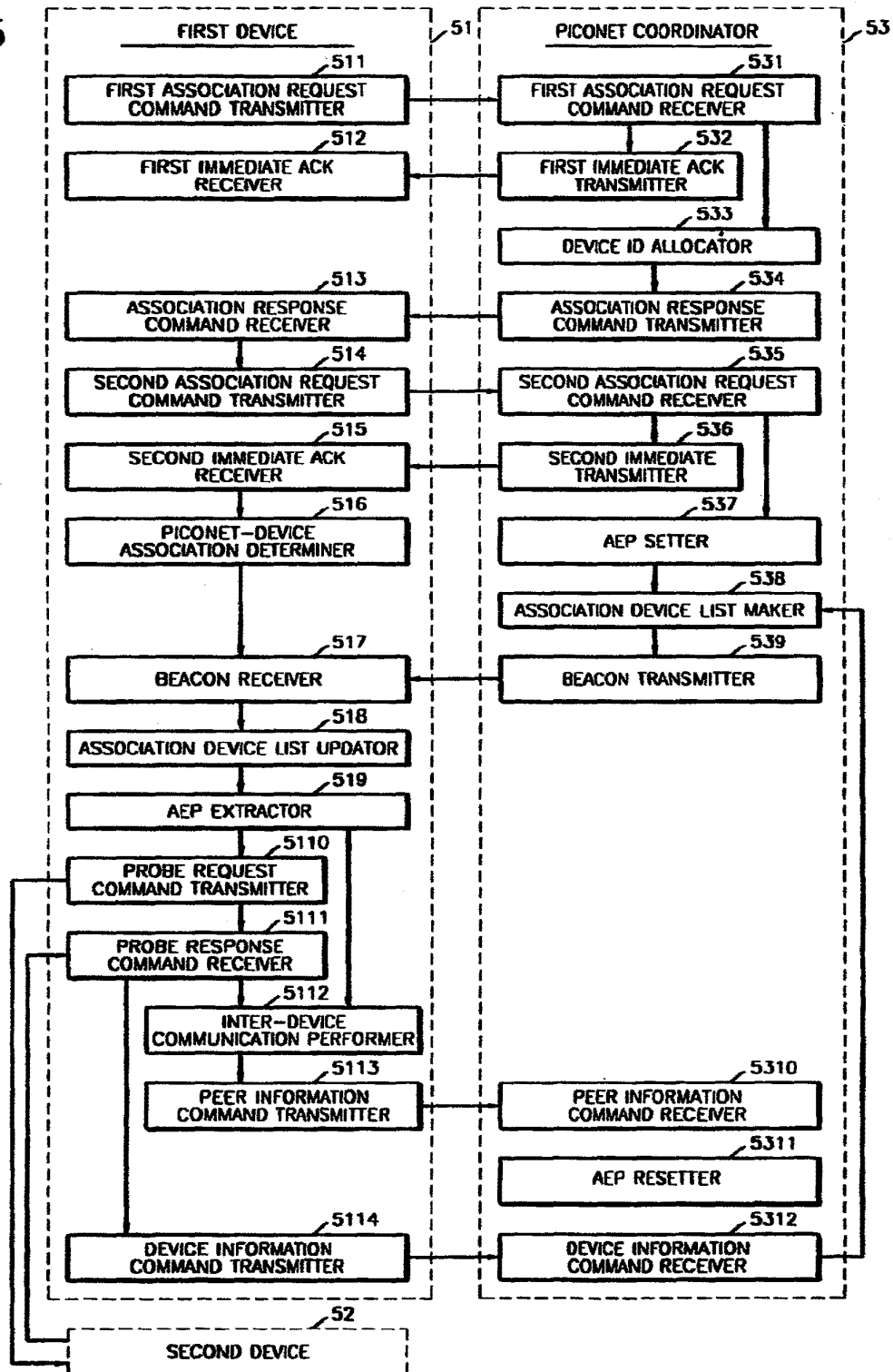


FIG. 6

octets: 1	3	1	1	2	2
Stream Index	Fragmentation control	SrcID	DestID	PNID	Frame Control

FIG. 7

octets: 1	2	7	8	2	2
DEV utility	ATP	Overall capabilities	DEV address	Length(=18)	Command type

FIG. 8

Octets: 10
MAC header

FIG. 9

Octets: 0 or L_n	1	2	1	8	2	2
Vendor specific IE	Reason code	ATP	DEVID	DEV address	Length(=13 or 13+ L_n)	Command type

FIG. 10

Octets: 8	L_n	...	L_m	21
FCS	Information element-n	...	Information element-1	Piconet synchronization parameters
Beacon frame body				

FIG. 11A

...	...	...
0x0D	Continued wake beacon (CWB)	As needed
0x0E	Overlapping PNID	Non-beacon IE
0x0F	Overlapping PNID	Non-beacon IE
0x10	Piconet services	Non-beacon IE
0x11-0x7E	Reserved	
0x7F	AEP Status	As needed
0x80-0xFF	Vendor specific	As needed

FIG. 11B

Octet: 1	...	1	1	1	1
DEV_n AEP Status (=DEVID)	...	DEV_2 AEP Status (=DEVID)	DEV_1 AEP Status (=DEVID)	Length (=1 * n)	Element ID (=0x7F)

FIG. 12

Octets: 2	4	2	2
Request index	Information requested	Length (=6)	Command type

FIG. 13

Octets: n	2	2
IEs provided	Length (=n)	Command type

FIG. 14

Octets: 1	2	2
DEVID	Length (=1)	Command type
		0x00FE

FIG. 15

Octets: 1	1	2	2
SrcID	DestID	Length (=2)	Command type
			0x00FF

FIG. 16

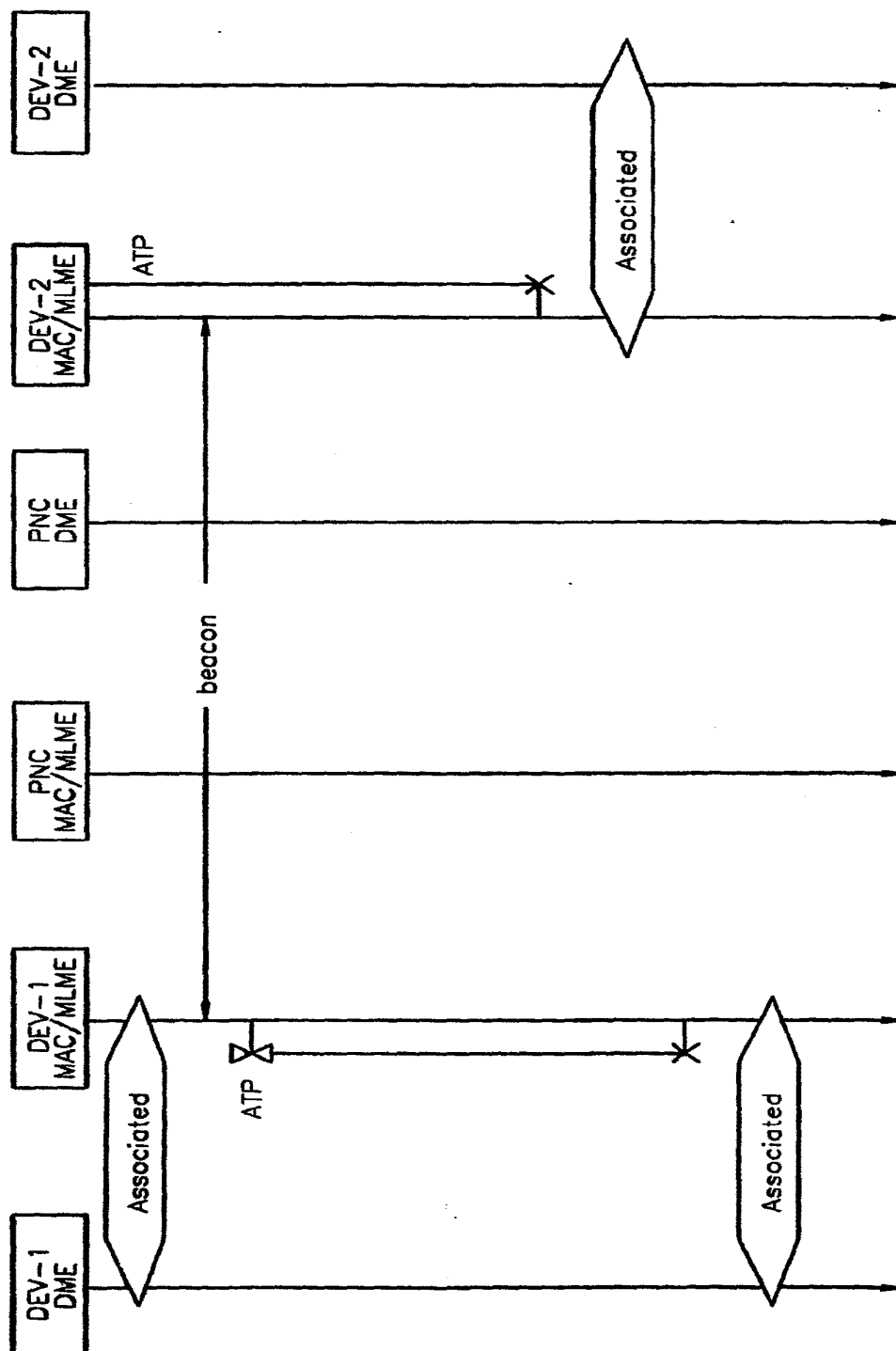


FIG. 17A

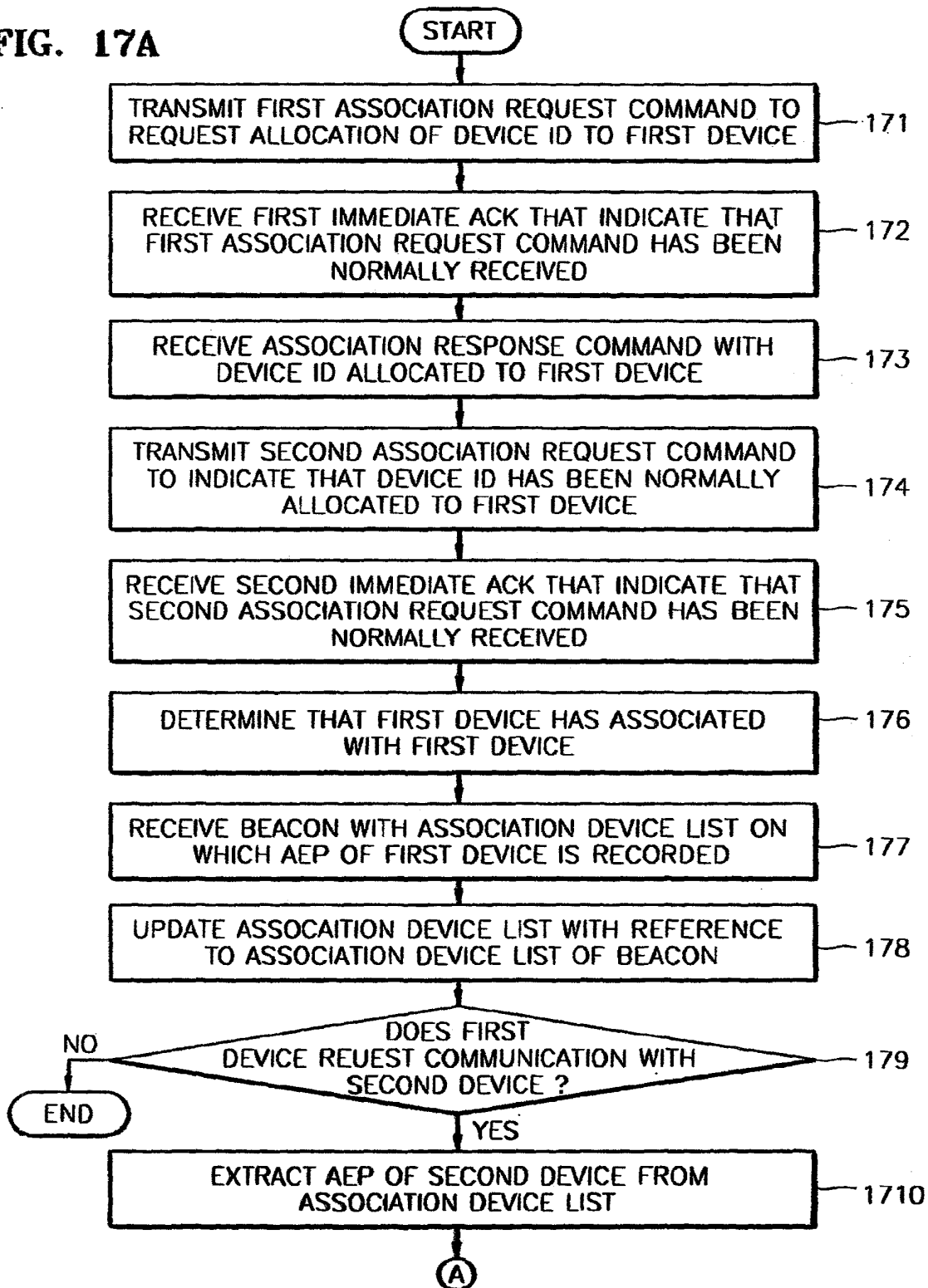


FIG. 17B

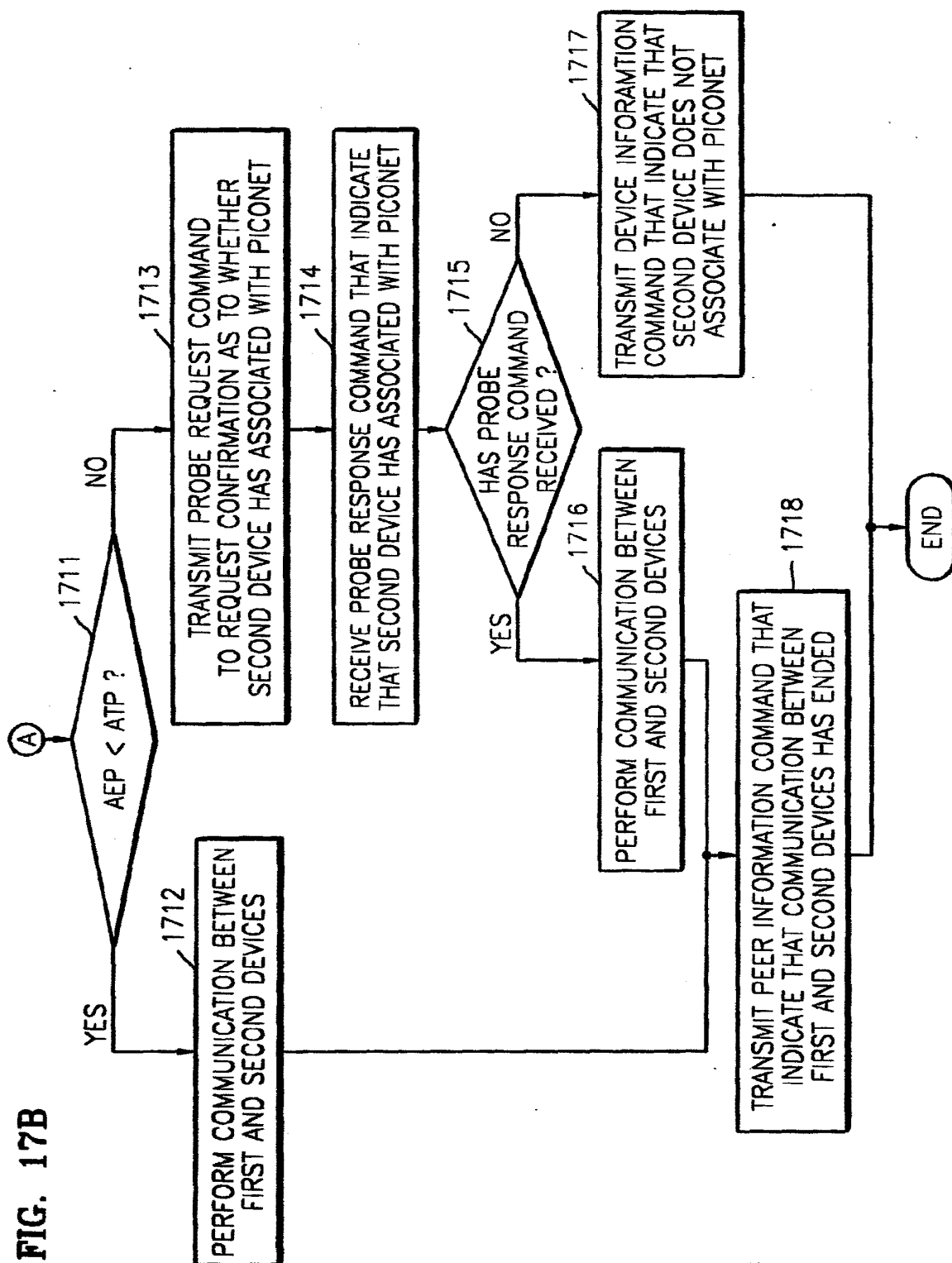
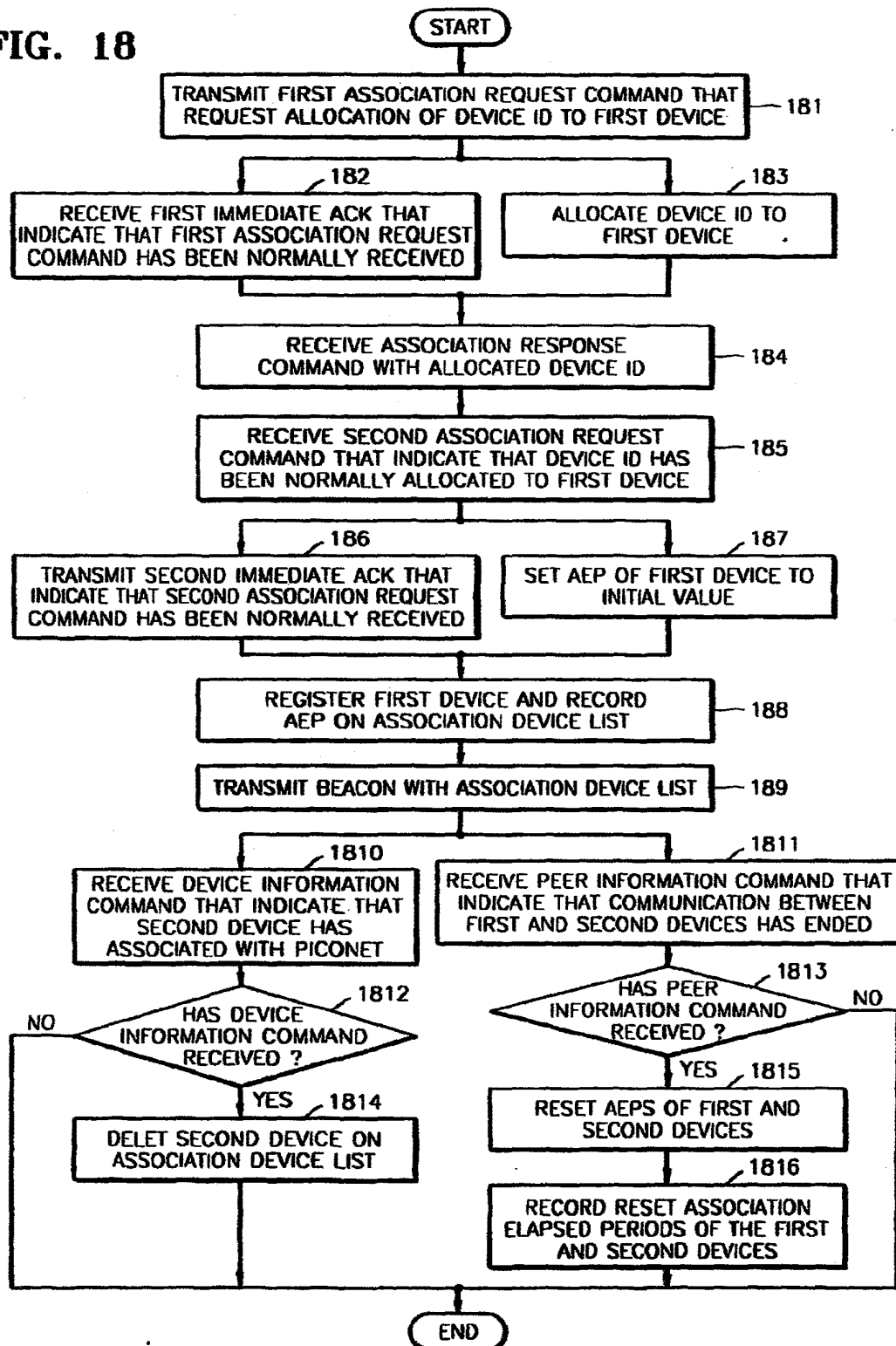


FIG. 18





(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
22.02.2006 Bulletin 2006/08

(51) Int Cl.:
H04L 12/56(2006.01)

(43) Date of publication A2:
27.10.2004 Bulletin 2004/44

(21) Application number: 04252388.6

(22) Date of filing: 23.04.2004

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

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(30) Priority: 25.04.2003 KR 2003026425

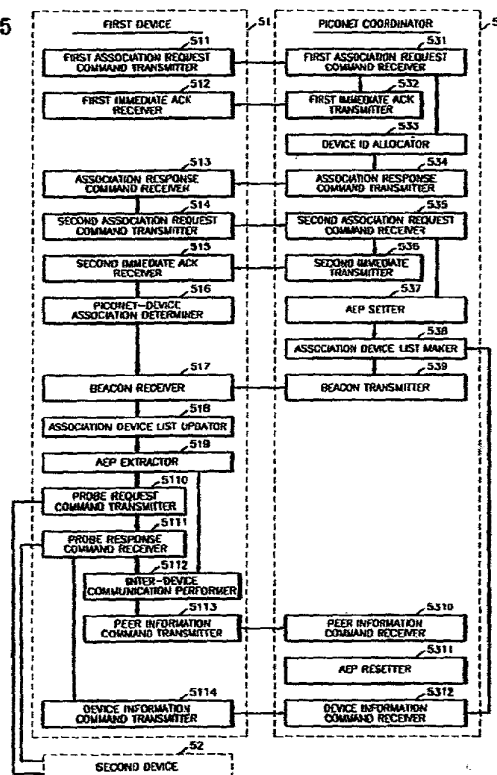
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(54) System and method for managing the association of a device with a piconet

(57) A system that manages associations of devices with a piconet is provided. The system includes a piconet-device association coordinator (53), which receives, from a first device (51), a second association request command that indicates a proper allocation of a device ID to the first device (51), sets an association elapsed period of the first device (51) to an initial value, and registers the first device (51) and records the association elapsed period to an association device list so that the first device (51) corresponds to the association elapsed period; and a piconet-device associator (51), which updates an association device list of the first device (51) by referring to the association device list, extracts an association elapsed period of a second device (52) registered on the updated association device list from the updated association device list when the first device (51) requests communication with the second device (52), and performs the communication between the first and second devices if the extracted association elapsed period is shorter than an association timeout period.

FIG. 5





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 25 2388

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D, A	<p>LAN/MAN STANDARDS COMMITTEE OF THE IEEE COMPUTER SOCIETY: "Draft P 802.15.3, Part 15.3: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for High Rate Wireless Personal Area Networks (WPAN), pg:1-xiv, chptrs: 7, 8" 17 February 2003 (2003-02-17), DRAFT P802.15.3/D17, PAGE(S) 107-228 , XP002294149</p> <p>* chapter 5.3.3 *</p> <p>* chapters 7.3.1, 7.4.4 and 7.5.1 *</p> <p>* chapter 8.3 *</p> <p>* chapter 8.9.2 *</p> <p>-----</p>	1-29,31, 32	H04L12/56
			TECHNICAL FIELDS SEARCHED (IPC)
			H04L H04Q
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 October 2005	Examiner Müller, N
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone</p> <p>Y : particularly relevant if combined with another document of the same category</p> <p>A : technological background</p> <p>O : non-written disclosure</p> <p>P : intermediate document</p> <p>T : theory or principle underlying the invention</p> <p>E : earlier patent document, but published on, or after the filing date</p> <p>D : document cited in the application</p> <p>L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p>			

3
EPO FORM 1503 03.82 (P04C01)



European Patent
Office

Application Number
EP 04 25 2388

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-29, 31, 32



European Patent
Office

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 04 25 2388

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-29,31,32

In a piconet, the association device list records association elapsed periods together with information about associated devices. In particular, a piconet coordinator sends a beacon frame including the association elapsed periods of the associated devices. The devices receiving the beacon know the association elapsed periods (ie. the association status) of all associated devices.

2. claims: 30,33

A piconet coordinator (PNC) is informed about the end of a communication between associated devices.

Electronic Acknowledgement Receipt

EFS ID:	3612638
Application Number:	12159753
International Application Number:	
Confirmation Number:	1409
Title of Invention:	INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK
First Named Inventor/Applicant Name:	Marinus Johannes Blange
Customer Number:	23460
Filer:	Mark Joy
Filer Authorized By:	
Attorney Docket Number:	263935
Receipt Date:	14-JUL-2008
Filing Date:	
Time Stamp:	16:53:43
Application Type:	U.S. National Stage under 35 USC 371

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		263935idsefs.pdf	243032 53d286614d6dd05cf5f95dcbd118bd382412683	yes	5

	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Information Disclosure Statement (IDS) Filed		1	4	
	Information Disclosure Statement (IDS) Filed		5	5	
Warnings:					
Information:					
2	Foreign Reference	263935fr1.pdf	1772824	no	30
			3164eced2834a7d4204bf7a272f8fca733c2b9e1		
Warnings:					
Information:					
3	NPL Documents	263935npl1_001.pdf	654021	no	6
			304c39c9cad8c1ea3886ceebffde5f397888513		
Warnings:					
Information:					
4	NPL Documents	263935npl2_001.pdf	1263163	no	14
			62630b04371b96abf89b728d79f68bf099c88955		
Warnings:					
Information:					
5	NPL Documents	263935np13_001.pdf	159920	no	5
			c003b18fedf19c70443d87f06b9dc7bee25936d		
Warnings:					
Information:					
Total Files Size (in bytes):			4092960		

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.

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371		ATTORNEY'S DOCKET NUMBER 263935
		CLIENT REF. NO. P74240US00
		U.S. APPLICATION NO. (if known, see 37 CFR 1.5) Unassigned
INTERNATIONAL APPLICATION NO. PCT/NL2007/000001	INTERNATIONAL FILING DATE January 2, 2007	PRIORITY DATE CLAIMED December 30, 2005
TITLE OF INVENTION INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK		
APPLICANT(S) FOR DO/EO/US Marinus Johannes Blangé and Miodrag Djurica		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<ol style="list-style-type: none"> 1. ☒ This is a FIRST submission of items concerning a filing under 35 USC 371 and 37 CFR 1.491. 2. ☐ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 USC 371 and 37 CFR 1.491. 3. ☒ This is an express request to begin national examination procedures (35 USC 371(f)). 4. ☐ The US has been elected (PCT Article 31) in a Chapter II Demand filed during the international phase. 5. ☒ A copy of the International Application as filed (35 USC 371(c)(2)) <ol style="list-style-type: none"> a. ☐ is attached hereto (required only if not communicated by the International Bureau). b. ☒ has been communicated by the International Bureau. c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US). 6. ☐ An English language translation of the International Application as filed (35 USC 371(c)(2)). <ol style="list-style-type: none"> a. ☐ is attached hereto. b. ☐ has previously been submitted under 35 U.S.C. 154(d)(4). 7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 USC 371(c)(3)) <ol style="list-style-type: none"> a. ☐ are attached hereto (required only if not communicated by the International Bureau). b. ☐ have been communicated by the International Bureau. c. ☐ have not been made; however, the time limit for making such amendments has NOT expired. d. ☒ have not been made and will not be made. 8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 USC 371(c)(3)). 9. ☐ An oath or declaration of the inventor(s) (35 USC 371(c)(4)). 10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 USC 371(c)(5)). 11. Nucleotide and/or Amino Acid Sequence Submission <ol style="list-style-type: none"> a. ☐ Computer Readable Form (CRF) b. Specification Sequence Listing on: <ol style="list-style-type: none"> i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper Copy c. ☐ Statement verifying identity of above copies 		
Items 12 to 20 below concern other document(s) or information included:		
<ol style="list-style-type: none"> 12. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98. <div style="margin-left: 20px;"> ☐ Form PTO-1449 ☐ Copies of References (except for U.S. patents and applications) </div> 13. ☐ An assignment for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 14. ☒ A FIRST preliminary amendment. 15. ☐ A SECOND or SUBSEQUENT preliminary amendment. 16. ☐ A substitute specification. 17. ☐ A change of power of attorney and/or address letter. 18. ☒ Application Data Sheet Under 37 CFR 1.76 19. ☐ Return Receipt Postcard 		

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

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) Unassigned	INTERNATIONAL APPLICATION NO. PCT/NL2007/000001	ATTORNEY DOCKET NO. 263935	CLIENT REF. NO. P74240US00
20. ☐ Other items or information:			
The following fees are submitted:		CALCULATIONS	PTO USE ONLY
21. ☒ Basic national fee (37 CFR 1.492(a))..... \$310		\$310.00	
22. ☒ Examination Fee (37 CFR 1.492(b)) If international preliminary examination report prepared by USPTO and all claims satisfy provisions of PCT Article 33(1)-(4) \$ 0 All other situations \$210		\$210.00	
23. ☒ Search Fee If the written opinion of the ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) \$ 0 USPTO was ISA \$100 Search report provided to USPTO by other entity \$410 All other situations \$510		\$410.00	
TOTAL OF 21, 22 AND 23 =		\$930.00	
☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing or computer program listing filed in an electronic medium). The fee is \$260 for each additional 50 sheets of paper or fraction thereof. Enter number of sheets here: - If application is filed in paper form, enter this number in Total Sheets, below. - If application is filed via EFS-Web, multiply this number by 0.75 and enter result in Total Sheets, below.			
Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round up to a whole number)	RATE
- 100 =	/ 50 =		x \$260
			\$
☐ Surcharge of \$130 for furnishing the National fee or oath or declaration later than 30 months from the earliest claimed priority date (37 CFR 1.492(h)).		\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total Claims	22 - 20 =	2	x \$ 50 =
Independent Claims	4 - 3 =	1	x \$210 =
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$370 =
TOTAL OF ABOVE CALCULATIONS =			\$1,240.00
☐ Applicant claims small entity status. See 37 CFR 1.27. Fees above are reduced by 1/2.		\$ ()	
SUBTOTAL=		\$1,240.00	
☐ Processing fee of \$130 for furnishing English Translation later than 30 months from the earliest claimed priority date.		\$	
TOTAL NATIONAL FEE=		\$1,240.00	
☐ Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40 per property.		\$	
☐ One-month extension of time fee of \$ 0.00		\$ 0.00	
☒ Petition for an extension of time (including the period noted above, if checked), as well as for any additional period necessary to render the present submission timely. Please charge Deposit Account No. 12-1216 for the appropriate petition fee.			
TOTAL FEES ENCLOSED=		\$1,240.00	
		Amount to be refunded	\$
		Amount to be charged:	\$

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) Unassigned	INTERNATIONAL APPLICATION NO. PCT/NL2007/000001	ATTORNEY DOCKET NO. 263935	CLIENT REF. NO. P74240US00
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a. ☐ No fee is believed to be due.

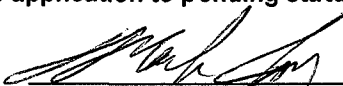
b. ☒ Please charge Deposit Account No. 12-1216 the total fee indicated above. A duplicate copy of this communication is enclosed for that purpose (unless submitted via EFS-Web).

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 12-1216. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO CUSTOMER NO.

23460


Mark Joy, Registration No. 35,562
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Date: June 30, 2008

Application Data Sheet

APPLICATION INFORMATION

Application Number:: Unassigned
Filing Date::
Application Type:: Regular
Subject Matter:: Utility
Suggested classification::
Suggested Group Art Unit::
CD-ROM or CD-R?:: None
Number of CD Disks:
Number of Copies of CDs::
Sequence Submission?::
Computer Readable Form (CRF)?::
Number of Copies of CRF::
Title:: INITIALIZATION OF A WIRELESS
COMMUNICATION NETWORK
Attorney Docket Number:: 263935
Request for Early Publication?:: No
Request for Non-Publication?:: No
Suggested Drawing Figure::
Total Drawing Sheets:: 3
Small Entity?:: No
Latin Name::
Variety denomination name::
Petition Included?::
Petition Type::
Licensed US Govt. Agency::
Contract or Grant Numbers::
Secrecy Order in Parent Appl.?:: No

APPLICANT INFORMATION

Applicant Authority Type::	Inventor
Primary Citizenship Country::	Netherlands
Status::	Full Capacity
Given Name::	Marinus
Middle Name::	Johannes
Family Name::	Blangé
Name Suffix::	
City of Residence::	Nootdorp
State or Prov. of Residence::	
Country of Residence::	Netherlands
Street of mailing address::	Withof 19
City of mailing address::	Nootdorp
State or Province of mailing address::	
Country of mailing address::	Netherlands
Postal or Zip Code of mailing address::	2631 SM
Applicant Authority Type::	Inventor
Primary Citizenship Country::	Netherlands
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Middle Name::	
Family Name::	Djurica
Name Suffix::	
City of Residence::	Rotterdam
State or Prov. of Residence::	
Country of Residence::	Netherlands
Street of mailing address::	Schepenstraat 7C
City of mailing address::	Rotterdam
State or Province of mailing address::	
Country of mailing address::	Netherlands
Postal or Zip Code of mailing address::	3039 NA

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E-mail Address:: mail@leydig.com

REPRESENTATIVE INFORMATION

Representative Customer Number:: 23460

Representative Designation:: Registration Number:: Representative Name::

DOMESTIC PRIORITY INFORMATION

Application::	Continuity Type::	Parent Application::	Parent Filing Date::
This Application	National Stage of	PCT/NL2007/000001	01/02/07

FOREIGN APPLICATION INFORMATION

Country::	Application Number::	Filing Date::	Priority Claimed
EP	05078044.4	12/30/05	Yes

ASSIGNEE INFORMATION

Assignee name:: Nederlandse Organisatie voor toegepast-
natuurwetenschappelijk Onderzoek TNO

Street of mailing address:: Schoemakerstraat 97

City of mailing address:: Delft

State or Province of
mailing address::

Country of mailing
address:: Netherlands

Postal or Zip Code of
mailing address:: 2628 VK

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application No. Unassigned

Confirmation No. Unassigned

Applicant: Blangé et al.

Filed:

TC/AU: Unassigned

Examiner: Unassigned

Docket No.: 263935 (Client Reference No. P74240US00)

Customer No.: 23460

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

PRELIMINARY AMENDMENT

Dear Sir:

Prior to the examination of the above-identified patent application, please enter the following amendments and consider the following remarks.

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks begin on page 10 of this paper.

AMENDMENTS TO THE SPECIFICATION

At page 1, line 1, insert: "FIELD OF THE INVENTION"

At page 1, line 4, insert: "BACKGROUND"

At page 4, line 16, insert: "SUMMARY OF THE INVENTION"

At page 7, line 9, insert: "BRIEF DESCRIPTION OF THE DRAWINGS"

At page 7, line 20, insert: "DETAILED DESCRIPTION OF THE DRAWINGS"

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application.

1. (Original) A wireless communication network that comprises an association unit and a plurality of stations, each station being configured to start up in a not-associated state and to transmit association request messages in the not-associated state, each station being configured to switch to an associated state upon reception of an association grant in response to one of its association request messages, the association request message and/or the association grant in response thereto establishing an operating route associated with the station for exchanging operating messages with the association unit during subsequent operation, the operating route associated with the station running through a source of the association grant in response to said one of the association request messages and, if the source of the association grant is not the association unit, the operating route between the source of the association grant and the association unit previously established for the source of the association grant in response to association request messages and/or the association grants for intermediate stations, in which network

- the association unit is configured to transmit association grants as responses to received ones of the association request messages;

- at least part of the stations is configured to become active to transmit association grants as responses to received ones of the association request messages, but only after switching to the associated state upon an association grant from the association unit or one of the at least part of the stations switched to the associated state directly or indirectly based on an association grant from the association unit.

2. (Original) A wireless communication network according to claim 1, wherein said part of the stations comprises at least one dual function station, said dual function station being configured to transmit association grants only after receiving a secondary association grant, the dual function station being configured to transmit one or more secondary association request messages to the association unit along its operating route when in the associated state, only the association unit being configured to originate the secondary association grant in response to the secondary association request message.

3. (Original) A wireless communication network according to claim 2, wherein the dual function station is configured to transmit information to the association unit indicating from which of the stations said dual function station has received transmissions, the association unit being configured to select whether to grant the secondary association request dependent on said information.

4. (Original) A wireless communication network according to Claim 3, wherein the stations are configured to transmit discovery messages before switching to the associated state, said transmissions comprising at least the discovery messages.

5. (Original) A wireless communication network according to Claim 1, wherein each station from said at least part of the stations is configured to transmit discovery advertisement messages including an identification of the station from said at least part of the stations, the stations that transmit association request messages being configured to address the association request messages using identifications from the discovery advertisement messages.

6. (Original) A wireless communication network according to Claim 5, wherein each station in said at least part of the stations is configured to indicate, in the discovery advertisement messages, whether the station is enabled to transmit association grants, the stations that transmit association requests being configured to transmit association requests addressed to stations from said at least part of the stations only if the addressed station has indicated in at least one of the discovery advertisement messages that it is enabled to transmit association grants.

7. (Original) A wireless communication network according to claim 2, wherein the dual function station comprises a first and second unit, each with at least a respective antenna, coupled via a mechanically flexible connection, the first unit being configured to transmit first ones of the association request messages and to receive first ones of the association grants, the second unit being configured to receive second ones of the association request messages and to the transmit second ones of the association grants in response to the first ones of the association request messages.

8. (Currently amended) A wireless communication network according to ~~any~~ claim 2, wherein the dual function station is configured to operate using respective, mutually distinct first and second frequency channels, using the first frequency channel for transmitting association request messages and receiving association grants, and using the second frequency channel for receiving association request messages and transmitting association grants.

9. (Currently amended) A wireless communication network according to ~~any one of the preceding claims~~ claim 1, wherein said at least part of the stations are configured to transmit route information toward the association unit after transmitting an association grant, the route information defining the associated route for the station to which the association grant has been sent.

10. (Original) A wireless communication network according to claim 9, wherein said at least part of the stations is configured to forward at least part of the route information towards the association unit, to store at least a further part of the route information and to route subsequent messages from the association unit to the station for which the route information was sent according to said stored at least further part.

11. (Original) A station for use in a wireless communication network, the station comprising a transmitter arrangement, a receiver arrangement and a processor circuit coupled to the transmitter arrangement and the receiver arrangement, the processor circuit being configured to start up in a not-associated state and to cause the transmitter arrangement to transmit association request messages in the not-associated state, the processor circuit being configured to switch to an associated state upon reception at the receiver arrangement of an association grant in response to one of the association request messages, the processor circuit being configured to establish an associated route for communication with an association unit during subsequent communication of operating messages to an association unit, the associated route including a source of the association grant, and, if the source of the association grant is not the association unit, the operating route between the source of the association grant and the association unit previously established for the source of the association grant in response to association request messages and/or the association grants for intermediate stations, the processor circuit being configured to cause the transmitter arrangement to initiate and transmit association grants in response to association request messages, but only after switching to the associated state.

12. (Original) A station according to claim 11, wherein the processor circuit is configured, when switched to the associated state, to cause the transmitter arrangement to transmit a secondary association request message to the association unit, and to cause the transmitter arrangement to transmit the association grants only after receiving a secondary association grant in response to said secondary association request message.

13. (Original) A station according to claim 11 ~~or 12~~, wherein the processor circuit is configured to send information to the association unit indicating from which one of the stations said dual function station has received messages prior to receiving the secondary association grant.

14. (Original) A dual function station for use in a wireless communication network, the station comprising

- a first unit and a second unit, each of the first and second unit comprising a transmitter and a receiver, each of the first and second unit comprising one or more antennas respectively, coupled to the transmitter and the receiver, the first and second unit being configured to operate concurrently in mutually different frequency channels;

- a processor circuit coupled to the transmitters and the receivers of the first and second unit, the processor circuit being configured to awaken the receiver of the first unit in first periodic time slots, and to awaken the receiver of the second periodic time slots, the first and second time-slots being mutually asynchronous, and to relay messages received in the first unit for transmission by the second unit and vice versa.

15. (Original) A dual function station according to claim 14, comprising a mechanically flexible connection between the antennas of the first and second unit.

16. (Original) A method of operating a wireless communication network that comprises an association unit and a plurality of stations, the method comprising

- installing the stations in a not-associated state;
- transmitting association request messages from stations in the not-associated state;
- transmitting the association grants in response to the association request messages,
- switching each station to an associated state when the station has received an association grant in response to one of its association request messages;
- storing route information defining a route between the station that has switched to the associated state and the association unit, the route including the station that has sent the associated grant and, if the source of the association grant is not the association unit, the operating route between the source of the association grant and the association unit previously established for the source of the association grant in response to association request messages and/or the association grants for intermediate stations; wherein
- each association grant is transmitted only from the association unit or from an intermediate station, the latter only after said intermediate station has switched to the associated state upon an association grant from the association unit or one of the at least part of the stations switched to the associated state directly or indirectly based on an association grant from the association unit..

17. (Original) A method according to claim 16, wherein the intermediate station is a dual function station, the method comprising

- transmitting a secondary association request message from the dual function station when the dual function is in the associated state;
- transmitting a secondary association grant originating from the association unit in response to the secondary association request message;
- enabling the dual function station to transmit the association grants only upon receiving the secondary association grant.

18. (Original) A method according to claim 17, comprising

- transmitting information from the intermediate station to the association unit about from which one of the stations the intermediated station has received transmissions;
- selecting, in the association unit, whether to grant the secondary association request dependent on said information.

19. (Currently amended) A method according to claim 18, comprising transmitting discovery messages from the stations before switching to the associated state, said transmissions comprising the discovery messages.

20. (Currently amended) A method according to claim 17, further comprising the steps of:

- transmitting discovery advertisement messages from at least part of the stations, including an identification of the station that has transmitted the discovery advertisement message;
- addressing the association request messages using identifications from the discovery advertisement messages.

21. (Currently amended) A method according to claim 20, further comprising the steps of:

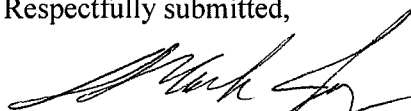
- including an indication in the discovery advertisement messages, whether the station that transmits the discovery advertisement message is enabled to transmit association grants,
- transmitting association requests addressed to stations only if the addressed station has indicated that it is enabled to transmit association grants.

22. (Currently amended) A method according to Claim 17, further comprising switching the intermediate station to operate at a first and second, mutually different transmission frequency after switching to the associated state, for directly or indirectly communicating with the association unit and for communicating with its associated stations respectively.

REMARKS

If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Mark Joy', is written over a horizontal line.

Mark Joy, Reg. No. 35,362
LEYDIG, VOIT & MAYER, LTD.
Two Prudential Plaza, Suite 4900
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Date: June 30, 2008

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK			
First Named Inventor/Applicant Name:	Marinus Johannes Blange			
Filer:	Mark Joy			
Attorney Docket Number:	263935			
Filed as Large Entity				
U.S. National Stage under 35 USC 371 Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
National Stage Fee	1631	1	310	310
Natl Stage Search Fee - Report provided	1642	1	410	410
National Stage Exam - all other cases	1633	1	210	210
Pages:				
Claims:				
Claims in excess of 20	1615	2	50	100
Independent claims in excess of 3	1614	1	210	210
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1240

Electronic Acknowledgement Receipt

EFS ID:	3544565
Application Number:	12159753
International Application Number:	PCT/NL07/00001
Confirmation Number:	1409
Title of Invention:	INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK
First Named Inventor/Applicant Name:	Marinus Johannes Blange
Customer Number:	23460
Filer:	Mark Joy
Filer Authorized By:	
Attorney Docket Number:	263935
Receipt Date:	30-JUN-2008
Filing Date:	
Time Stamp:	17:54:07
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 1240
RAM confirmation Number	4056
Deposit Account	121216
Authorized User	

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File Listing:					
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	Multipart Description/PDF files in .zip description				
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	Transmittal of New Application		1	3	
	Application Data Sheet		4	7	
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2	Fee Worksheet (PTO-06)	fee-info.pdf	8588 9d8c9a215c12fbd8e6a1b58f2336a5c42567cc37	no	2
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Total Files Size (in bytes):			582359		
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(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
12 July 2007 (12.07.2007)

PCT

(10) International Publication Number
WO 2007/078193 A1

(51) International Patent Classification:
H04L 12/56 (2006.01)

(21) International Application Number:
PCT/NL2007/000001

(22) International Filing Date: 2 January 2007 (02.01.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
05078044.4 30 December 2005 (30.12.2005) EP

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

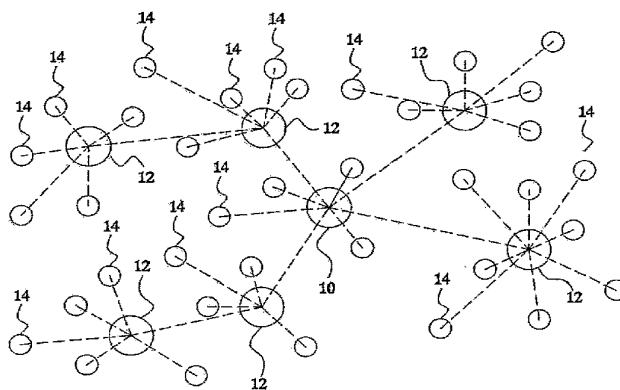
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **INITIALIZATION OF A WIRELESS COMMUNICATION NETWORK**



(57) **Abstract:** A wireless communication network comprises an association unit and a plurality of stations. At least part of the stations store association information indicative of an associated route for transmission of messages from the station to the association unit. The association information is generated by installing the stations in a not-associated state; transmitting association request messages from stations in the not-associated state; and transmitting association grant messages in response to the association request messages. Each association grant message is transmitted only from the association unit or, at least when the station that has transmitted association request message is outside a reception range of the association unit, from one of the stations that is in an associated state. Each station that has received the association grant message in response to its association request message is switched to the associated state. Association information is stored that indicates the station that has sent the association grant message as part of the associated route to the association unit.

Title: Initialization of a wireless communication network

The invention relates to a method of operating a wireless communication network, to a wireless communication system that uses such a method and to stations for use in such a network.

5 US patent application No. 2003/0151513 describes a wireless sensor station network. In operation data from the sensor stations is transmitted in multiple hops to a central panel and vice versa. This is because the sensor stations are not able to transmit directly to the central panel. Each sensor station is given its own, fixed route for transmitting and receiving data to and
10 from the central panel. Typically, the data is first sent to another sensor station and from there to another sensor station and so on until a cluster head is reached. Then the data is sent through a network of cluster heads to the central panel.

After installation of the sensor stations at various locations in a
15 sensing area a network topology is dynamically formed. That is, the routes for each of the sensor stations are automatically selected and programmed into the sensor stations. In US patent application No. 2003/0151513 describes a number of methods of dynamically forming the routes from the sensor stations to cluster head units that channel communication from groups of sensor
20 stations. The initiative is taken by the cluster head unit, which transmits link discovery messages, which alert nearby sensor stations about the availability of the cluster head. These sensor stations forward the link discovery messages. Further sensor stations may receive and forward the forwarded link discovery messages and so on. The link discovery packets function to synchronize
25 communication clocks of the cluster head and the sensor stations.

Next the routes for transmitting messages from the sensor stations to the association unit are defined. In one embodiment this is done by transmitting and forwarding route discovery packets from the association unit.

The forwarded route discovery packets indicate the number of hops over which they have been forwarded. In this embodiment each sensor stations picks a route by selecting the association unit or sensor station from which it received a route discovery packet over least hops. The sensor stations record an
5 indication of these routes for later use in normal operation. Subsequently, the sensor stations send route registration packets to the association unit to indicate the route that they have selected.

In another embodiment the sensor stations send link registration messages without waiting for route discovery messages. These link
10 registration messages may reach the association unit via each available route. In this embodiment the association unit selects routes for the sensor stations from which it has received link registration messages. After making the selection the association unit sends route definition messages to the sensor stations for recording an indication of these routes for later use in normal
15 operation.

A problem with these techniques is that they require transmission of information via sensor stations before the routing topology has been defined, i.e. when plural routes are still possible. This complicates the (sensor) stations, because they have to support different modes of communication while
20 operating in low-power mode. If forwarding of information is only done using the definite routing topology, a central approach is slow (each station has to wait until its upward station has centrally been assigned a route) and a decentral approach is inefficient (a routing topology with an unnecessary amount of branches has been created)

25 Another problem that may occur is that the wireless links between nodes are hindered by barriers and that using the same frequency for upward and downward link routes requires synchronization. This complicates the (sensor) station, because they have to support synchronization and powerful RF signals.

30 A mobile communications protocol is known from an article titled

"TBONE: A Mobile-Backbone Protocol for Ad Hoc Wireless Networks" by Izhak Rubin et al. and published in the IEEE Aerospace Conference proceedings 2002 (Piscataway NJ, March 9-16, 2002) page 2727-2740. The mobile protocol of this article uses two types of network: a high power network termed the
5 BNET, or backbone, and a plurality of low power networks called ANETs. In each low power network (ANET) low power nodes communicate under control of a central node of that ANET. Each of the central nodes also functions as backbone node, i.e. as a node in the high power backbone network.

Devices are provided that are capable of operating as backbone
10 nodes. Initially, each of these devices decides whether it will switch to operation as backbone node, dependent on whether it has a higher qualifications to do so than neighboring devices that are capable of operating as backbone nodes. Subsequently, those devices that have switched to operation as backbone nodes receive join requests from remaining nodes that
15 want to become part of a low power network (ANET) centred on a particular backbone node. The low power networks (ANETs) are formed by granting these join requests. Join requests can come from both remaining backbone capable devices that have not decided to operate as backbone devices, and from low power nodes that are not capable of operating as backbone devices at all.

20 The article also describes the possibility that remaining backbone capable devices (that have not initially decided to operate as backbone devices) can be commanded to become backbone nodes by existing backbone nodes. This happens when a remaining backbone capable device that is part of a low power network (ANET) receives and relays a join request from a requesting node that
25 cannot be accepted by any existing backbone node. When this happens the central backbone node of the low power network (ANET) commands the remaining backbone capable device to switch to operation as a backbone node and to grant the join request of the requesting node. In this case the remaining backbone capable device joins the high power network (BNET), sets up a low
30 power network (ANET) of its own and ceases to use the paths in the low power

network (ANET) of the commanding backbone node. The remaining backbone capable device uses the high power network to relay further messages to or from the requesting node. No provision is made for routing through successive previously established low power network (ANET) nodes and association for
5 this form of routing.

This system addresses the use of two types of network links: links in the low power networks and links in the high power networks. Direct communication links (not via other associated nodes) are used in the low power networks. The selection of communication paths in the high power network is
10 not described, but as high power communication is used longer range paths can be used in this network than in the low power networks. As the system is intended to provide communication in a dynamic environment rather than control of devices in the system there is no single central backbone node. The use of two types of network without central unit makes this system complex
15 and inefficient in bandwidth use.

Among others, it is desirable to provide for a wireless network wherein routes for communication can be determined without the need to forward information via stations for which the routes have not yet been
20 defined.

Among others, it is desirable to provide for a method of operating a wireless network wherein routes for communication can be determined without the need to forward information via stations for which routes have not yet been defined.

25 Among others it is desirable to provide for stations for flexible use in wireless networks.

The invention provides for a wireless communication network according to claim 1. This network allows routes between stations and an
30 association station to be set up for further use, using routes that have already

been defined in response to earlier associations. Each route is established when an association request from a station is granted. Establishment of a route is effected by the association unit for example by storing information that defines the route to the associated station in a memory that the
5 association unit uses to select the route each time when a message has to be sent to the associated station. Routes are established upon an association grant from the association unit or from a station that has switched to the associated state directly or indirectly based on an association grant from the association unit, in a wave of association that radiates from nodes to nodes
10 starting from the association unit. Only the association unit and stations that have an established route to the association unit, which has been established in this way in response to association requests and corresponding association grants by nodes along the route, are allowed to grant association requests. Therefore their routes can immediately be used for the station that is
15 associated.

In an embodiment a station is configured to transmit association requests first for association via an active frequency channel and subsequently, if the first transmitted association request is not granted, for association via an as yet unused frequency channel. The latter request may be
20 transmitted for example directly to the association unit. Because the route that is to be used to the station is established only upon association it is prevented that inconsistent multiple routes are assigned when such different association requests are transmitted.

More generally, in an embodiment the station that issues the
25 association grant to a specific station is configured to make issue of the association grant dependent on whether the specific station indicates that a function that is active in that specific station or not. This means that a specific station may associate with different other stations, dependent on whether the function is active in the specific station or not. As a result the specific station
30 has the opportunity to issue a plurality of association requests; without

activating the function and after the function is activated, for example with a request directly to the association unit. Thus, for example, if the function consumes a scarce resource (such as function that uses a frequency channel for communication between the stations, thereby excluding use of the frequency channel by other stations), it can be prevented that the resource is consumed needlessly by granting the association request before activating the function. Because the routes to stations are established only upon association it is prevented that inconsistent station addresses are assigned.

In an embodiment association is preceded by a discovery stage, wherein no routes are yet established but station discover other stations, that can function to relay messages. Thus, stations may be enabled first to discover addresses of available other stations to which association requests can be sent, or stations that may send association requests before a route is established. In a further embodiment discovery advertisement messages are used that identify stations that are enabled to grant discovery requests. Thus, it is made possible to avoid waste of energy or bandwidth on association requests that cannot be granted.

In another embodiment part of the stations are dual function stations, which start to send association grant messages only after receiving approval from the association unit to do so. Thus, the association unit has control over the selection of stations that act as relay station, even after the dual function station has obtained a route for its "own" messages (e.g. sensor messages from a built in sensor station). In an embodiment the dual function station comprises units that function as a beacon frame transmitter and as a station with sensor station-like communication abilities respectively. The association unit may follow a strategy of enabling such dual function stations selectively to avoid enabling many stations that act as relay for only a few stations each, or to avoid selecting stations when these will become a relay for messages for too many stations.

In another embodiment dual function stations are used that comprises a mechanically flexible connection between separate units that each have an antenna or antennas for transmission and reception. Thus such stations can be used to connect different spaces "around the corner".

5 In another embodiment dual function stations are used that operate concurrently in different frequency channels that are periodically active in time slots that repeat with different asynchronous periods. This simplifies coordination between different network parts.

10 These and other objects and advantageous aspects will be described for exemplary examples, using the following figures.

Figure 1 shows a wireless network

Figure 2 shows a station

Figure 3 shows a state diagram of a sensor station

15 Figure 4 shows a state diagram of a beacon frame transmitter

Figure 5a shows messages during a discovery phase

Figure 5b shows messages during an association phase

Figure 6 shows an embodiment of a beacon frame transmitter

Figure 7 shows a state diagram of a beacon frame transmitter

20

Figure 1 shows a wireless network. The network comprises an association unit 10, a plurality of beacon frame transmitters 12 and a plurality of sensor stations 14 (only some numbered explicitly). Fixed communication routes are defined between association unit 10 and sensor stations 14, using wireless communication links (shown by dashed lines) between association unit 10, beacon frame transmitters 12 and sensor stations 14. The communication routes form a tree structure with association unit 10 at its root and beacon frame transmitters 12 at its nodes. Each beacon frame transmitter 12 is coupled in a star topology to a number of the sensor stations 14.

25

Figure 2 shows a station. At the level of detail shown, the figure applies to beacon frame transmitters 12 as well as sensor stations 14. The station contains a receiver circuit 20, a transmitter circuit 22, a processor circuit 24, a memory 26 and, at least in case of sensor stations, a sensing circuit 28. Processor circuit 24 is coupled to receiver circuit 20, transmitter circuit 22, memory 26 and optionally to sensing circuit 28. Each of receiver circuit 20 and transmitter circuit 22 include an antenna (not shown).

Preferably, the antennas of receiver circuit 20 and transmitter circuit 22 are formed by a shared antenna of receiver circuit 20 and transmitter circuit 22.

Preferably the stations are battery operated, with on board batteries (not shown) or supplied by other on board power supplies such as solar cells. This means that it is desirable to reduce power consumption as much as possible.

In operation, data is exchanged between sensor stations 14 and association unit 10 via the links that are shown in figure 1. Because the links form a tree structure, a single route to and from association unit 10 is defined for each sensor station 12.

It should be appreciated that the communication routes are a result of selection from a greater number of possible routes. In principle, each sensor station 14 could communicate directly with association unit 10 and each beacon frame transmitter 12. In practice, a number of these direct communication routes are not possible, because of insufficient signal strength. But direct wireless communication from a sensor station 14 to still more than one beacon frame transmitters 12 and/or to association unit 10 may be possible. Similarly, each beacon frame transmitter 12 may be able to communicate directly with association unit 10 and/or a number of beacon frame transmitters 12.

The wireless connections shown in figure 1 are the result of a selection from these possible routes. A number of operable wireless communication links between sensor stations 14, beacon frame transmitters 12

and association unit 10 is not used. These links are not shown in figure 1.

Sensor stations 14 transmit messages to association unit 10 via fixed routes and conversely association unit 10 transmits messages to sensor stations via the fixed routes. The routes are defined by information in memory 26.

5 Each sensor station 14 stores at least information that is selective for the beacon frame transmitter 12 at the start of its route to association unit 10; this address information is used to form messages that the sensor station 14 sends to association unit 10. Typically, each beacon frame transmitter 12 stores at least information that is selective for the next beacon frame
10 transmitter 12 in the route or for association unit 10. This information is used to forward messages from the sensor station 14 sends to association unit 10. Alternatively, each sensor station 14 may store information that is selective for the entire route to association unit 10 and the sensor station 14 may use this information to form messages, from which beacon frame transmitters 12 can
15 determine how to forward the message.

Conversely, association unit 10 preferably stores information for each sensor station 14 that is selective for the beacon frame transmitter 12 at the start of the route to that sensor station 14. Association unit 10 uses this information to form messages that association unit 10 transmits to the sensor
20 station 14. Typically, association unit 10 stores information that identifies the entire route to each sensor station 14. The association unit 10 may use this information to form messages, from which beacon frame transmitters 12 can determine how to forward the message to the sensor station 14. Alternatively, each beacon frame transmitter 12 stores, for each sensor station 14 for which it
25 can receive messages, at least information that is selective for the next beacon frame transmitter 12 in the route to that sensor station 14. This information is used to forward messages for the sensor station 14 from association unit 10 to the sensor station 14.

An embodiment of the part of operation wherein the routes are established will now be described. Basically this embodiment includes two stages:

- a discovery stage wherein beacon frame transmitters 12 and sensor stations 14 become "aware" of stations (association unit 10 or beacon frame transmitters 12 in the case of sensor stations and association unit 10, other beacon frame transmitters 12 and sensor stations 14 in the case of beacon frame transmitters 14) that are within reception range and
- an association stage wherein sensor stations 14 and beacon frame transmitters 14 (or sensor stations that are fixedly coupled to these beacon frame transmitters) send requests to associate to association unit 10 or beacon frame transmitters 12, i.e. to establish a route through the association unit 10 or beacon frame transmitter 12 for subsequent use.

The association stage for a sensor station 14 (or beacon frame transmitter 12) is completed when an association request is granted by the association unit 10 or a beacon frame transmitter 12. The route via the granting station is thereby established for subsequent use. In one embodiment each beacon frame transmitter 12 is enabled to grant association requests immediately after it has received a grant of an association request itself, but preferably the beacon frame transmitter 12 is enabled to grant association requests only after receiving secondary grant message, this time from the association unit 14 that allows the beacon frame transmitter 12 to grant association requests. Association unit 10 may for example make issuance of the secondary grant message dependent on information about the number of as yet unassociated stations that the beacon frame transmitter 12 has discovered. Thus, association unit 10 can control network topology.

Preferably, the association requests are addressed specifically to beacon frame transmitters 12 or the association unit 10, using addresses (or more generally any identifier of these stations) that have been discovered in the discovery stage. Thus, it is excluded that conflicting association grants can

be received in response to an association requests. However, addressing may be made unnecessary, for example when stations address all subsequent messages to one station that has sent a grant, or if some conflict resolution scheme is used.

5 In the embodiment the discovery stage comprises use of discovery messages from sensor stations 14 and beacon frame transmitters 12 (or sensor stations that are fixedly coupled to these beacon frame transmitters 12) and responses in reaction to these discovery messages. Alternatively or in addition, stations may be discovered from unsolicited messages. The discovery stage and
10 the association stage may overlap, the stations continuing to collect identifiers of discovered stations between transmission of association requests during the association stage. Alternatively non-overlapping consecutive stages may be used. In another embodiment the discovery stage may even be eliminated, for example if association requests are used that are not specifically addressed, or
15 if association requests are used to discover stations.

When the discovery stage and the association stage may overlap, it is preferred that beacon frame transmitters 12 include information in their messages to indicate whether they have been enabled to grant association requests (preferably in general, i.e. not limited to requests from specific sensor
20 stations 14, but in a further embodiment specific sensor stations 14 or beacon frame transmitters 12 from which association requests may be accepted may be indicated). Thus, sensor stations 14 and/or beacon frame transmitters 12 can avoid transmission of association requests to discovered beacon frame transmitters 12 that are not enabled to grant association requests.

25 Figure 3 shows a state diagram of operation of a sensor station 14 before a route is established. Figures 5a,b shows messages exchanged with sensor station 14 during discovery and association respectively. Initially the sensor station 14 is in a first state 31. In this first state 31 processor circuit 24 causes transmitter 22 to transmit discovery messages 50a, for example once
30 every minute, every two minutes or every hour. When processor circuit 24

detects that receiver 20 has received a beacon frame 52a from a beacon frame transmitter 12 or association unit 10, processor circuit 24 switches sensor station 14 to a second state 32. In this way, the beacon frame 52a acts as a discovery confirm message.

5 Preferably, sensor station 14 switches to second state 32 in response indiscriminately to both beacon frames 52a that are transmitted in response to the discovery message or to any other beacon frame that is received spontaneously. In an embodiment sensor station 14 switches to second state 32 in response only to beacon frames 52a wherein it is indicated that the
10 transmitting station is prepared to grant association requests and not to optional other beacon frames 52a that do not contain such an indication.

 In second state 32 processor circuit 24 causes transmitter 22 to transmit association request messages 54a for example once every minute, every two minutes or every hour. Preferably each association request message
15 54a includes an identification of the sensor station 14 that allows messages specifically directed at the sensor station 14 to be sent in response. Also preferably, processor 24 reads an identification of the beacon frame transmitter 12 or association unit 10 from a previously received discovery confirm message and includes that identification in the association request
20 message. This may be done for example when it is desirable to avoid collisions between association grant messages in response to the association request message.

 When processor circuit 24 detects that receiver 20 has received an association grant message 56a from a beacon frame transmitter 12 or
25 association unit 10 directed at the sensor station 14 of the processor circuit 24 in response to an association request message 54a, processor circuit 24 switches sensor station 14 to a third state 33 and records information for reaching this beacon frame transmitter 12 or the association unit 10 in memory 26 to define route to association unit 10 for use during normal
30 operation. Optionally sensor station sends an acknowledgment 58 of the

association grant message back to the beacon frame transmitter 12 or association unit 10.

In third state 33 sensor station 14 stops transmitting association request messages 54a. In one embodiment sensor station 14 stops transmitting
5 discovery messages 50a already when it switches to second state 32. Alternatively sensor station 14 may be arranged to continue transmitting discovery messages 50a in second state 32, only to stop after switching to third state 33 or after a predetermined time interval has elapsed after switching to second state 32, if this occurs earlier than the switch to third state 33.

10 In an embodiment a station is configured to transmit association requests first for association via an active frequency channel and subsequently, if the first transmitted association request is not granted, for association via an as yet unused frequency channel. The latter request may be transmitted for example directly to the association unit. Because the route
15 that is to be used to the station is established only upon association it is prevented that inconsistent multiple routes are assigned when such different association requests are transmitted.

More generally, in an embodiment the station that issues the association grant to a specific station is configured to make issue of the
20 association grant dependent on whether the specific station indicates that a function that is active in that specific station or not. This means that a specific station may associate with different other stations, dependent on whether the function is active in the specific station or not. As a result the specific station has the opportunity to issue a plurality of association requests: without
25 activating the function and after the function is activated, for example with a request directly to the association unit. Thus, for example, if the function consumes a scarce resource (such as function that uses a frequency channel for communication between the stations, thereby excluding use of the frequency channel by other stations), it can be prevented that the resource is consumed
30 needlessly by granting the association request before activating the function.

Because the routes to stations are established only upon association it is prevented that inconsistent station addresses are assigned.

Figure 4 shows a state diagram of operation of a beacon frame transmitter 12 before a route is established. Initially the beacon frame transmitter 12 is in a first state 41. In this first state 41 processor circuit 24 causes transmitter 22 to transmit discovery messages 50b, for example once every minute, every two minutes or every hour. When processor circuit 24 detects that receiver 20 has received a beacon frame 52b from another beacon frame transmitter 12 or association unit 10, processor circuit 24 switches beacon frame transmitter 12 to a second state 42. In this way, the beacon frame 52b acts as a discovery confirm message. In an embodiment discovery confirm messages may also be transmitted unsolicited, i.e. not in response to a discovery message, in this sense discovery messages could also be called "hello" messages. The term "discovery advertisement message" is used herein both for messages in response to discovery requests and unsolicited (hello) messages. Examples of use of discovery advertisement messages will be given in terms of discovery confirm messages, but unless indicated otherwise these examples apply generally for discovery advertisement messages. In a further embodiment stations need not transmit discovery messages 50a,b at all. In this case the stations listen only to unsolicited messages. The discovery confirm message does not need to be addressed to any station in particular: any station may react to any discovery confirm message.

Preferably, beacon frame transmitter 12 switches to second state 42 in response indiscriminately to both a beacon frame 52b that is transmitted in response to the discovery message or to any other beacon frame that is received spontaneously. In an embodiment sensor station 14 switches to second state 42 in response only to beacon frames 52b wherein it is indicated that the transmitting station is prepared to grant association requests and not to optional other beacon frames 52b that do not contain such an indication.

In second state 42 processor circuit 24 causes transmitter 22 to transmit association request messages 54b, for example once every minute, every two minutes or every hour. Preferably each association request message 54b includes an identification of the beacon frame transmitter 12 that allows
5 messages specifically directed at the beacon frame transmitter to be sent in response. Also preferably, processor 24 reads an identification of the beacon frame transmitter 12 or association unit 10 from a previously received discovery confirm message and includes that identification in the association request message. This may be done for example when it is desirable to avoid
10 collisions between association grant messages in response to the association request message.

When processor circuit 24 detects that receiver 20 has received an association grant message 56b from another beacon frame transmitter 12 or association unit 10 in response to an association request message 54b,
15 processor circuit 24 switches beacon frame transmitter 12 to a third state 43 and records information for reaching this other beacon frame transmitter 12 or the association unit 10 in memory 26 to define a route to association unit 10 for use during normal operation. Optionally frame transmitter 12 sends an acknowledgement 59 of the association grant message back to the beacon
20 frame transmitter 12 or association unit 10.

In third state 43 frame transmitter 12 stops transmitting association request messages 54b. In one embodiment frame transmitter 12 stops transmitting discovery messages 50b when it switches to second state 42. Alternatively frame transmitter 12 may stop after switching to third state 43,
25 or after a predetermined time interval has elapsed after switching to second state 42, if this occurs earlier than the switch to third state 42.

Preferably beacon frame transmitter 12 transmits discovery confirm messages in at least when in second and third state 42, 43. More preferably beacon frame transmitter 12 includes an indication in the discovery confirm
30 messages indicating whether the beacon frame transmitter 12 is ready to

respond to association grant messages with association requests. This allows stations to avoid using bandwidth for transmission of useless association requests. In principle beacon frame transmitter 12 may also be arranged to transmit discovery confirm messages in the first state 41. Preferably, when
5 beacon frame transmitter 12 receives a discovery request message from a sensor station 14 or another beacon frame transmitter 12 beacon frame transmitter 12 records an identification of the sensor station 14 or other beacon frame transmitter 12 from which the discovery request was received. Optionally beacon frame transmitter 12 also records identifications of stations
10 that have transmitted association requests that the beacon frame transmitter 12 did not respond to, if any.

In first state 41 and second state 42 beacon frame transmitter 12 does not respond to association request messages 54a. However, in third state 43 beacon frame transmitter 12 does respond to association request messages
15 54a. In this state processor circuit 24 causes transmitter 22 to transmit an association grant message 56a in response to each received association request message 54a, directed at the station that has sent association request message 54a, using the station identification in the association request message 54a. Processor circuit 24 includes information for reaching the beacon frame
20 transmitter 12 in the association grant message 56a and optionally also further information for reaching association unit 10.

Furthermore, beacon frame transmitter 12 transmits an update message 59 with information that the sensor station 14 has been associated to association unit 10 after sending the association grant message 56a (and after
25 receiving an optional acknowledgment 58 of that message).

This response of beacon frame transmitter 12 to association request messages 54a is not limited to such messages from sensor stations 14, but applies also to association request messages 54b from other beacon frame transmitters 12.

It should be noted that beacon frame transmitter 12 and sensor station 14 become stations of the network with well defined routes only when reaching their respective third states 33, 43. Furthermore it should be noted that beacon frame transmitters 12 respond to association request messages 54a,b only once they have entered their third state 43, that is, only when the beacon frame transmitter 12 has a well defined route to association unit 10. Thus, the information about association can be transmitted along the route that will be used during normal operation. This route may also be used as part of the route to the newly associated sensor station 14. Association unit 10 may use information from its memory, about the route to the beacon frame transmitter 12 to define the route to the sensor station 14. In another embodiment, the beacon frame transmitters 12 along the route may add their identity to inform association unit 10 of the route, or in yet another embodiment the beacon frame transmitter 12 that associates to the sensor station 14 may insert this information.

It may be noted that not all beacon frame transmitters 12 need to become part of the network as beacon frame transmitters. If a beacon frame transmitter 12 receives no association grant signal 56b or grants no association grant requests from other beacon frame transmitters 12 or sensor stations 14 the beacon frame transmitter 12 does not become a functional beacon frame transmitter in the network.

In an embodiment association unit 10 decides on whether a beacon frame transmitter 12 becomes a functional beacon frame transmitter. In this embodiment functional beacon frame transmitters 12 in third state 43 forward association requests 54a from other beacon frame transmitters 12 (and optionally also from sensor stations 14) to association unit 10 before sending an association grant message 56b. (Alternatively a further message derived from this association request is forwarded).

In this embodiment association unit 10 is arranged to grant or deny the forwarded association request in response to forwarding (or to the further

message). When the association request is granted association unit sends back a grant message, which is used to generate the association grant signal 56b to the original association request 54b. Thus association unit 10 (and/or a beacon frame transmitter 12) is enabled to control generation of the network topology, for example by first granting association to selected preferred beacon frame transmitters and granting association requests to others later only if this is still necessary to complete connections to all sensor stations 14.

In a further embodiment beacon frame transmitters 12 are arranged to supply information about the number and/or identity of the sensor stations 14 and or beacon frame transmitters 12 from which it has received beacon frame request messages and/or association request messages. The identity may be provided by including identity information in beacon frame request messages and/or association request messages. The beacon frame transmitters 12 may supply this information for example in their own beacon frame request messages and/or association request messages. In this further embodiment the association unit 10 (and/or a beacon frame transmitter) is provided with information which it may use to select beacon frame transmitters 12 for granting association. This may be used for example to distribute links over several beacon frame transmitters 12, or on the contrary to avoid distribution by concentrating links on one beacon frame transmitter 12.

In a further embodiment beacon frame transmitters 12 return grants of in response to association requests only after receiving a grant of a secondary association request, distinguished, at least in function, if not in format, from the previously described association request. For this purpose optionally an additional fourth state 44 may be added to the states of figure 4. When in third state 43 (after receiving the previously described grant to one of the previously described association requests, which will be termed primary association requests beacon frame transmitter 12 transmits a secondary association request to association unit 10. Upon receiving a grant of this secondary association request beacon frame transmitter 12 switches to the

fourth state 44. In this embodiment the beacon frame transmitter 12 is enabled to begin to return association grant messages to requesting stations only in fourth state 44. Optionally the beacon frame transmitter indicates this in discovery confirm messages.

5 Preferably beacon frame transmitter 12 is configured to include a list of stations from which beacon frame transmitter 12 has received discovery request messages (and/or not-granted association request) in the secondary association request. As an alternative beacon frame transmitter 12 may optionally be configured to transmit one or more accompanying messages to
10 provide such a list to association unit 10. This enables association unit 10 to select to which of the beacon frame transmitters 12 it will grant association requests of the second type. In this way association unit 10 can control the network topology, after admitting beacon frame transmitters 12 to the network by granting a primary association request.

15 In a preferred embodiment each functional beacon frame transmitter 12 (and association unit 10, which acts as a beacon frame transmitter in this respect) operates in a time slot scheme during normal operation, periodically transmitting a beacon signal to which the sensor stations 14 that are associated with that beacon frame transmitter may
20 synchronize. After the beacon signal the beacon frame transmitter 12 and its associated stations exchange messages for a limited period.

 This allows the beacon frame transmitters 12 and the sensor stations 14 to switch between a low power sleep mode and a normal operating mode. After exchanging messages the beacon frame transmitters 12 and the
25 sensor stations 14 switch to the sleep mode wherein power supply and/or clock signals to at least part of the beacon frame transmitter 12 and the sensor station 14 is switched off. After counting off a predetermined time-interval the beacon frame transmitters 12 and the sensor stations 14 switch back to the normal operating mode. With a predetermined delay after switching to the

normal operating mode the beacon frame transmitter 12 transmits the beacon frame and the sensor stations 14 receive this beacon frame.

In this embodiment the association unit 10 and/or the beacon frame transmitters preferably select the timing of the first of the periodic beacon frames so that the time slots of different beacon frame transmitters 12 that are within range to receive each others messages do not overlap. In this embodiment the information in the sensor stations 14 after association defines the time slot in which the sensor station 14 should switch to the normal operating mode.

In one embodiment each beacon frame transmitter 12 also switches to a forwarding mode in the time slot defined by the further beacon frame transmitter 12 through which the original beacon frame transmitter 12 transmits messages to the association unit 10 (or in the time slot of the association unit 10). When in the forwarding mode the original beacon frame transmitter 12 exchanges messages with the further beacon frame transmitter 12.

This embodiment has the disadvantage that overlap of the time slots of neighboring beacon frame transmitters 12 must be avoided. This means that beacon frame transmitters 12 must monitor time slots of other beacon frame transmitter 12. In turn this means that the beacon frame transmitters 12 cannot operate in the sleep mode as much as desirable.

In an alternative embodiment the beacon frame transmitter 12 are designed to transmit and receive in a selectable one of a plurality of frequency channels. In this embodiment the frequency channels for different functional beacon frame transmitters 12 are selected during initialization, for example by the beacon frame transmitters themselves after detecting that no messages are received in the frequency channel during a predetermined time period, or by the association unit 10 so that beacon frame transmitters 12 that have been detected to receive each other get different frequency channels to avoid collisions. In an embodiment the beacon frame transmitters 12 and their

associated sensor stations 14 switch to the selected frequency channel when they start normal operation. In this embodiment the information in the sensor stations 14 after association defines the frequency channel for communicating with the beacon frame transmitter 12. Use of different frequency channels has the advantage that no extensive synchronization between time slots of beacon frame transmitters 12 is needed. Therefore beacon frame transmitters 12 can switch to the sleep mode more often.

In this further embodiment one frequency channel may be used during initialization. Alternatively a plurality of the frequency channels may be used in parallel. As an alternative the beacon frame transmitters 12 themselves may select a frequency channel during initialization after detecting that no messages are received in the frequency channel during a predetermined time period. Subsequently each beacon frame transmitter 12 performs all of its operations towards sensor stations 14 using the selected frequency channel, and uses another frequency channel to make upstream connections toward association unit 10.

Figure 6 shows a further embodiment of a beacon frame transmitter. The beacon frame transmitter contains two unit 60, 62 as shown in figure 2, plus a message exchange memory 64 coupled between the processor circuits 24 of the two units. In one embodiment mutually different units 60, 62 are used, a first unit 60 arranged to perform the functions of a beacon frame transmitter (having a higher power transmitter 22 and/or a differently programmed processor circuit for example than the other unit) and a second unit 62 of a type used in sensor stations 14. A mechanically flexible connection 66 is provided between the units 60, 62 (e.g. between message exchange memory 64, which may be part of the first unit 60 and second unit 62). Flexible connection 66 is for example at least 5 centimetre long.

In this embodiment a first unit 60 acts as beacon frame transmitter, except for the transmission of discovery requests 50b, association requests 54b and any communication towards association unit (e.g. update message 59). The

second unit 62 performs the remaining functions of the beacon frame transmitter. It may be noted that this second unit performs much like a sensor station 14, except that it does not generate or receive its own messages.

Instead it forwards messages to or from the other unit. Messages to and from
5 the association unit 10 or other beacon frame transmitters 12 (or data from such messages) are placed in message exchange memory 64.

In normal operation units 60, 62 switch between the sleep mode and normal active mode in time slots defined by respective beacon frames. The unit that acts as beacon frame transmitter transmits its own beacon signal,
10 preferably in the select frequency channel for the beacon frame transmitter. The unit that acts as sensor station switches to the normal operation mode in the time slot defined by the beacon frames of the further beacon frame transmitter to which the beacon frame transmitter 60, 62, 64 is associated. Thus, no power expensive synchronization is needed.

15 Figure 7 shows a state diagram of operation of the paired units of figure 6 during discovery and association. The paired units 60, 62 start in a first state 71 wherein a second unit 62 of the pair 60, 62 that acts like a sensor station transmits discovery messages. When the second unit 62 detects that a beacon frame from a beacon frame transmitter 12 or association unit 10 has
20 been received, the paired units switch to second state 72. In second state 72 the first unit 60 of the pair that acts as a beacon frame transmitter starts transmitting beacon frames in response to received discovery messages by transmitting a discovery confirm message. In these beacon frames the first unit 60 includes information to indicate that the first unit 60 is not yet
25 associated.

Also in second state 72 the second unit 62 starts monitoring whether it receives beacon frames with information that indicates that the station that transmits the beacon frame has been associated (or is association unit).

When the second unit 62 detects a beacon frame with information
30 that indicates that the unit that transmits the beacon frame has been

associated, the paired units 60, 62 switch from second state 72 to a third state 73. Herein the second unit 62 starts transmitting association requests. When the second unit 62 receives an association confirmation in response, the paired units 60, 62 switch to a fourth state 74. In second, third and fourth state 72, 73 and 74 first unit 60 starts and restarts counting a time out interval. The time out interval is restarted each time when first unit 60 receives a discovery message from a new source (sensor station or other beacon frame transmitter). The time out interval expires after a predetermined duration (e.g. a minute or more) wherein first unit 60 has received no discovery message from any new source. After expiration of the time out interval unit 60 stops transmitting beacon frames in response to received discovery messages.

From fourth state 74, after expiry of the time out interval the paired units 60, 62 switch to a fifth state 75 wherein second unit 60 transmits a beacon frame transmitter association request for the first unit 62, listing the sources from which the first unit has received a discovery message. This beacon frame transmitter association request is forwarded to association unit 10, which grants or denies the request, dependent on the list (granting the request for example if more than a threshold number of sources are listed that have not yet been associated). When the beacon frame transmitter association request is denied, new beacon frame transmitter association requests may be sent. Association unit 10 may be configured to lower the threshold with time so that the same request may be granted later if a source that is mentioned in the request cannot be reached in any other way even after an extended period of time.

Association unit 10 sends a grant message with a grant signal to the first unit 60 via the second unit 62. When the grant message is received the paired units 60, 62 switch to a sixth state 76. Wherein first unit 62 starts transmitting beacon frames indicating that it has been associated, after which it can cause other units to switch from the first state 72 to the third state 73.

Although completely separate units 60, 62 are shown, it should be appreciated that part or all of these units may use shared circuits. Use of separate circuits has the advantage that a standard sensor station unit may be used. The use of a flexible connection has the advantage that the different
5 units may be located "around a corner" from each other, so that one unit has contact with a space to which the other has no contact. Thus, a system in a building can be realized very easily with this type of beacon frame transmitter.

Although the network has been described with beacon frame transmitters 12, it should be appreciated that instead of beacon signal
10 synchronized transmission other forms of message exchange may be used. In this case beacon frame transmitters 12 act simply as stations. In that case beacon frame requests are only discovery requests and beacon frame transmissions responses to discovery requests.

Furthermore, although an example has been discussed wherein the
15 beacon frame transmitters 12 merely act to relay sensor data, it should be appreciated that the beacon frame transmitters 12 themselves may also be equipped with sensors, so that the beacon frame transmitters 12 can also transmit their own sensor data.

Although a network of sensor stations has been described (each
20 provided with a temperature sensor, and/or a smoke sensor and/or a light intensity sensor and/or a moisture sensor and/or a gas sensor etc.) has been described it should be appreciated that the described techniques can also be applied to non-sensor or part-sensor networks wherein sensor stations 14 are simply information handling stations.

25 Although an association process with a discovery phase (Figure 5a) and an association phase has been described, it should be appreciated that the two phases can be integrated partly or wholly. In one embodiment beacon frame requests 50a double as association requests 54a. In another embodiment association grant messages 56a double as beacon transmissions 52a. Both

embodiments may be combined. However, the use of separate phases has the advantage that the whole process runs more quickly.

Claims

1. A wireless communication network that comprises an association unit and a plurality of stations, each station being configured to start up in a not-associated state and to transmit association request messages in the not-associated state, each station being configured to switch to an associated state upon reception of an association grant in response to one of its association request messages, the association request message and/or the association grant in response thereto establishing an operating route associated with the station for exchanging operating messages with the association unit during subsequent operation, the operating route associated with the station running through a source of the association grant in response to said one of the association request messages and, if the source of the association grant is not the association unit, the operating route between the source of the association grant and the association unit previously established for the source of the association grant in response to association request messages and/or the association grants for intermediate stations, in which network
- the association unit is configured to transmit association grants as responses to received ones of the association request messages;
 - at least part of the stations is configured to become active to transmit association grants as responses to received ones of the association request messages, but only after switching to the associated state upon an association grant from the association unit or one of the at least part of the stations switched to the associated state directly or indirectly based on an association grant from the association unit.
2. A wireless communication network according to claim 1, wherein said part of the stations comprises at least one dual function station, said dual function station being configured to transmit association grants only after receiving a secondary association grant, the dual function station being

configured to transmit one or more secondary association request messages to the association unit along its operating route when in the associated state, only the association unit being configured to originate the secondary association grant in response to the secondary association request message.

5 3. A wireless communication network according to claim 2, wherein the dual function station is configured to transmit information to the association unit indicating from which of the stations said dual function station has received transmissions, the association unit being configured to select whether to grant the secondary association request dependent on said
10 information.

4. A wireless communication network according to Claim 3, wherein the stations are configured to transmit discovery messages before switching to the associated state, said transmissions comprising at least the discovery messages.

15 5. A wireless communication network according to Claim 1, wherein each station from said at least part of the stations is configured to transmit discovery advertisement messages including an identification of the station from said at least part of the stations, the stations that transmit association request messages being configured to address the association request
20 messages using identifications from the discovery advertisement messages.

6. A wireless communication network according to Claim 5, wherein each station in said at least part of the stations is configured to indicate, in the discovery advertisement messages, whether the station is enabled to transmit association grants, the stations that transmit association requests being
25 configured to transmit association requests addressed to stations from said at least part of the stations only if the addressed station has indicated in at least one of the discovery advertisement messages that it is enabled to transmit association grants.

7. A wireless communication network according to claim 2, wherein
30 the dual function station comprises a first and second unit, each with at least a

respective antenna, coupled via a mechanically flexible connection, the first unit being configured to transmit first ones of the association request messages and to receive first ones of the association grants, the second unit being configured to receive second ones of the association request messages and to
5 the transmit second ones of the association grants in response to the first ones of the association request messages.

8. A wireless communication network according to any claims 2, wherein the dual function station is configured to operate using respective, mutually distinct first and second frequency channels, using the first
10 frequency channel for transmitting association request messages and receiving association grants, and using the second frequency channel for receiving association request messages and transmitting association grants.

9. A wireless communication network according to any one of the preceding claims, wherein said at least part of the stations are configured to
15 transmit route information toward the association unit after transmitting an association grant, the route information defining the associated route for the station to which the association grant has been sent.

10. A wireless communication network according to claim 9, wherein said at least part of the stations is configured to forward at least part of the route information towards the association unit, to store at least a further part
20 of the route information and to route subsequent messages from the association unit to the station for which the route information was sent according to said stored at least further part.

11. A station for use in a wireless communication network, the station
25 comprising a transmitter arrangement, a receiver arrangement and a processor circuit coupled to the transmitter arrangement and the receiver arrangement, the processor circuit being configured to start up in a not-associated state and to cause the transmitter arrangement to transmit association request messages in the not-associated state, the processor circuit
30 being configured to switch to an associated state upon reception at the receiver

arrangement of an association grant in response to one of the association request messages, the processor circuit being configured to establish an associated route for communication with an association unit during subsequent communication of operating messages to an association unit, the
5 associated route including a source of the association grant, and, if the source of the association grant is not the association unit, the operating route between the source of the association grant and the association unit previously established for the source of the association grant in response to association request messages and/or the association grants for intermediate stations, the
10 processor circuit being configured to cause the transmitter arrangement to initiate and transmit association grants in response to association request messages, but only after switching to the associated state.

12. A station according to claim 11, wherein the processor circuit is configured, when switched to the associated state, to cause the transmitter
15 arrangement to transmit a secondary association request message to the association unit, and to cause the transmitter arrangement to transmit the association grants only after receiving a secondary association grant in response to said secondary association request message.

13. A station according to claim 11 or 12, wherein the processor circuit is
20 configured to send information to the association unit indicating from which one of the stations said dual function station has received messages prior to receiving the secondary association grant.

14. A dual function station for use in a wireless communication network, the station comprising
25 - a first unit and a second unit, each of the first and second unit comprising a transmitter and a receiver, each of the first and second unit comprising one or more antennas respectively, coupled to the transmitter and the receiver, the first and second unit being configured to operate concurrently in mutually different frequency channels;

- a processor circuit coupled to the transmitters and the receivers of the first and second unit, the processor circuit being configured to awaken the receiver of the first unit in first periodic time slots, and to awaken the receiver of the second periodic time slots, the first and second time-slots being mutually
5 asynchronous, and to relay messages received in the first unit for transmission by the second unit and vice versa.

15. A dual function station according to claim 14, comprising a mechanically flexible connection between the antennas of the first and second unit.

- 10 16. A method of operating a wireless communication network that comprises an association unit and a plurality of stations, the method comprising
- installing the stations in a not-associated state;
 - transmitting association request messages from stations in the not-associated
15 state;
 - transmitting the association grants in response to the association request messages,
 - switching each station to an associated state when the station has received an association grant in response to one of its association request messages;
 - 20 - storing route information defining a route between the station that has switched to the associated state and the association unit, the route including the station that has sent the associated grant and, if the source of the association grant is not the association unit, the operating route between the source of the association grant and the association unit previously established
25 for the source of the association grant in response to association request messages and/or the association grants for intermediate stations; wherein
 - each association grant is transmitted only from the association unit or from an intermediate station, the latter only after said intermediate station has switched to the associated state upon an association grant from the association

unit or one of the at least part of the stations switched to the associated state directly or indirectly based on an association grant from the association unit..

17. A method according to claim 16, wherein the intermediate station is a dual function station, the method comprising

- 5 - transmitting a secondary association request message from the dual function station when the dual function is in the associated state;
- transmitting a secondary association grant originating from the association unit in response to the secondary association request message;
- enabling the dual function station to transmit the association grants only
- 10 upon receiving the secondary association grant.

18. A method according to claim 17, comprising

- transmitting information from the intermediate station to the association unit about from which one of the stations the intermediated station has received transmissions;
- 15 - selecting, in the association unit, whether to grant the secondary association request dependent on said information.

19. A method according to claim 18, comprising transmitting discovery messages from the stations before switching to the associated state, said transmissions comprising the discovery messages.

20. A method according to claim 17, comprising

- 20 - transmitting discovery advertisement messages from at least part of the stations. including an identification of the station that has transmitted the discovery advertisement message;
- addressing the association request messages using identifications from the
- 25 discovery advertisement messages.

21. A method according to claim 20,

- including an indication in the discovery advertisement messages, whether the station that transmits the discovery advertisement message is enabled to transmit association grants,

- transmitting association requests addressed to stations only if the addressed station has indicated that it is enabled to transmit association grants.

22. A method according to Claim 17, comprising switching the intermediate station to operate at a first and second, mutually different transmission frequency after switching to the associated state, for directly or indirectly communicating with the association unit and for communicating with its associated stations respectively.

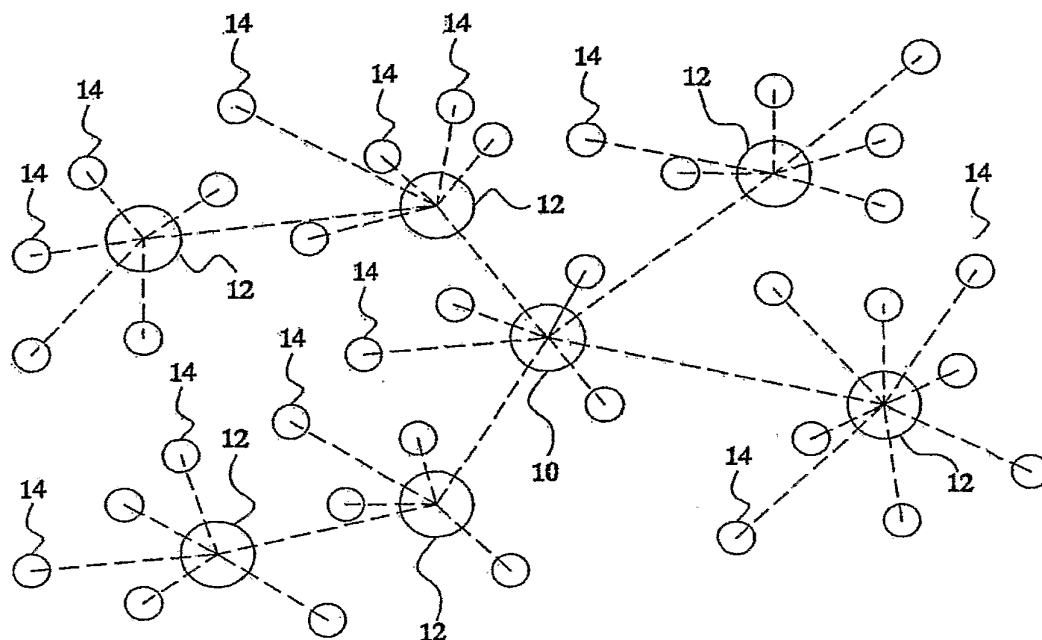


Fig.1

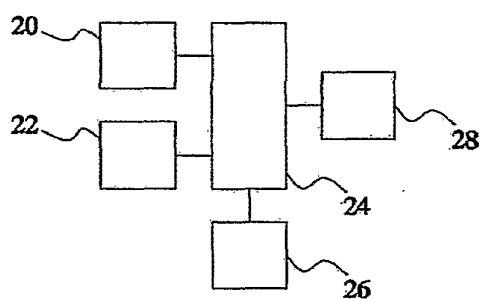


Fig.2

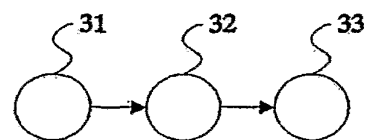
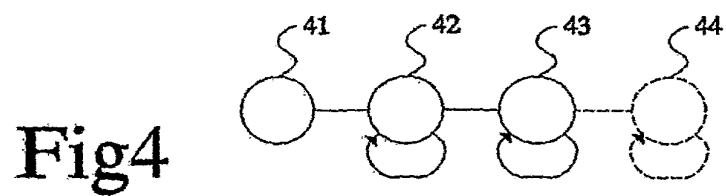
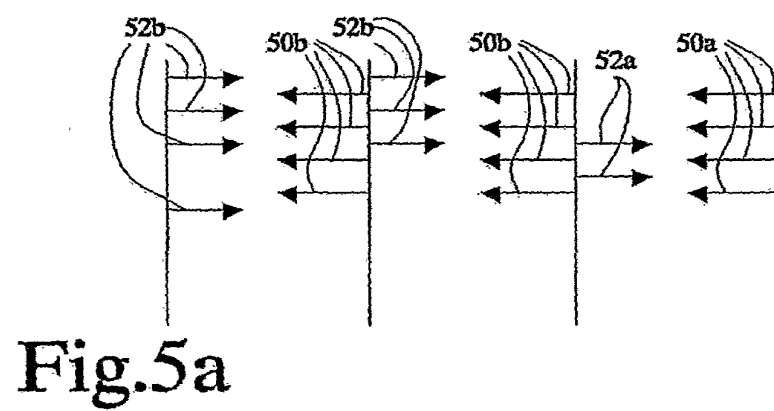
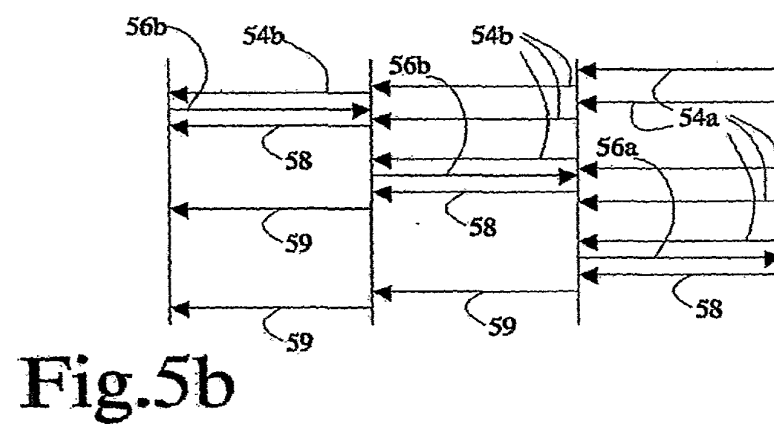
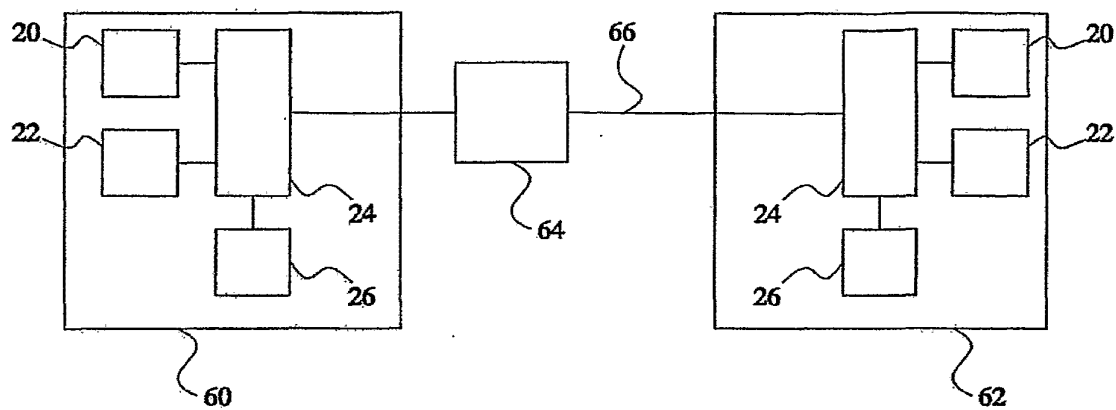
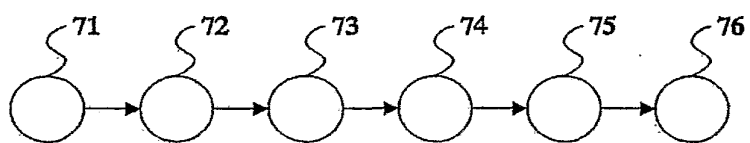


Fig.3



**Fig.6****Fig.7**

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/NL2007/000001

International filing date: 02 January 2007 (02.01.2007)

Document type: Certified copy of priority document

Document details: Country/Office: EP
Number: 05078044.4
Filing date: 30 December 2005 (30.12.2005)

Date of receipt at the International Bureau: 09 March 2007 (09.03.2007)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



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Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr.

Patent application No.

Demande de brevet n°

05078044.4 / EP05078044

The organization code and number of your priority application, to be used for filing abroad under the Paris Convention, is EP05078044

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

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Anmeldung Nr:
Application no.: 05078044.4
Demande no:

Anmeldetag:
Date of filing: 30.12.05
Date de dépôt:

Anmelder/Applicant(s)/Demandeur(s):

Nederlandse Organisatie voor
Toegepast-Natuurwetenschappelijk Onderzoek TNO
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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se référer à la description.)

Initialization of a wireless communication network

In anspruch genommene Priorität(en) / Priority(ies) claimed / Priorité(s) revendiquée(s)
Staat/Tag/Aktenzeichen / State/Date/File no. / Pays/Date/Numéro de dépôt:

Internationale Patentklassifikation / International Patent Classification / Classification internationale de brevets:

H04L12/56

Am Anmeldetag benannte Vertragsstaaten / Contracting states designated at date of filing / Etats contractants désignées lors du dépôt:

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

Title: Initialization of a wireless communication network

The invention relates to a method of operating a wireless communication network, to a wireless communication system that uses such a method and to stations for use in such a network.

5 US patent application No. 2003/0151513 describes a wireless sensor station network. In operation data from the sensor stations is transmitted in multiple hops to a central panel and vice versa. This is because the sensor stations are not able to transmit directly to the central panel. Each sensor station is given its own, fixed route for transmitting and receiving data to and
10 from the central panel. Typically, the data is first sent to another sensor station and from there to another sensor station and so on until a cluster head is reached. Then the data is sent through a network of cluster heads to the central panel.

After installation of the sensor stations at various locations in a
15 sensing area a network topology is dynamically formed. That is, the routes for each of the sensor stations are automatically selected and programmed into the sensor stations. In US patent application No. 2003/0151513 describes a number of methods of dynamically forming the routes from the sensor stations to cluster head units that channel communication from groups of sensor
20 stations. The initiative is taken by the cluster head unit, which transmits link discovery messages, which alert nearby sensor stations about the availability of the cluster head. These sensor stations forward the link discovery messages. Further sensor stations may receive and forward the forwarded link discovery messages and so on. The link discovery packets function to synchronize
25 communication clocks of the cluster head and the sensor stations.

Next the routes for transmitting messages from the sensor stations to the association unit are defined. In one embodiment this is done by transmitting and forwarding route discovery packets from the association unit. The forwarded route discovery packets indicate the number of hops over which

they have been forwarded. In this embodiment each sensor stations picks a route by selecting the association unit or sensor station from which it received a route discovery packet over least hops. The sensor stations record an indication of these routes for later use in normal operation. Subsequently, the
 5 sensor stations send route registration packets to the association unit to indicate the route that they have selected.

In another embodiment the sensor stations send link registration messages without waiting for route discovery messages. These link registration messages may reach the association unit via each available route.
 10 In this embodiment the association unit selects routes for the sensor stations from which it has received link registration messages. After making the selection the association unit sends route definition messages to the sensor stations for recording an indication of these routes for later use in normal operation.

15 A problem with these techniques is that they require transmission of information via sensor stations before the routing topology has been defined, i.e. when plural routes are still possible. This complicates the (sensor) stations, because they have to support different modes of communication while operating in low-power mode. If forwarding of information is only done using
 20 the definite routing topology, a central approach is slow (each station has to wait until its upward station has centrally been assigned a route) and a decentral approach is inefficient (a routing topology with an unnecessary amount of branches has been created)

Another problem that may occur is that the wireless links between
 25 nodes are hindered by barriers and that using the same frequency for upward and downward link routes requires synchronization. This complicates the (sensor) station, because they have to support synchronization and powerful RF signals.

Among others, it is desirable to provide for a wireless network wherein routes for communication can be determined without the need to forward information via stations for which the routes have not yet been defined.

5 Among others, it is desirable to provide for a method of operating a wireless network wherein routes for communication can be determined without the need to forward information via stations for which routes have not yet been defined.

10 Among others it is desirable to provide for stations for flexible use in wireless networks.

The invention provides for a wireless communication network according to claim 1. This network allows routes between stations and an association station to be set up for further use, using routes that have already
15 been defined. Each route is established when an association request from a station is granted. Only the association unit and stations that have an established route are allowed to grant association requests. Therefore their route can immediately be used for the station that is associated.

In an embodiment association is preceded by a discovery stage,
20 wherein no routes are yet established but station discover other stations, that can function to relay messages. Thus, stations may be enabled first to discover addresses of available other stations to which association requests can be sent, or stations that may send association requests before a route is established. In a further embodiment discovery advertisement messages are used that
25 identify stations that are enabled to grant discovery requests. Thus, it is made possible to avoid waste of energy or bandwidth on association requests that cannot be granted.

In another embodiment part of the stations are dual function stations, which start to send association grant messages only after receiving
30 approval from the association unit to do so. Thus, the association unit has

control over the selection of stations that act as relay station, even after the dual function station has obtained a route for its "own" messages (e.g. sensor messages from a built in sensor station). In an embodiment the dual function station comprises units that function as a beacon frame transmitter and as a station with sensor station-like communication abilities respectively. The association unit may follow a strategy of enabling such dual function stations selectively to avoid enabling many stations that act as relay for only a few stations each, or to avoid selecting stations when these will become a relay for messages for too many stations.

10 In another embodiment dual function stations are used that comprises a mechanically flexible connection between separate units that each have an antenna or antennas for transmission and reception. Thus such stations can be used to connect different spaces "around the corner".

15 In another embodiment dual function stations are used that operate concurrently in different frequency channels that are periodically active in time slots that repeat with different asynchronous periods. This simplifies coordination between different network parts.

20 These and other objects and advantageous aspects will be described for exemplary examples, using the following figures.

Figure 1 shows a wireless network

Figure 2 shows a station

Figure 3 shows a state diagram of a sensor station

Figure 4 shows a state diagram of a beacon frame transmitter

25 Figure 5a shows messages during a discovery phase

Figure 5b shows messages during an association phase

Figure 6 shows an embodiment of a beacon frame transmitter

Figure 7 shows a state diagram of a beacon frame transmitter

Figure 1 shows a wireless network. The network comprises an association unit 10, a plurality of beacon frame transmitters 12 and a plurality of sensor stations 14 (only some numbered explicitly). Fixed communication routes are defined between association unit 10 and sensor stations 14, using wireless communication links (shown by dashed lines) between association unit 10, beacon frame transmitters 12 and sensor stations 14. The communication routes form a tree structure with association unit 10 at its root and beacon frame transmitters 12 at its nodes. Each beacon frame transmitter 12 is coupled in a star topology to a number of the sensor stations 14.

Figure 2 shows a station. At the level of detail shown, the figure applies to beacon frame transmitters 12 as well as sensor stations 14. The station contains a receiver circuit 20, a transmitter circuit 22, a processor circuit 24, a memory 26 and, at least in case of sensor stations, a sensing circuit 28. Processor circuit 24 is coupled to receiver circuit 20, transmitter circuit 22, memory 26 and optionally to sensing circuit 28. Each of receiver circuit 20 and transmitter circuit 22 include an antenna (not shown). Preferably, the antennas of receiver circuit 20 and transmitter circuit 22 are formed by a shared antenna of receiver circuit 20 and transmitter circuit 22.

Preferably the stations are battery operated, with on board batteries (not shown) or supplied by other on board power supplies such as solar cells. This means that it is desirable to reduce power consumption as much as possible.

In operation, data is exchanged between sensor stations 14 and association unit 10 via the links that are shown in figure 1. Because the links form a tree structure, a single route to and from association unit 10 is defined for each sensor station 12.

It should be appreciated that the communication routes are a result of selection from a greater number of possible routes. In principle, each sensor station 14 could communicate directly with association unit 10 and each beacon frame transmitter 12. In practice, a number of these direct

communication routes are not possible, because of insufficient signal strength. But direct wireless communication from a sensor station 14 to still more than one beacon frame transmitters 12 and/or to association unit 10 may be possible. Similarly, each beacon frame transmitter 12 may be able to
5 communicate directly with association unit 10 and/or a number of beacon frame transmitters 12.

The wireless connections shown in figure 1 are the result of a selection from these possible routes. A number of operable wireless communication links between sensor stations 14, beacon frame transmitters 12
10 and association unit 10 is not used. These links are not shown in figure 1. Sensor stations 14 transmit messages to association unit 10 via fixed routes and conversely association unit 10 transmits messages to sensor stations via the fixed routes. The routes are defined by information in memory 26.

Each sensor station 14 stores at least information that is selective
15 for the beacon frame transmitter 12 at the start of its route to association unit 10; this address information is used to form messages that the sensor station 14 sends to association unit 10. Typically, each beacon frame transmitter 12 stores at least information that is selective for the next beacon frame transmitter 12 in the route or for association unit 10. This information is used
20 to forward messages from the sensor station 14 sends to association unit 10. Alternatively, each sensor station 14 may store information that is selective for the entire route to association unit 10 and the sensor station 14 may use this information to form messages, from which beacon frame transmitters 12 can determine how to forward the message.

25 Conversely, association unit 10 preferably stores information for each sensor station 14 that is selective for the beacon frame transmitter 12 at the start of the route to that sensor station 14. Association unit 10 uses this information to form messages that association unit 10 transmits to the sensor station 14. Typically, association unit 10 stores information that identifies the
30 entire route to each sensor station 14. The association unit 10 may use this

information to form messages, from which beacon frame transmitters 12 can determine how to forward the message to the sensor station 14. Alternatively, each beacon frame transmitter 12 stores, for each sensor station 14 for which it can receive messages, at least information that is selective for the next beacon
 5 frame transmitter 12 in the route to that sensor station 14. This information is used to forward messages for the sensor station 14 from association unit 10 to the sensor station 14.

An embodiment of the part of operation wherein the routes are established will now be described. Basically this embodiment includes two
 10 stages:

- a discovery stage wherein beacon frame transmitters 12 and sensor stations 14 become "aware" of stations (association unit 10 or beacon frame transmitters 12 in the case of sensor stations and association unit 10, other beacon frame transmitters 12 and sensor stations 14 in the case of beacon
 15 frame transmitters 14) that are within reception range and
- an association stage wherein sensor stations 14 and beacon frame transmitters 14 (or sensor stations that are fixedly coupled to these beacon frame transmitters) send requests to associate to association unit 10 or beacon frame transmitters 12, i.e. to establish a route through the association unit 10
 20 or beacon frame transmitter 12 for subsequent use.

The association stage for a sensor station 14 (or beacon frame transmitter 12) is completed when an association request is granted by the association unit 10 or a beacon frame transmitter 12. The route via the granting station is thereby established for subsequent use. In one embodiment
 25 each beacon frame transmitter 12 is enabled to grant association requests immediately after it has received a grant of an association request itself, but preferably the beacon frame transmitter 12 is enabled to grant association requests only after receiving secondary grant message, this time from the association unit 14 that allows the beacon frame transmitter 12 to grant
 30 association requests. Association unit 10 may for example make issuance of

the secondary grant message dependent on information about the number of as yet unassociated stations that the beacon frame transmitter 12 has discovered. Thus, association unit 10 can control network topology.

Preferably, the association requests are addressed specifically to
5 beacon frame transmitters 12 or the association unit 10, using addresses (or more generally any identifier of these stations) that have been discovered in the discovery stage. Thus, it is excluded that conflicting association grants can be received in response to an association requests. However, addressing may be made unnecessary, for example when stations address all subsequent
10 messages to one station that has sent a grant, or if some conflict resolution scheme is used.

In the embodiment the discovery stage comprises use of discovery messages from sensor stations 14 and beacon frame transmitters 12 (or sensor stations that are fixedly coupled to these beacon frame transmitters 12) and
15 responses in reaction to these discovery messages. Alternatively or in addition, stations may be discovered from unsolicited messages. The discovery stage and the association stage may overlap, the stations continuing to collect identifiers of discovered stations between transmission of association requests during the association stage. Alternatively non-overlapping consecutive stages may be
20 used. In another embodiment the discovery stage may even be eliminated, for example if association requests are used that are not specifically addressed, or if association requests are used to discover stations.

When the discovery stage and the association stage may overlap, it is preferred that beacon frame transmitters 12 include information in their
25 messages to indicate whether they have been enabled to grant association requests (preferably in general, i.e. not limited to requests from specific sensor stations 14, but in a further embodiment specific sensor stations 14 or beacon frame transmitters 12 from which association requests may be accepted may be indicated). Thus, sensor stations 14 and/or beacon frame transmitters 12

can avoid transmission of association requests to discovered beacon frame transmitters 12 that are not enabled to grant association requests.

Figure 3 shows a state diagram of operation of a sensor station 14 before a route is established. Figures 5a,b shows messages exchanged with sensor station 14 during discovery and association respectively. Initially the sensor station 14 is in a first state 31. In this first state 31 processor circuit 24 causes transmitter 22 to transmit discovery messages 50a, for example once every minute, every two minutes or every hour. When processor circuit 24 detects that receiver 20 has received a beacon frame 52a from a beacon frame transmitter 12 or association unit 10, processor circuit 24 switches sensor station 14 to a second state 32. In this way, the beacon frame 52a acts as a discovery confirm message.

Preferably, sensor station 14 switches to second state 32 in response indiscriminately to both beacon frames 52a that are transmitted in response to the discovery message or to any other beacon frame that is received spontaneously. In an embodiment sensor station 14 switches to second state 32 in response only to beacon frames 52a wherein it is indicated that the transmitting station is prepared to grant association requests and not to optional other beacon frames 52a that do not contain such an indication.

In second state 32 processor circuit 24 causes transmitter 22 to transmit association request messages 54a for example once every minute, every two minutes or every hour. Preferably each association request message 54a includes an identification of the sensor station 14 that allows messages specifically directed at the sensor station 14 to be sent in response. Also preferably, processor 24 reads an identification of the beacon frame transmitter 12 or association unit 10 from a previously received discovery confirm message and includes that identification in the association request message. This may be done for example when it is desirable to avoid collisions between association grant messages in response to the association request message.

When processor circuit 24 detects that receiver 20 has received an association grant message 56a from a beacon frame transmitter 12 or association unit 10 directed at the sensor station 14 of the processor circuit 24 in response to an association request message 54a, processor circuit 24

5 switches sensor station 14 to a third state 33 and records information for reaching this beacon frame transmitter 12 or the association unit 10 in memory 26 to define route to association unit 10 for use during normal operation. Optionally sensor station sends an acknowledgment 58 of the association grant message back to the beacon frame transmitter 12 or

10 association unit 10.

In third state 33 sensor station 14 stops transmitting association request messages 54a. In one embodiment sensor station 14 stops transmitting discovery messages 50a already when it switches to second state 32. Alternatively sensor station 14 may be arranged to continue transmitting

15 discovery messages 50a in second state 32, only to stop after switching to third state 33 or after a predetermined time interval has elapsed after switching to second state 32, if this occurs earlier than the switch to third state 33.

Figure 4 shows a state diagram of operation of a beacon frame transmitter 12 before a route is established. Initially the beacon frame transmitter 12 is in a first state 41. In this first state 41 processor circuit 24 causes transmitter 22 to transmit discovery messages 50b, for example once every minute, every two minutes or every hour. When processor circuit 24 detects that receiver 20 has received a beacon frame 52b from another beacon frame transmitter 12 or association unit 10, processor circuit 24 switches

20 beacon frame transmitter 12 to a second state 42. In this way, the beacon frame 52b acts as a discovery confirm message. In an embodiment discovery confirm messages may also be transmitted unsolicited, i.e. not in response to a discovery message, in this sense discovery messages could also be called "hello" messages. The term "discovery advertisement message" is used herein both for

25 messages in response to discovery requests and unsolicited (hello) messages.

30

Examples of use of discovery advertisement messages will be given in terms of discovery confirm messages, but unless indicated otherwise these examples apply generally for discovery advertisement messages. In a further embodiment stations need not transmit discovery messages 50a,b at all. In this case the stations listen only to unsolicited messages. The discovery confirm message does not need to be addressed to any station in particular: any station may react to any discovery confirm message.

Preferably, beacon frame transmitter 12 switches to second state 42 in response indiscriminately to both a beacon frame 52b that is transmitted in response to the discovery message or to any other beacon frame that is received spontaneously. In an embodiment sensor station 14 switches to second state 42 in response only to beacon frames 52b wherein it is indicated that the transmitting station is prepared to grant association requests and not to optional other beacon frames 52b that do not contain such an indication.

In second state 42 processor circuit 24 causes transmitter 22 to transmit association request messages 54b, for example once every minute, every two minutes or every hour. Preferably each association request message 54b includes an identification of the beacon frame transmitter 12 that allows messages specifically directed at the beacon frame transmitter to be sent in response. Also preferably, processor 24 reads an identification of the beacon frame transmitter 12 or association unit 10 from a previously received discovery confirm message and includes that identification in the association request message. This may be done for example when it is desirable to avoid collisions between association grant messages in response to the association request message.

When processor circuit 24 detects that receiver 20 has received an association grant message 56b from another beacon frame transmitter 12 or association unit 10 in response to an association request message 54b, processor circuit 24 switches beacon frame transmitter 12 to a third state 43 and records information for reaching this other beacon frame transmitter 12 or

the association unit 10 in memory 26 to define a route to association unit 10 for use during normal operation. Optionally frame transmitter 12 sends an acknowledgement 59 of the association grant message back to the beacon frame transmitter 12 or association unit 10.

5 In third state 43 frame transmitter 12 stops transmitting association request messages 54b. In one embodiment frame transmitter 12 stops transmitting discovery messages 50b when it switches to second state 42. Alternatively frame transmitter 12 may stop after switching to third state 43, or after a predetermined time interval has elapsed after switching to second
10 state 42, if this occurs earlier than the switch to third state 42.

 Preferably beacon frame transmitter 12 transmits discovery confirm messages in at least when in second and third state 42, 43. More preferably beacon frame transmitter 12 includes an indication in the discovery confirm messages indicating whether the beacon frame transmitter 12 is ready to
15 respond to association grant messages with association requests. This allows stations to avoid using bandwidth for transmission of useless association requests. In principle beacon frame transmitter 12 may also be arranged to transmit discovery confirm messages in the first state 41. Preferably, when beacon frame transmitter 12 receives a discovery request message from a
20 sensor station 14 or another beacon frame transmitter 12 beacon frame transmitter 12 records an identification of the sensor station 14 or other beacon frame transmitter 12 from which the discovery request was received. Optionally beacon frame transmitter 12 also records identifications of stations that have transmitted association requests that the beacon frame transmitter
25 12 did not respond to, if any.

 In first state 41 and second state 42 beacon frame transmitter 12 does not respond to association request messages 54a. However, in third state 43 beacon frame transmitter 12 does respond to association request messages 54a. In this state processor circuit 24 causes transmitter 22 to transmit an
30 association grant message 56a in response to each received association request

message 54a, directed at the station that has sent association request message 54a, using the station identification in the association request message 54a. Processor circuit 24 includes information for reaching the beacon frame transmitter 12 in the association grant message 56a and optionally also
5 further information for reaching association unit 10.

Furthermore, beacon frame transmitter 12 transmits an update message 59 with information that the sensor station 14 has been associated to association unit 10 after sending the association grant message 56a (and after receiving an optional acknowledgment 58 of that message).

10 This response of beacon frame transmitter 12 to association request messages 54a is not limited to such messages from sensor stations 14, but applies also to association request messages 54b from other beacon frame transmitters 12.

It should be noted that beacon frame transmitter 12 and sensor
15 station 14 become stations of the network with well defined routes only when reaching their respective third states 33, 43. Furthermore it should be noted that beacon frame transmitters 12 respond to association request messages 54a,b only once they have entered their third state 43, that is, only when the beacon frame transmitter 12 has a well defined route to association unit 10.
20 Thus, the information about association can be transmitted along the route that will be used during normal operation. This route may also be used as part of the route to the newly associated sensor station 14. Association unit 10 may use information from its memory, about the route to the beacon frame transmitter 12 to define the route to the sensor station 14. In another
25 embodiment, the beacon frame transmitters 12 along the route may add their identity to inform association unit 10 of the route, or in yet another embodiment the beacon frame transmitter 12 that associates to the sensor station 14 may insert this information.

It may be noted that not all beacon frame transmitters 12 need to
30 become part of the network as beacon frame transmitters. If a beacon frame

transmitter 12 receives no association grant signal 56b or grants no association grant requests from other beacon frame transmitters 12 or sensor stations 14 the beacon frame transmitter 12 does not become a functional beacon frame transmitter in the network.

5 In an embodiment association unit 10 decides on whether a beacon frame transmitter 12 becomes a functional beacon frame transmitter. In this embodiment functional beacon frame transmitters 12 in third state 43 forward association requests 54a from other beacon frame transmitters 12 (and optionally also from sensor stations 14) to association unit 10 before sending
10 an association grant message 56b. (Alternatively a further message derived from this association request is forwarded).

 In this embodiment association unit 10 is arranged to grant or deny the forwarded association request in response to forwarding (or to the further message). When the association request is granted association unit sends back
15 a grant message, which is used to generate the association grant signal 56b to the original association request 54b. Thus association unit 10 (and/or a beacon frame transmitter 12) is enabled to control generation of the network topology, for example by first granting association to selected preferred beacon frame transmitters and granting association requests to others later only if this is
20 still necessary to complete connections to all sensor stations 14.

 In a further embodiment beacon frame transmitters 12 are arranged to supply information about the number and/or identity of the sensor stations 14 and or beacon frame transmitters 12 from which it has received beacon frame request messages and/or association request messages. The identity
25 may be provided by including identity information in beacon frame request messages and/or association request messages. The beacon frame transmitters 12 may supply this information for example in their own beacon frame request messages and/or association request messages. In this further embodiment the association unit 10 (and/or a beacon frame transmitter) is provided with
30 information which it may use to select beacon frame transmitters 12 for

granting association. This may be used for example to distribute links over several beacon frame transmitters 12, or on the contrary to avoid distribution by concentrating links on one beacon frame transmitter 12.

In a further embodiment beacon frame transmitters 12 return
5 grants of in response to association requests only after receiving a grant of a secondary association request, distinguished, at least in function, if not in format, from the previously described association request. For this purpose optionally an additional fourth state 44 may be added to the states of figure 4. When in third state 43 (after receiving the previously described grant to one of
10 the previously described association requests, which will be termed primary association requests beacon frame transmitter 12 transmits a secondary association request to association unit 10. Upon receiving a grant of this secondary association request beacon frame transmitter 12 switches to the fourth state 44. In this embodiment the beacon frame transmitter 12 is
15 enabled to begin to return association grant messages to requesting stations only in fourth state 44. Optionally the beacon frame transmitter indicates this in discovery confirm messages.

Preferably beacon frame transmitter 12 is configured to include a list of stations from which beacon frame transmitter 12 has received discovery
20 request messages (and/or not-granted association request) in the secondary association request. As an alternative beacon frame transmitter 12 may optionally be configured to transmit one or more accompanying messages to provide such a list to association unit 10. This enables association unit 10 to select to which of the beacon frame transmitters 12 it will grant association
25 requests of the second type. In this way association unit 10 can control the network topology, after admitting beacon frame transmitters 12 to the network by granting a primary association request.

In a preferred embodiment each functional beacon frame
transmitter 12 (and association unit 10, which acts as a beacon frame
30 transmitter in this respect) operates in a time slot scheme during normal

operation, periodically transmitting a beacon signal to which the sensor stations 14 that are associated with that beacon frame transmitter may synchronize. After the beacon signal the beacon frame transmitter 12 and its associated stations exchange messages for a limited period.

5 This allows the beacon frame transmitters 12 and the sensor stations 14 to switch between a low power sleep mode and a normal operating mode. After exchanging messages the beacon frame transmitters 12 and the sensor stations 14 switch to the sleep mode wherein power supply and/or clock signals to at least part of the beacon frame transmitter 12 and the sensor
10 station 14 is switched off. After counting off a predetermined time-interval the beacon frame transmitters 12 and the sensor stations 14 switch back to the normal operating mode. With a predetermined delay after switching to the normal operating mode the beacon frame transmitter 12 transmits the beacon frame and the sensor stations 14 receive this beacon frame.

15 In this embodiment the association unit 10 and/or the beacon frame transmitters preferably select the timing of the first of the periodic beacon frames so that the time slots of different beacon frame transmitters 12 that are within range to receive each others messages do not overlap. In this
20 embodiment the information in the sensor stations 14 after association defines the time slot in which the sensor station 14 should switch to the normal operating mode.

 In one embodiment each beacon frame transmitter 12 also switches to a forwarding mode in the time slot defined by the further beacon frame transmitter 12 through which the original beacon frame transmitter 12
25 transmits messages to the association unit 10 (or in the time slot of the association unit 10). When in the forwarding mode the original beacon frame transmitter 12 exchanges messages with the further beacon frame transmitter 12.

 This embodiment has the disadvantage that overlap of the time slots
30 of neighboring beacon frame transmitters 12 must be avoided. This means that

beacon frame transmitters 12 must monitor time slots of other beacon frame transmitter 12. In turn this means that the beacon frame transmitters 12 cannot operate in the sleep mode as much as desirable.

In an alternative embodiment the beacon frame transmitter 12 are
5 designed to transmit and receive in a selectable one of a plurality of frequency channels. In this embodiment the frequency channels for different functional beacon frame transmitters 12 are selected during initialization, for example by the beacon frame transmitters themselves after detecting that no messages are received in the frequency channel during a predetermined time period, or by
10 the association unit 10 so that beacon frame transmitters 12 that have been detected to receive each other get different frequency channels to avoid collisions. In an embodiment the beacon frame transmitters 12 and their associated sensor stations 14 switch to the selected frequency channel when they start normal operation. In this embodiment the information in the sensor
15 stations 14 after association defines the frequency channel for communicating with the beacon frame transmitter 12. Use of different frequency channels has the advantage that no extensive synchronization between time slots of beacon frame transmitters 12 is needed. Therefore beacon frame transmitters 12 can switch to the sleep mode more often.

In this further embodiment one frequency channel may be used
20 during initialization. Alternatively a plurality of the frequency channels may be used in parallel. As an alternative the beacon frame transmitters 12 themselves may select a frequency channel during initialization after detecting that no messages are received in the frequency channel during a
25 predetermined time period. Subsequently each beacon frame transmitter 12 performs all of its operations towards sensor stations 14 using the selected frequency channel, and uses another frequency channel to make upstream connections toward association unit 10.

Figure 6 shows a further embodiment of a beacon frame transmitter.
30 The beacon frame transmitter contains two unit 60, 62 as shown in figure 2,

plus a message exchange memory 64 coupled between the processor circuits 24 of the two units. In one embodiment mutually different units 60, 62 are used, a first unit 60 arranged to perform the functions of a beacon frame transmitter (having a higher power transmitter 22 and/or a differently programmed processor circuit for example than the other unit) and a second unit 62 of a type used in sensor stations 14. A mechanically flexible connection 66 is provided between the units 60, 62 (e.g. between message exchange memory 64, which may be part of the first unit 60 and second unit 62). Flexible connection 66 is for example at least 5 centimetre long.

In this embodiment a first unit 60 acts as beacon frame transmitter, except for the transmission of discovery requests 50b, association requests 54b and any communication towards association unit (e.g. update message 59). The second unit 62 performs the remaining functions of the beacon frame transmitter. It may be noted that this second unit performs much like a sensor station 14, except that it does not generate or receive its own messages. Instead it forwards messages to or from the other unit. Messages to and from the association unit 10 or other beacon frame transmitters 12 (or data from such messages) are placed in message exchange memory 64.

In normal operation units 60, 62 switch between the sleep mode and normal active mode in time slots defined by respective beacon frames. The unit that acts as beacon frame transmitter transmits its own beacon signal, preferably in the select frequency channel for the beacon frame transmitter. The unit that acts as sensor station switches to the normal operation mode in the time slot defined by the beacon frames of the further beacon frame transmitter to which the beacon frame transmitter 60, 62, 64 is associated. Thus, no power expensive synchronization is needed.

Figure 7 shows a state diagram of operation of the paired units of figure 6 during discovery and association. The paired units 60, 62 start in a first state 71 wherein a second unit 62 of the pair 60, 62 that acts like a sensor station transmits discovery messages. When the second unit 62 detects that a

beacon frame from a beacon frame transmitter 12 or association unit 10 has been received, the paired units switch to second state 72. In second state 72 the first unit 60 of the pair that acts as a beacon frame transmitter starts transmitting beacon frames in response to received discovery messages by
 5 transmitting a discovery confirm message. In these beacon frames the first unit 60 includes information to indicate that the first unit 60 is not yet associated.

Also in second state 72 the second unit 62 starts monitoring whether it receives beacon frames with information that indicates that the station that
 10 transmits the beacon frame has been associated (or is association unit).

When the second unit 62 detects a beacon frame with information that indicates that the unit that transmits the beacon frame has been associated, the paired units 60, 62 switch from second state 72 to a third state 73. Herein the second unit 62 starts transmitting association requests. When
 15 the second unit 62 receives an association confirmation in response, the paired units 60, 62 switch to a fourth state 74. In second, third and fourth state 72, 73 and 74 first unit 60 starts and restarts counting a time out interval. The time out interval is restarted each time when first unit 60 receives a discovery message from a new source (sensor station or other beacon frame transmitter).
 20 The time out interval expires after a predetermined duration (e.g. a minute or more) wherein first unit 60 has received no discovery message from any new source. After expiration of the time out interval unit 60 stops transmitting beacon frames in response to received discovery messages.

From fourth state 74, after expiry of the time out interval the paired
 25 units 60, 62 switch to a fifth state 75 wherein second unit 60 transmits a beacon frame transmitter association request for the first unit 62, listing the sources from which the first unit has received a discovery message. This beacon frame transmitter association request is forwarded to association unit 10, which grants or denies the request, dependent on the list (granting the
 30 request for example if more than a threshold number of sources are listed that

have not yet been associated). When the beacon frame transmitter association request is denied, new beacon frame transmitter association requests may be sent. Association unit 10 may be configured to lower the threshold with time so that the same request may be granted later if a source that is mentioned in the request cannot be reached in any other way even after an extended period of time.

Association unit 10 sends a grant message with a grant signal to the first unit 60 via the second unit 62. When the grant message is received the paired units 60, 62 switch to a sixth state 76. Wherein first unit 62 starts transmitting beacon frames indicating that it has been associated, after which it can cause other units to switch from the first state 72 to the third state 73.

Although completely separate units 60, 62 are shown, it should be appreciated that part or all of these units may use shared circuits. Use of separate circuits has the advantage that a standard sensor station unit may be used. The use of a flexible connection has the advantage that the different units may be located "around a corner" from each other, so that one unit has contact with a space to which the other has no contact. Thus, a system in a building can be realized very easily with this type of beacon frame transmitter.

Although the network has been described with beacon frame transmitters 12, it should be appreciated that instead of beacon signal synchronized transmission other forms of message exchange may be used. In this case beacon frame transmitters 12 act simply as stations. In that case beacon frame requests are only discovery requests and beacon frame transmissions responses to discovery requests.

Furthermore, although an example has been discussed wherein the beacon frame transmitters 12 merely act to relay sensor data, it should be appreciated that the beacon frame transmitters 12 themselves may also be equipped with sensors, so that the beacon frame transmitters 12 can also transmit their own sensor data.

Although a network of sensor stations has been described (each provided with a temperature sensor, and/or a smoke sensor and/or a light intensity sensor and/or a moisture sensor and/or a gas sensor etc.) has been described it should be appreciated that the described techniques can also be applied to non-sensor or part-sensor networks wherein sensor stations 14 are simply information handling stations.

Although an association process with a discovery phase (Figure 5a) and an association phase has been described, it should be appreciated that the two phases can be integrated partly or wholly. In one embodiment beacon frame requests 50a double as association requests 54a. In another embodiment association grant messages 56a double as beacon transmissions 52a. Both embodiments may be combined. However, the use of separate phases has the advantage that the whole process runs more quickly.

Claims

1. A wireless communication network that comprises an association unit and a plurality of stations, each station being configured to start up in a not-associated state and to transmit association request messages in the not-associated state, each station being configured to switch to an associated state upon reception of an association grant in response to one of its association request messages, the association request message and/or the association grant in response thereto establishing an operating route associated with the station for exchanging operating messages with the association unit during subsequent operation, the operating route associated with the station running through a source of the association grant in response to said one of the association request messages, in which network
- the association unit is configured to transmit association grants as responses to received ones of the association request messages;
 - at least part of the stations is configured to become active to transmit association grants as responses to received ones of the association request messages, but only after switching to the associated state.
2. A wireless communication network according to claim 1, wherein said part of the stations comprises at least one dual function station, said dual function station being configured to transmit association grants only after receiving a secondary association grant, the dual function station being configured to transmit one or more secondary association request messages to the association unit along its operating route when in the associated state, only the association unit being configured to originate the secondary association grant in response to the secondary association request message.
3. A wireless communication network according to claim 2, wherein the dual function station is configured to transmit information to the association unit indicating from which of the stations said dual function

station has received transmissions, the association unit being configured to select whether to grant the secondary association request dependent on said information.

4. A wireless communication network according to Claim 3, wherein
5 the stations are configured to transmit discovery messages before switching to the associated state, said transmissions comprising at least the discovery messages.

5. A wireless communication network according to Claim 1, wherein
10 each station from said at least part of the stations is configured to transmit discovery advertisement messages including an identification of the station from said at least part of the stations, the stations that transmit association request messages being configured to address the association request messages using identifications from the discovery advertisement messages.

6. A wireless communication network according to Claim 5, wherein
15 each station in said at least part of the stations is configured to indicate, in the discovery advertisement messages, whether the station is enabled to transmit association grants, the stations that transmit association requests being configured to transmit association requests addressed to stations from said at least part of the stations only if the addressed station has indicated in at least
20 one of the discovery advertisement messages that it is enabled to transmit association grants.

7. A wireless communication network according to claim 2, wherein
the dual function station comprises a first and second unit, each with at least a respective antenna, coupled via a mechanically flexible connection, the first
25 unit being configured to transmit first ones of the association request messages and to receive first ones of the association grants, the second unit being configured to receive second ones of the association request messages and to the transmit second ones of the association grants in response to the first ones of the association request messages.

8. A wireless communication network according to any claims 2, wherein the dual function station is configured to operate using respective, mutually distinct first and second frequency channels, using the first frequency channel for transmitting association request messages and receiving
5 association grants, and using the second frequency channel for receiving association request messages and transmitting association grants.

9. A wireless communication network according to any one of the preceding claims, wherein said at least part of the stations are configured to transmit route information toward the association unit after transmitting an
10 association grant, the route information defining the associated route for the station to which the association grant has been sent.

10. A wireless communication network according to claim 9, wherein said at least part of the stations is configured to forward at least part of the route information towards the association unit, to store at least a further part
15 of the route information and to route subsequent messages from the association unit to the station for which the route information was sent according to said stored at least further part.

11. A station for use in a wireless communication network, the station comprising a transmitter arrangement, a receiver arrangement and a
20 processor circuit coupled to the transmitter arrangement and the receiver arrangement, the processor circuit being configured to start up in a not-associated state and to cause the transmitter arrangement to transmit association request messages in the not-associated state, the processor circuit being configured to switch to an associated state upon reception at the receiver
25 arrangement of an association grant in response to one of the association request messages, the processor circuit being configured to establish an associated route for communication with an association unit during subsequent communication of operating messages to an association unit, the associated route including a source of the association grant, the processor
30 circuit being configured to cause the transmitter arrangement to initiate and

transmit association grants in response to association request messages, but only after switching to the associated state.

12. A station according to claim 11, wherein the processor circuit is configured, when switched to the associated state, to cause the transmitter arrangement to transmit a secondary association request message to the association unit, and to cause the transmitter arrangement to transmit the association grants only after receiving a secondary association grant in response to said secondary association request message.

13. A station according to claim 11 or 12, wherein the processor circuit is configured to send information to the association unit indicating from which one of the stations said dual function station has received messages prior to receiving the secondary association grant.

14. A dual function station for use in a wireless communication network, the station comprising

- a first unit and a second unit, each of the first and second unit comprising a transmitter and a receiver, each of the first and second unit comprising one or more antennas respectively, coupled to the transmitter and the receiver, the first and second unit being configured to operate concurrently in mutually different frequency channels;
- a processor circuit coupled to the transmitters and the receivers of the first and second unit, the processor circuit being configured to awaken the receiver of the first unit in first periodic time slots, and to awaken the receiver of the second periodic time slots, the first and second time-slots being mutually asynchronous, and to relay messages received in the first unit for transmission by the second unit and vice versa.

15. A dual function station according to claim 14, comprising a mechanically flexible connection between the antennas of the first and second unit.

16. A method of operating a wireless communication network that comprises an association unit and a plurality of stations, the method comprising
- installing the stations in a not-associated state;
 - 5 - transmitting association request messages from stations in the not-associated state;
 - transmitting the association grants in response to the association request messages,
 - switching each station to an associated state when the station has received
 - 10 an association grant in response to one of its association request messages;
 - storing route information defining a route between the station that has switched to the associated state and the association unit, the route including the station that has sent the associated grant; wherein
 - each association grant is transmitted only from the association unit or from
 - 15 an intermediate station, the latter only after said intermediate station has switched to the associated state.
17. A method according to claim 16, wherein the intermediate station is a dual function station, the method comprising
- transmitting a secondary association request message from the dual function
 - 20 station when the dual function is in the associated state;
 - transmitting a secondary association grant originating from the association unit in response to the secondary association request message;
 - enabling the dual function station to transmit the association grants only upon receiving the secondary association grant.
- 25 18. A method according to claim 17, comprising
- transmitting information from the intermediate station to the association unit about from which one of the stations the intermediated station has received transmissions;
 - selecting, in the association unit, whether to grant the secondary association
 - 30 request dependent on said information.

19. A method according to claim 18, comprising transmitting discovery messages from the stations before switching to the associated state, said transmissions comprising the discovery messages.
20. A method according to claim 17, comprising
- 5 - transmitting discovery advertisement messages from at least part of the stations, including an identification of the station that has transmitted the discovery advertisement message;
- addressing the association request messages using identifications from the discovery advertisement messages.
- 10 21. A method according to claim 20,
- including an indication in the discovery advertisement messages, whether the station that transmits the discovery advertisement message is enabled to transmit association grants,
- transmitting association requests addressed to stations only if the addressed
- 15 station has indicated that it is enabled to transmit association grants.
22. A method according to Claim 17, comprising switching the intermediate station to operate at a first and second, mutually different transmission frequency after switching to the associated state, for directly or indirectly communicating with the association unit and for communicating
- 20 with its associated stations respectively.

Title: Initialization of a wireless communication network

Abstract

A wireless communication network comprises an association unit and a plurality of stations. At least part of the stations store association information indicative of an associated route for transmission of messages from the station to the association unit. The association information is generated by installing the stations in a not-associated state; transmitting association request messages from stations in the not-associated state; and transmitting association grant messages in response to the association request messages. Each association grant message is transmitted only from the association unit or, at least when the station that has transmitted association request message is outside a reception range of the association unit, from one of the stations that is in an associated state. Each station that has received the association grant message in response to its association request message is switched to the associated state. Association information is stored that indicates the station that has sent the association grant message as part of the associated route to the association unit.

Fig.1

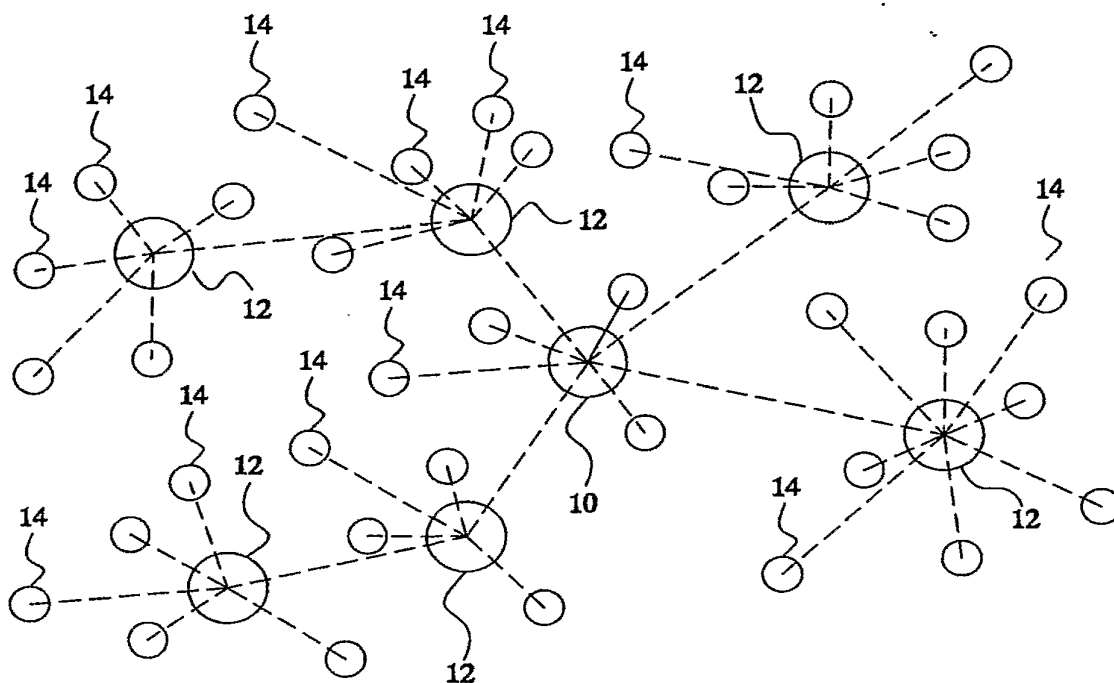
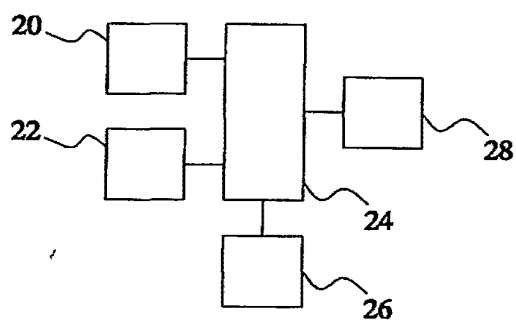
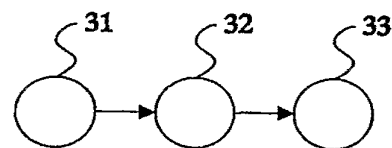
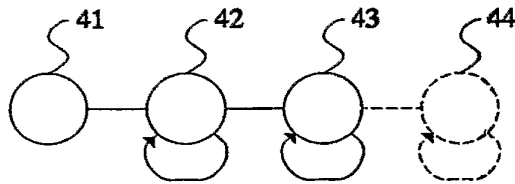
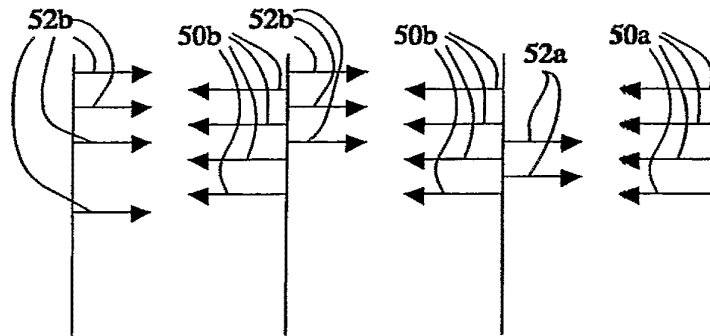
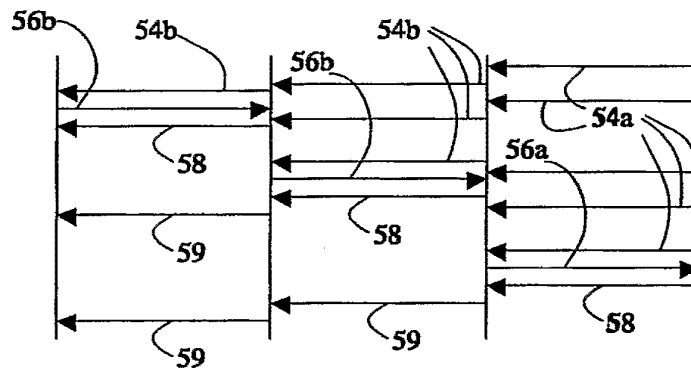
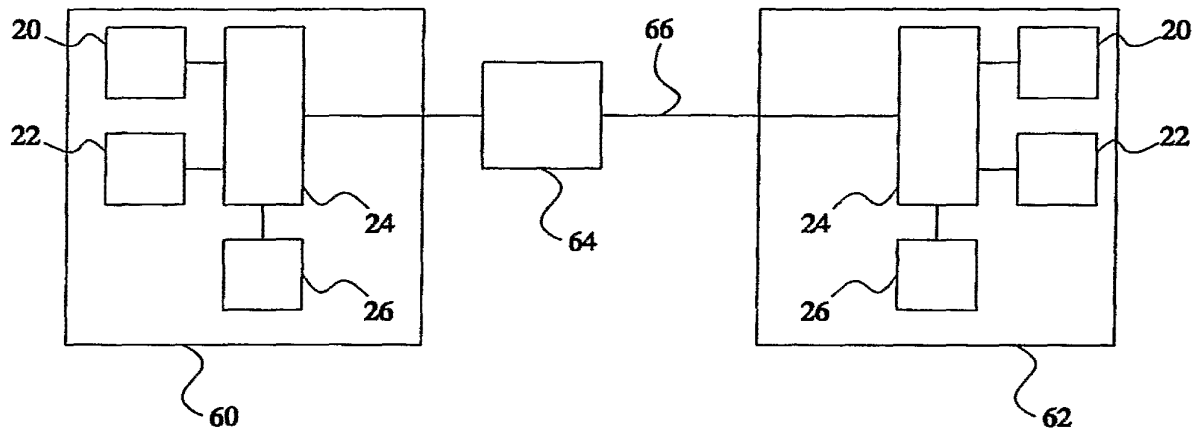
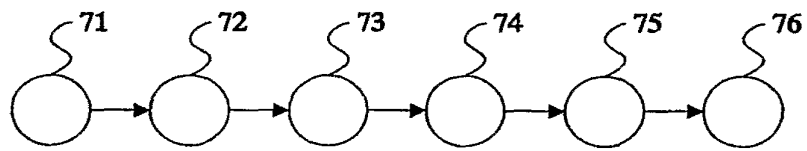
**Fig.1****Fig.2****Fig.3**

Fig4**Fig.5a****Fig.5b**

**Fig.6****Fig.7**

DO/ EO WORKSHEET

Patent Application Specialist/ National Stage Division

U.S. Appl. No. 12/159,787

International Appl. No. PCT/

NL 2007/008801

WIPO PUBLICATION INFORMATION :

Publication No.: WO2007/08801

Publication Language : ☒ English (IA used as specification) ☐ German ☐ Japanese
☐ Chinese ☐ Korean ☐ French ☐ Spanish ☐ Russian ☐ Other : _____

Publication Date : 12 July 2007

Not Published : ☐ U.S. only ☐ Early Pub. Request

Published : ☐ Early Pub.

INTERNATIONAL APPLICATION PAPERS IN THE APPLICATION FILE :

☒ International Application (RECORD COPY)

☐ PCT/IB/306

☐ Article 19 Amendments

☐ Request form PCT/RO/101

☐ PCT/IPEA/409 - IPER (check Examination Authority) :

☒ PCT/ISA/210 - Search Report (check Searching Authority) :

☐ EP ☐ JP ☐ SE ☐ AU ☐ US ☐ FR ☐ CN ☐ ES
☐ RU ☐ AT ☐ CA ☐ KR ☐ _____

☒ EP ☐ JP ☐ SE ☐ AU ☐ US ☐ FR ☐ CN ☐ ES
☐ RU ☐ AT ☐ CA ☐ KR ☐ _____ ☐ NONE

☐ Annexes to 409

☐ Search Report References

☐ PCT/ISA/237 (check Searching Authority) :

☒ Priority Document (s) No. 1

☐ EP ☐ JP ☐ SE ☐ AU ☐ US ☐ FR ☐ CN ☐ ES
☐ RU ☐ AT ☐ CA ☐ KR ☐ _____

☐ N/A

☐ Priority Document was NOT AVAILABLE at the time of paralegal review

☐ Other : _____

☐ Other : _____

RECEIPTS FROM THE APPLICANT (filed with the application unless noted otherwise) :

☒ Basic National Fee (or authorization to charge)

☒ Express Request to Begin Nat'l Examination Procedures

☒ Description ☒ Claims ☒ Abstract

☒ Preliminary Amendment(s) Filed on :

1. ☒ same as 371 request date 2. _____ 3. _____

☒ Number of Drawing Sheets : 3

☒ Information Disclosure Statement(s) Filed on :

1. ☐ same as 371 request date 2. 7/19/07 3. _____

☐ Translation of Article 19 Amendments

☐ Assignee Statement Under 37 CFR 3.73(b)

☐ entered ☐ not entered :

☐ Assignee PG Publication Notice

☐ not a page for page substitution
☐ replaced by Article 34 Amendment

☐ Substitute Specification Filed on :

1. ☐ same as 371 request date 2. _____ 3. _____

☐ Annexes to 409

☐ Verified Small Status Statement

☐ entered ☐ not entered :

☐ not a page for page substitution
☐ no translation ☐ other : _____

☐ Oath/ Declaration (executed)

☒ Application Data Sheet

☐ Defective Oath/ Declaration ☐ unsigned ☐ no citizenship ☐ other

☐ Power of Attorney

☐ DNA Diskette ☐ Sequence Listing

☐ Change of Address

☐ Other : _____

☐ PG Pub Early Publication Request

☐ Other : _____

NOTES :

35 U.S.C. 371 - Receipt of Request (PTO-1390)

Date Acceptable Oath/ Declaration Received

Date of Completion of requirements under 35 U.S.C. 371

Date of Completion of DO/ EO 903 - Notification of Acceptance

Date of Completion of DO/ EO 905 - Notification of Missing Requirements

Date of Completion of DO/ EO 909 - Notification of Abandonment

Date of Completion of DO/ EO 916 - Notification of Defective Response

Date of Completion of DO/ EO 922 - Notification to Comply w/ Requirements for Patent Applications
Containing Nucleotide and/or Amino Acid Sequence Disclosures

Date of Completion of DO/ EO 923

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET (FOR USE WITH FORM PTO-875)							SERIAL NO. <div style="font-size: 1.2em; font-family: cursive;">12/159743</div>	FILING DATE
APPLICANT(S)								
CLAIMS								
	AS FILED		AFTER 1 st AMENDMENT		AFTER 2 nd AMENDMENT			
	IND.	DEP.	IND.	DEP.	IND.	DEP.		
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TOTAL DEP.	27	←	18	←		←		
TOTAL CLAIMS	31		22					
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TOTAL CLAIMS								

PTO - 1360 (REV. 04/2007)

U.S. DEPARTMENT of COMMERCE
 Patent and Trademark Office

PATENT APPLICATION FEE DETERMINATION RECORD

Effective December 8, 2004

Application or Docket Number

12/18/75

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
U.S. NATIONAL STAGE FEES		
BASIC FEE		
EXAMINATION FEE		
SEARCH FEE		
FEE FOR EXTRA SPEC. PGS.	minus 100 =	/ 50 =
TOTAL CHARGEABLE CLAIMS	27 minus 20 =	7
INDEPENDENT CLAIMS	4 minus 3 =	1
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY OR LARGE ENTITY

RATE	FEE		RATE	FEE
BASIC FEE		OR	BASIC FEE	36
EXAM. FEE			EXAM. FEE	26
SEARCH FEE			SEARCH FEE	46
X \$ 125 =			X \$ 250 =	
X \$ 25 =		OR	X \$ 50 =	100
X \$ 100 =		OR	X \$ 200 =	210
+ \$ 180 =		OR	+ \$ 360 =	
TOTAL		OR	TOTAL	1290

CLAIMS AS AMENDED - PART II

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus **	=
Independent	*	Minus ***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

SMALL ENTITY OR OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X \$ 25 =		OR	X \$ 50 =	
X \$ 100 =		OR	X \$ 200 =	
+ \$ 180 =		OR	+ \$ 360 =	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus **	=
Independent	*	Minus ***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X \$ 25 =		OR	X \$ 50 =	
X \$ 100 =		OR	X \$ 200 =	
+ \$ 180 =		OR	+ \$ 360 =	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. 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 "10", enter "10".