AO 120 (Rev. 08/10)

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

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

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

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:22-cv-282	7/25/2022	Eastern District of Texas

PLAINTIFF	DEFENDANT
KONINKLIJKE KPN N.V.	TELEFONAKTIEBOLAGET LM ERICSSON and ERICSSON INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,092,705	8/15/2006	KONINKLIJKE KPN N.V.
2	8,660,560	2/25/2014	KONINKLIJKE KPN N.V.
3	8,886,772	11/11/2014	KONINKLIJKE KPN N.V.
4			
5			

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

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

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

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

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

KONINKLIJKE KPN N.V.
EXHIBIT 2004

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/499,924	Filing Date 04/03/2012	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT

05/13/2014	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 24	Minus	** 24	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/DIANA BATES/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/499,924	02/25/2014	8660560	4965.1003-000	7977

21005 7590 02/05/2014

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.
530 VIRGINIA ROAD
P.O. BOX 9133
CONCORD, MA 01742-9133

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 0 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):

Job Cornelis Oostveen, Haren, NETHERLANDS;
Ljupco Jorguseski, Rijswijk, NETHERLANDS;
Remco Litjens, Voorschoten, NETHERLANDS;
Adrian Victor Pais, Rijswijk, NETHERLANDS;
Haibin Zhang, The Hague, NETHERLANDS;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

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)

21005 7590 10/11/2013
HAMILTON, BROOK, SMITH & REYNOLDS, P.C.
530 VIRGINIA ROAD
P.O. BOX 9133
CONCORD, MA 01742-9133

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.
13/499,924	04/03/2012	Job Cornelis Oostveen	4965.1003-000	7977

TITLE OF INVENTION: SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	~~$1780~~ $960	~~$300~~	$0	~~$2080~~ $960	01/13/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
SIDDIQUI, KASHIF	2646	455-437000

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 _____
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)
Koninklijke KPN N.V. and	The Hague, The Netherlands
Nederlandse Organisatie Voor Toegepast-Natuurwetenschappelijk Onderzoek TNO	Delft, The 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 08-0380 (enclose an extra copy of this form).

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29	NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
❑ Applicant asserting small entity status. See 37 CFR 1.27	NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
❑ Applicant changing to regular undiscounted fee status.	NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: 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 /Timothy J. Meagher, Reg. No.39302/ Date 1/10/2014

Typed or printed name Timothy J. Meagher Registration No. 39,302

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:	13499924
Filing Date:	03-Apr-2012
Title of Invention:	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE
First Named Inventor/Applicant Name:	Job Cornelis Oostveen
Filer:	Timothy J. Meagher/Julie Kertyzak
Attorney Docket Number:	4965.1003-000

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	960	960
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**960**

Electronic Acknowledgement Receipt

EFS ID:	17877464
Application Number:	13499924
International Application Number:	
Confirmation Number:	7977
Title of Invention:	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE
First Named Inventor/Applicant Name:	Job Cornelis Oostveen
Customer Number:	21005
Filer:	Timothy J. Meagher/Julie Kertyzak
Filer Authorized By:	Timothy J. Meagher
Attorney Docket Number:	4965.1003-000
Receipt Date:	10-JAN-2014
Filing Date:	03-APR-2012
Time Stamp:	15:06:35
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	$960
RAM confirmation Number	1659
Deposit Account	080380
Authorized User	

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

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	49651003000IF.pdf	85612 cdacc1bf0d41d2b990c2d922a721b7541d7dba61	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30983 f38c1805777cffa86f7f8c291addb319c397a480	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	116595		

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.

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

21005 7590 10/11/2013
HAMILTON, BROOK, SMITH & REYNOLDS, P.C.
530 VIRGINIA ROAD
P.O. BOX 9133
CONCORD, MA 01742-9133

EXAMINER
SIDDIQUI, KASHIF

ART UNIT	PAPER NUMBER
2646	

DATE MAILED: 10/11/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/499,924	04/03/2012	Job Cornelis Oostveen	4965.1003-000	7977

TITLE OF INVENTION: SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	01/13/2014

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

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

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

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

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

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

PART B - FEE(S) TRANSMITTAL

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

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

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

21005 7590 10/11/2013
HAMILTON, BROOK, SMITH & REYNOLDS, P.C.
530 VIRGINIA ROAD
P.O. BOX 9133
CONCORD, MA 01742-9133

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.
13/499,924	04/03/2012	Job Cornelis Oostveen	4965.1003-000	7977

TITLE OF INVENTION: SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	01/13/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
SIDDIQUI, KASHIF	2646	455-437000

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 _____
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)

❑ Applicant certifying micro entity status. See 37 CFR 1.29	NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
❑ Applicant asserting small entity status. See 37 CFR 1.27	NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
❑ Applicant changing to regular undiscounted fee status.	NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: 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.
13/499,924	04/03/2012	Job Cornelis Oostveen	4965.1003-000	7977

21005 7590 10/11/2013

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.
530 VIRGINIA ROAD
P.O. BOX 9133
CONCORD, MA 01742-9133

EXAMINER	
SIDDIQUI, KASHIF	

ART UNIT	PAPER NUMBER
2646	

DATE MAILED: 10/11/2013

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

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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.

Notices of Allowance and Fee(s) Due mailed between October 1, 2013 and December 31, 2013

(Addendum to PTOL-85)

If the "Notice of Allowance and Fee(s) Due" has a mailing date on or after October 1, 2013 and before January 1, 2014, the following information is applicable to this application.

If the issue fee is being timely paid on or after January 1, 2014, the amount due is the issue fee and publication fee in effect January 1, 2014. On January 1, 2014, the issue fees set forth in 37 CFR 1.18 decrease significantly and the publication fee set forth in 37 CFR 1.18(d)(1) decreases to $0.

If an issue fee or publication fee has been previously paid in this application, applicant is not entitled to a refund of the difference between the amount paid and the amount in effect on January 1, 2014.

Notice of Allowability	Application No. 13/499,924	Applicant(s) OOSTVEEN ET AL.	
	Examiner KASHIF SIDDIQUI	Art Unit 2646	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *08/14/2013*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-13 and 15-18*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☒ All b) ☐ Some *c) ☐ None of the:
   1. ☒ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/KASHIF SIDDIQUI/
Primary Examiner, Art Unit 2646

1. The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Allowable Subject Matter

2. In view of amended claims and further search, Claims 1-13, 15-18 are allowed.

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

The reasons for Allowance are the same as those presented by the Applicant in the Remarks submitted on 8/14/2013.

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

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KASHIF SIDDIQUI whose telephone number is (571)270-3188. The examiner can normally be reached on Monday through Thursday 6:30-16:30 (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamran Afshar can be reached on (571)272-7796. 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.

/KASHIF SIDDIQUI/
Primary Examiner, Art Unit 2646

***

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13499924	OOSTVEEN ET AL.
	Examiner	**Art Unit**
	KASHIF SIDDIQUI	2646

CPC		
Symbol	**Type**	**Version**

CPC Combination Sets				
Symbol	**Type**	**Set**	**Ranking**	**Version**

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	17	
/KASHIF SIDDIQUI/ Primary Examiner.Art Unit 2646	10/02/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3A

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13499924	OOSTVEEN ET AL.
	Examiner	**Art Unit**
	KASHIF SIDDIQUI	2646

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
455	437	H	0	4	W	36 / 08 (2009.01.01)						

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
370	331				

NONE	Total Claims Allowed:	
(Assistant Examiner) (Date)	17	
/KASHIF SIDDIQUI/ Primary Examiner.Art Unit 2646 10/02/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner) (Date)	1	3A

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13499924	OOSTVEEN ET AL.
	Examiner	**Art Unit**
	KASHIF SIDDIQUI	2646

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

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	17	
/KASHIF SIDDIQUI/ Primary Examiner.Art Unit 2646	10/02/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3A

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13499924	OOSTVEEN ET AL.
	Examiner	Art Unit
	KASHIF SIDDIQUI	2646

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
455	435.1-445,524-525	4/16/2013	KS
370	329-334,336,350	4/16/2013	KS
All Above	Updated	10/2/2013	KS

SEARCH NOTES		
Search Notes	Date	Examiner
Searched EAST	4/16/2013	KS
Searched Google Patents	4/16/2013	KS
Searched Inventor	4/16/2013	KS
Searched Assignee	4/16/2013	KS
Searched EPO/WIPO	4/16/2013	KS
Updated Search	10/2/2013	KS

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
455	435.1-445,524-525	10/2/2013	KS
370	329-334,336,350	10/2/2013	KS
	keyword search of the claims using claim terms and language	10/2/2013	KS

	/KASHIF SIDDIQUI/ Primary Examiner.Art Unit 2646

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Job Cornelis Oostveen, Ljupco Jorguseski, Remco Litjens, Adrian Victor Pais and Haibin Zhang	
Application No.:	13/499,924	Group: 2646
371(c) File Date:	April 3, 2012	Examiner: Siddiqui, Kashif
Confirmation No:	7977	
For:	System for Updating a Neighbour Cell List (NCL) of a Wireless Access Node of a Telecommunications Architecture and Method Therefore	

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, or is being facsimile transmitted to the United States Patent and Trademark Office on:

_____ _____
Date Signature

_____
Typed or printed name of person signing certificate

AMENDMENT

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

Commissioner:

This Amendment is being filed in response to the Office Action mailed from the U.S. Patent and Trademark Office on April 22, 2013 in the above-identified application. Reconsideration and further examination are requested.

An extension of time to respond to the Office Action is respectfully requested. A Petition for Extension of Time and the appropriate fee are being filed concurrently with this Amendment.

Please amend the application as follows:

Amendments to the Claims

Please cancel claim 14. Please amend claims 1, 9-13 and 16.

The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing

1. (Currently Amended) A system for updating a neighbour cell list in a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined, the system comprising:

[[-]] a detector configured for detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;

[[-]] a selector configured for selecting a part of the user terminals;

[[-]] a request generator configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

[[-]] a receiver configured for receiving the cell information from the one or more of the selected user terminals; and

[[-]] updating means configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

2. (Original) The system according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving

the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node.

3. (Original) The system according to claim 2, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

4. (Previously Presented) The system according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node.

5. (Original) The system according to claim 4, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

6. (Previously Presented) The system according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node,

further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or

more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

7. (Previously Presented) The system according to claim 1, wherein the telecommunications system is further configured for receiving location information from one or more of the detected user terminals and wherein the location information is used as a selection parameter for selecting the part of the detected user terminals.

8. (Previously Presented) The system according to claim 1, wherein one or more thresholds, possibly service-dependent, are defined in the telecommunications system for transferring the user terminals between the first wireless access network and the second wireless access network and wherein at least one of the thresholds is used as a selection parameter for selecting the part of the detected user terminals.

9. (Currently Amended) In a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined, a method for updating at least one of the first and second neighbour cell lists comprising the steps of:

[[-]] detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;

[[-]] selecting a part of the user terminals; requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

[[-]] receiving the cell information from the one or more of the selected user terminals; and

[[-]] updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

10. (Currently Amended) The method according to claim 9, comprising the steps of:

[[-]] requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

[[-]] receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node, and

[[-]] transferring the selected user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node.

11. (Currently Amended) The method according to claim 9, comprising the steps of:

[[-]] requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

[[-]] receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node, and

[[-]] transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node.

12. (Currently Amended) The method according to claim 9, comprising the steps of:

[[-]] requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

[[-]] receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node; and

[[-]] transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

13. (Currently Amended) A non-transitory computer-readable storage medium containing a set of instructions that, when executed by a processor in a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined, performs a method for updating at least one of the first and second neighbour cell lists, including the steps of:

[[-]] detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;

[[-]] selecting a part of the user terminals;

[[-]] requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

[[-]] receiving the cell information from the one or more of the selected user terminals; and

[[-]] updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

14. (Cancelled)

15. (Previously Presented) The method according to claim 10, further comprising the step of transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

16. (Currently Amended) The method according to claim 10, comprising the steps of:

[[-]] requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

[[-]] receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node, and

[[-]] transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node.

17. (Previously Presented) The method according to claim 11, comprising the step of transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

18. (Previously Presented) The method according to claim 16, comprising the step of transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

REMARKS

Claims 1-18 are pending in the application. With entry of the amendment, claim 14 is cancelled and claims 1, 9-13 and 16 are amended.

Claims 1, 9-13 and 16 are amended to remove extraneous punctuation.

Applicant acknowledges with appreciation the indication by the Office of allowable subject matter with respect to claims 2-6, 10-12 and 15-18. However, for the reasons indicated below, Applicant traverses the rejection of claims 1, 7-9 and 13.

Claims 1, 9 and 13 are rejected under 35 USC 102(b) as being anticipated by WO2009/119699 ("Serravalle"). The rejection is respectfully traversed.

Serravalle discloses a method of facilitating handover of a user device between a source base station component in a first communications network of a first network type and a target base station component in a second communications network of a second network type. The method includes determining an identifier of at least one target gateway component connected to the target base station component in the second communications network. A handover request message is then generated in the first communications network, the handover request message incorporating the identifier of the at least one target gateway component. The handover request message is then transmitted to the second communications network.

In order to facilitate such a handover between two different network types it is necessary that the first network obtains information about elements of the second network. The information relates to both identity information in order to address the elements of the other network, and also to, e.g., signal strength information. The identity information may relate to base stations, gateways and controllers.

As explained in the background section of the present application, a handover (or cell reselection) is performed using information from the neighbour cell list, which is stored in each base station and broadcast within the cell. Mobile terminals in the cell receive and store the NCL.

Serravalle discloses a method to update the NCL in the first network with information about elements in the second network, the Automatic Neighbour Relation (ANR) function.

The present application relates to an enhanced ANR function. Differences between claim 1 over the ANR disclosed in Serravalle are in the first place:

- a detector configured for detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;

- a selector configured for selecting a part of the user terminals.

Further, because the other features of the claim are performing their functionality on the previously detected and selected user terminals, Serravalle also not does disclose:

- a request generator configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

- a receiver configured for receiving the cell information from the one or more of the selected user terminals; and

- updating means configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

According to Serravalle at page 12, line 22-27, the Identifier Management Module is operable for requesting information relating to identifiers of target gateway and base station components and of storing processing and managing this information. It is not clear to the applicant how this module relates to the selector of the present application, which is configured to select a part of the user terminals from all the user terminals detected to be in a handover or cell reselect situation.

The Handover module of Serravalle is for generating and transmitting handover requests based on the identifier information (presumably in the Identifier Management Module), e.g., on page 12, line 4-5, where the source eNB can address the target SGSN and provides the identifier of the target RNC in the Handover request message. As such, the Handover module is clearly not operating the same as detecting user terminals to be handed over.

In Serravalle the ANR function is carried out as part of the actual handover, see page 9, line 13 to page 10, line 17.

In the present application the updating of the NCL is performed independently of actual handover procedures, although the updating of the NCL is done based on information received from selected terminals about to be in a handover or reselection situation (page 5, second paragraph). This leads to the situation of, e.g., claim 2 where the actual hand over or cell reselection is performed prior to receiving the cell information. In addition, this also allows for the possibility that a terminal that is about to be handed over is not requested to report cell information (page 7, last sentence).

Furthermore, in the present application a selection is made of all the terminals in a handover or reselection situation, e.g., based on location or on a service based threshold (page 7, last sentence – page 9 first paragraph and page 12 last paragraph- page 13 second paragraph).

In the ANR function of Serravalle the Report Neighbour Request message is sent to the user terminal to be handed over (page 8, line 10-11 and page 9, line 18).

In summary, Serravalle relates to a method of facilitating handovers based on the results of an ANR function based on information received from the terminal to be handed over, whereas the present application relates to updating (optimizing) an NCL based on information previously received from selected terminals in a handover situation.

The effect of selecting a part of the user terminals to report cell information is that the amount of cell information reporting can be tuned, which relates to a trade-off between the measurement overhead and the potential for neighbour cell list optimization (page 8, first paragraph). So the problem address by the present invention is how to tune the cell information reporting by user terminals. This is a problem which could occur in the system of the present application, where potentially all terminals in a handover or cell reselection situation could be requested to report cell information. The problem would not occur in the system of Serravalle, where a user terminal is requested to report cell information in a specific handover situation and which information is necessary to perform the handover. Therefore, one skilled in the art would not be motivated to consider Serravalle in addressing such a problem.

Since Serravalle does not teach each and every feature of claim 1, Serravalle does not anticipate claim 1. For the above reasons, claim 1 is patentable over Serravalle. Claims 9 and 13, which depend from claim 1, are patentable for at least the same reasons. Reconsideration and withdrawal of the rejection under 35 USC 102 are respectfully requested.

Claim 14 is rejected under 35 USC 103(a) as being unpatentable over Serravalle and further in view of US2009/0137265 ("Flore"). Claim 14 is now cancelled; therefore, the rejection is moot.

Claims 7 and 8 are rejected under 35 USC 103(a) as being unpatentable over Serravalle and further in view of US2006/0193295 ("White"). The rejection is respectfully traversed.

Claims 7 and 8 depend from base claim 1. White does not supply what is lacking in Serravalle with respect to claim 1. For reasons similar to those set forth above regarding claim 1, dependent claims 7 and 8 are patentable over Serravalle taken with White by being dependent upon a patentable base claim. Reconsideration and withdrawal of the rejection of claims 7 and 8 under 35 USC 103 are respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

By /Timothy J. Meagher, Reg. No. 39302/
Timothy J. Meagher
Registration No. 39,302
Telephone: (978) 341-0036
Facsimile: (978) 341-0136

Concord, MA 01742-9133
Date: August 14, 2013

Electronic Patent Application Fee Transmittal

Application Number:	13499924
Filing Date:	03-Apr-2012
Title of Invention:	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE
First Named Inventor/Applicant Name:	Job Cornelis Oostveen
Filer:	Timothy J. Meagher/Julie Kertyzak
Attorney Docket Number:	4965.1003-000

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:				
Extension-of-Time:				
Extension - 1 month with $0 paid	1251	1	200	200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**200**

Electronic Acknowledgement Receipt

EFS ID:	16589391
Application Number:	13499924
International Application Number:	
Confirmation Number:	7977
Title of Invention:	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE
First Named Inventor/Applicant Name:	Job Cornelis Oostveen
Customer Number:	21005
Filer:	Timothy J. Meagher/Julie Kertyzak
Filer Authorized By:	Timothy J. Meagher
Attorney Docket Number:	4965.1003-000
Receipt Date:	14-AUG-2013
Filing Date:	03-APR-2012
Time Stamp:	16:15:08
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	$200
RAM confirmation Number	3314
Deposit Account	080380
Authorized User	

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

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	49651003000feetrans.pdf	105451 f6b5c5ada089cf54d3915c4ff761ec59ef4e58bb	no	3
Warnings:					
Information:					
2		49651003000Amend.pdf	95613 592e70963286c6a11c9376530a87483ca486c78e	yes	11

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Claims	2	7
Applicant Arguments/Remarks Made in an Amendment	8	11

Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	31137 4309643462316c0e09003004f1f77b2bbac90d86	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	232201		

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Job Cornelis Oostveen, Ljupco Jorguseski, Remco Litjens, Adrian Victor Pais and Haibin Zhang

Application No.: 13/499,924 Group: 2646

371(c) File Date: April 3, 2012 Examiner: Siddiqui, Kashif

Confirmation No.: 7977

For: System for Updating a Neighbour Cell List (NCL) of a Wireless Access Node of a Telecommunications Architecture and Method Therefore

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, or is being facsimile transmitted to the United States Patent and Trademark Office on:

_____ _____

Date Signature

_____

Typed or printed name of person signing certificate

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

Commissioner:

Transmitted herewith is an Amendment for filing in the above-identified application.

☐ Small entity status of this application under 37 CFR 1.9 and 1.27 has been established by a Small Entity Statement previously submitted.

☐ A Small Entity Statement to establish small entity status under 37 CFR 1.9 and 1.27 is enclosed.

☐ The Assignee hereby asserts small entity status of the above-identified application under 37 CFR 1.27. This statement is being executed on behalf of the Assignee pursuant to 1.27(c)(2).
(Use if large entity and changing to small entity.)

☐ Applicant qualifies for and certifies micro entity status. A Certification of Micro Entity Status **[Option** (Gross Income Basis)(Institution of Higher Education Basis)**]** is enclosed.

The claims fee has been calculated as shown below:

	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NO. PREVIOUSLY PAID FOR	PRESENT EXTRA	LARGE ENTITY RATE	LARGE ENTITY ADDIT. FEE
TOTAL	17	MINUS	* 20	0	X $80	$
INDEP	3	MINUS	** 3	0	X $420	$
☐ FIRST PRESENTATION OF MULTIPLE DEP. CLAIM					+ $780	$

* not fewer than 20
** not fewer than 3

TOTAL OF ABOVE = $ 0

☐ Applicant asserts small entity status. Fees above are reduced by 50%. MINUS $ 0

☐ Applicant certifies micro entity status. Fees above are reduced by 75%. MINUS $ 0

TOTAL CLAIMS FEE $ 0

The Application Size Fee has been calculated as shown below:
(Effective for cases filed on or after December 8, 2004)

Actual Sheets (Including current amendment)	Highest No. of Sheets Paid For (At least 100)	No. of Additional Units Required (Increments of 50 sheets)	LARGE ENTITY Rate	LARGE ENTITY Total Amount Owed	Payment Sufficient for up to
29	100	0	X $400	$0	100 Sheets

☐ Applicant asserts small entity status. Fees above are reduced by 50%. MINUS $ 0

☐ Applicant certifies micro entity status. Fees above are reduced by 75%. MINUS $ 0

TOTAL APPLICATION SIZE FEE $ 0

Petition for Extension of Time

☒ Applicant hereby petitions to extend the time to respond to the Office Action dated April 22, 2013 for 1 month(s) from July 22, 2013 to August 22, 2013. The appropriate fee is set forth below.

☐ *[For action-specific language in an extension of time, select the appropriate option from the Firm Templates]*

Please charge Deposit Account No. 08-0380 for the following fees:

☒	Petition for 1 month Extension of Time	$ 200
☐	Claims Fee	$
☐	Application Size Fee	$
☐	Other Fees:	
		$
		$
	TOTAL:	$ 200

A check is enclosed in payment of the following fees:

☐	Petition for [ ] month Extension of Time	$
☐	Claims Fee	$
☐	Application Size Fee	$
☐	Other Fees:	
		$
		$
	TOTAL:	$

☒ Please charge any deficiency or credit any overpayment in the fees that may be due in this matter to Deposit Account No. 08-0380.

Respectfully submitted,

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

By /Timothy J. Meagher, Reg. No. 39302/
Timothy J. Meagher
Registration No.: 39,302
Telephone (978) 341-0036
Facsimile (978) 341-0136

Concord, Massachusetts 01742-9133
Dated: August 14, 2013

–Rev/Fee Schedule March 19, 2013

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/499,924	Filing Date 04/03/2012	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)		
	08/14/2013	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	* 17	Minus	** 20	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**0**

		(Column 1)		(Column 2)	(Column 3)		
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/DEBORAH POLLARD/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/499,924	04/03/2012	Job Cornelis Oostveen	US17827

CONFIRMATION NO. 7977

POWER OF ATTORNEY NOTICE

90057
De Vries & Metman
Overschiestraat 180
Amsterdam, 1062 XK
NETHERLANDS

OC000000062139994

Date Mailed: 06/24/2013

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/18/2013.

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

/gbien-aime/

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/499,924	04/03/2012	Job Cornelis Oostveen	4965.1003-000

CONFIRMATION NO. 7977

POA ACCEPTANCE LETTER

21005
HAMILTON, BROOK, SMITH & REYNOLDS, P.C.
530 VIRGINIA ROAD
P.O. BOX 9133
CONCORD, MA 01742-9133

OC000000062140065

Date Mailed: 06/24/2013

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/18/2013.

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

/gbien-aime/

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

REVOCATION OF POWER OF ATTORNEY WITH NEW POWER OF ATTORNEY and CHANGE OF CORRESPONDENCE ADDRESS

Application/Patent Number	13/499,924
371(c) Date	April 3, 2012
First Named Inventor/Patentee	Job Cornelis Oostveen
Confirmation Number	7977
Group Art Unit	2646
Examiner Name	Siddiqui, Kashif
Attorney Docket Number	4965.1003-000

Title: System for Updating a Neighbour Cell List (NCL) of a Wireless Access Node of a Telecommunications Architecture and Method Therefore

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ I hereby appoint the following practitioner(s): [Not to exceed 10]

OR

☒ I hereby appoint the practitioners associated with the Customer Number: **021005**

Please change the correspondence address for the above-identified application to:

☒ **Customer Number 021005**
Hamilton, Brook, Smith & Reynolds, P.C.
530 Virginia Road
P.O. Box 9133
Concord, Massachusetts 01742-9133

☐ Other

Please direct all telephone calls and facsimiles to:

Name: Timothy J. Meagher Tel. No. (978) 341-0036 Fax No. (978) 341-0136

I am the:

☐ Applicant/Inventor.

☒ Authorized representative of the Assignee, Koninklijke KPN N.V., of the entire interest. See 37 CFR § 3.71. A Statement under 37 CFR § 3.73(b) is enclosed.

☐ Authorized representative of the Assignee, [FILL IN WITH NAME OF ASSIGNEE], together with [FILL IN WITH NAME OF ASSIGNEE], of the entire interest. A Statement under 37 CFR § 3.73(b) is enclosed.

A copy of this form, together with a Statement under 37 CFR § 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The Statement under 37 CFR § 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Applicant or Assignee of Record

Signature	
Name & Title	K.M. Wuyts Corporate Intellectual Property Officer
Date	

1462000.1

Docket No. 4965.1003-000

STATEMENT UNDER 37 CFR § 3.73(b)

Applicant/Patentee: Job Cornelis, Ljupco Jorguseski, Remco Litjens, Adrian Victor Pais and Haibin Zhang (Oosveen)

Application No./Patent No.: 13/499,924 371(c) Date: April 3, 2012

For: System for Updating a Neighbour Cell List (NCL) of a Wireless Access Node of a Telecommunications Architecture and Method Therefore

Koninklijke KPN N.V. (Name of Assignee), a Corporation (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is

A. ☒ the assignee of the entire right, title and interest in the patent application identified above; or

B. ☐ an assignee together with [ ] of the entire right, title and interest in the patent application identified above.

The right, title and interest of the above-named assignee in the patent application identified above is established by virtue of:

A. ☒ An assignment from the inventor(s) of the patent application identified above. The assignment was recorded in the Patent and Trademark Office at Reel 028153, Frames 0989-0993, or a copy thereof is attached.

OR

B. ☐ A chain of title from the inventor(s) of the patent application identified above, to the current assignee as shown below:

1. From: [ ] To: [ ]
The document was recorded in the United States Patent and Trademark Office at
Reel [ ], Frames [ ], or a copy thereof is attached.

2. From: [ ] To: [ ]
The document was recorded in the United States Patent and Trademark Office at
Reel [ ], Frames [ ], or a copy thereof is attached.

3. From: [ ] To: [ ]
The document was recorded in the United States Patent and Trademark Office at
Reel [ ], Frames [ ], or a copy thereof is attached.

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

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

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

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

Signature

Name: K.M. Wright

Title: Corporate Intellectual Property Officer

Date: 17 June 2013

1461994.1

Electronic Acknowledgement Receipt

EFS ID:	16066474
Application Number:	13499924
International Application Number:	
Confirmation Number:	7977
Title of Invention:	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE
First Named Inventor/Applicant Name:	Job Cornelis Oostveen
Customer Number:	90057
Filer:	Timothy J. Meagher/Amy McGrew
Filer Authorized By:	Timothy J. Meagher
Attorney Docket Number:	US17827
Receipt Date:	18-JUN-2013
Filing Date:	03-APR-2012
Time Stamp:	11:36:40
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		49651003000Rev373.pdf	199193 c272a36286d6518698301c3b3924fdb668545b8c	yes	2

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Power of Attorney	1	1
	Assignee showing of ownership per 37 CFR 3.73.	2	2
Warnings:			
Information:			
	Total Files Size (in bytes):	199193	

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New Applications Under 35 U.S.C. 111
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National Stage of an International Application under 35 U.S.C. 371
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New International Application Filed with the USPTO as a Receiving Office
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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/499,924	04/03/2012	Job Cornelis Oostveen	US17827	7977

90057 7590 04/22/2013

De Vries & Metman
Overschiestraat 180
Amsterdam, 1062 XK
NETHERLANDS

EXAMINER	
SIDDIQUI, KASHIF	

ART UNIT	PAPER NUMBER
2646	

NOTIFICATION DATE	DELIVERY MODE
04/22/2013	ELECTRONIC

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

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

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

mail@dvme.nl
n.hartmann@dvme.nl
mk@dvme.nl

Office Action Summary	Application No. 13/499,924	Applicant(s) OOSTVEEN ET AL.	
	Examiner KASHIF SIDDIQUI	Art Unit 2646	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *1 June 2012*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-18* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1,7-9,13 and 14* is/are rejected.

8)☒ Claim(s) *2-6,10-12 and 15-18* is/are objected to.

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

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

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

11)☒ The drawing(s) filed on *03 April 2012* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☒ All b)☐ Some * c)☐ None of the:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Interim copies:

a)☐ All b)☐ Some c)☐ None of the: Interim copies of the priority documents have been received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. Claims 2-6, 10-12, and 15-18 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claim(s) 1, 9, 13 is/are rejected under 35 U.S.C. 102(b) as being anticipated by WO 2009119699 A2 to Serravalle, Francesca.**

Re: Claim(s) 1, 9, 13

Serravalle discloses a system (pg. 6 lines 3-4)

for updating a neighbour cell list in a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined (pg. 8 line 27- page 9 line 1 - the first BS updates its Inter-RAT neighbor relation list.

The Examiner points out that the neighbor relation list is a list of neighbors for both networks (e.g. RATs)),

the system comprising: a detector configured for detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network (Fig. 8 – element 35. Pg. 12 lines 20-27 – the BS utilizes an Identifier Management Module 33 and a Handover Module 35 to identify and store information relating to the target gateway and base station components which are used by the Handover Module to transmit handover requests. The Examiner points out that handover requests would be specific to the particular terminal for which the handover is requested; therefore detecting the terminals is necessary);

a selector configured for selecting a part of the user terminals (see last citation);

a request generator configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network (Fig. 3 – elements 316 and 318. pg. 8 lines 6-19 – the LTE network (i.e. first network) determines if other neighbor base stations are in the area that are part of other types of networks. The BS sends a Report Neighbour Request Message 316 to UE 314 which the UE in response transmits a Report Neighbour Response Message 318 which reports the presence of the second BS which is part of a different network type (e.g. a UTRAN network));

a receiver configured for receiving the cell information from the one or more of the selected user terminals (Fig. 8 – element 21);

and updating means configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information (pg. 8 line 27-pg. 9 line 1 - the first BS updates its Inter-RAT neighbor relation list).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. **Claim(s) 14 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Serravalle as applied to claim 1 above, and further in view of US 20090137265 A1 Flore; Oronzo et al.**

Re: Claim(s) 14

Serravalle discloses a mobile user terminal configured for use in the method according to claim 9 (see the rejection of claim 1 above and Fig. 9),

the terminal comprising: a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network (Fig. 9 – element 71);

scanning means for detecting the cell information from the wireless access nodes, at least one of the wireless access nodes being absent in the neighbour cell list (Fig. 9 – element 89. pg. 13 lines 10-13. The Examiner points out that the purpose of the UE reporting the detected BSs is to inform the network about new BSs to update the neighbor list with; therefore the nodes being absent prior to the update is implicit),

a transmitter for transmitting the detected cell information (Fig. 9 – element 71).

Serravalle does/do not appear to explicitly disclose wherein the mobile terminal, in use, contain a neighbour cell list of the first wireless access node, and that wherein the mobile user terminal is arranged for temporarily storing the detected cell information and transmitting the detected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

However, the Examiner points out that it is old and well known that a mobile terminal contains a neighbour cell list of the first wireless access node. For instance, as disclosed in 3GPP TS 36.300 v8.9.0, chapter 10.2.1 a UE performs cell reselection and handover functions per a neighbor list provided by the serving cell.

Further, attention is directed to **Flore** which discloses wherein the mobile user terminal is arranged for temporarily storing the detected cell information and transmitting the detected cell information to the second wireless access node after being transferred from the first to the second wireless access network (0054-0055 – after establishing a radio link with an intermediary of a different RAT, the UE 402 retains (i.e. stores) missing inter-RAT neighbor relationship between the first access node 406 and the

intermediary access node 416 for the duration of a timer. After expiration of the timer, the information is discarded (therefore temporary)).

Therefore it would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the **Serravalle** invention by employing the teaching as taught by **Flore** to provide the ability to temporarily store the detected cell information after being transferred to the second network. The motivation for the combination is given by **Flore** (0003 – the invention relates to updating access node neighbor lists in a wireless communications network).

6. **Claim(s) 7, 8 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Serravalle as applied to claim 1 above, and further in view of US 20060193295 A1 to White; Patrick E. et al.**

Re: Claim(s) 7

Serravalle discloses those limitations as set forth in the rejection of claim(s) 1 above.

Serravalle does/do not appear to explicitly disclose wherein the telecommunications system is further configured for receiving location information from one or more of the detected user terminals and wherein the location information is used as a selection parameter for selecting the part of the detected user terminals.

However, attention is directed to **White** which discloses said limitation (0060 – Mobility management information includes triggers [for handover] which include known

metrics such as RSSI/SNR, CIR, BER, BLER measurements, cell ranking functions, various cost functions, distance, and location information).

Therefore it would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the **Serravalle** invention by employing the teaching as taught by **White** to provide the ability to select terminals for transfer on the basis of location. The motivation for the combination is given by **White** (0007 - what would be desirable, but has not yet been provided, is a multi-access access terminal for communicating over multiple, heterogeneous (e.g., wired and wireless) communication channels, wherein a mobile client can simultaneously aggregate multiple connections to heterogeneous access points and/or ad-hoc network terminals to increase capacity and/or efficiency).

Re: Claim(s) 8

Serravalle discloses those limitations as set forth in the rejection of claim(s) 1 above.

Serravalle does/do not appear to explicitly disclose wherein one or more thresholds, possibly service-dependent, are defined in the telecommunications system for transferring the user terminals between the first wireless access network and the second wireless access network and wherein at least one of the thresholds is used as a selection parameter for selecting the part of the detected user terminals.

However, attention is directed to **White** which discloses said limitation (0054, 0060 - Mobility management information includes triggers [for handover] which include

known metrics such as RSSI/SNR, CIR, BER, BLER measurements, cell ranking functions, various cost functions, distance, and location information. The Examiner points out that if signal strength measurements are the basis for a trigger to be set, then it would be necessary for there to be a signal strength level above which the trigger could be enacted upon (i.e. a threshold). Further in 0054 - thresholds are disclosed to indicate that a communication loss is about to occur (i.e. a trigger to perform handover)) and in 0057 - The triggers include: changes in the underlying network (QoS characteristics, attributes, connectivity), changes in the availability of access networks, changes in the user or service context/preferences, internal decisions of the DE 124 (operation policy, timer-based policy updates, threshold-based policy updates) and the introduction of new application flows).

Therefore it would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the **Serravalle** invention by employing the teaching as taught by **White** to provide the ability to utilize a threshold to be used in performing the selection of a UE for handover. The motivation for the combination is given by **White** (0007 - what would be desirable, but has not yet been provided, is a multi-access access terminal for communicating over multiple, heterogeneous (e.g., wired and wireless) communication channels, wherein a mobile client can simultaneously aggregate multiple connections to heterogeneous access points and/or ad-hoc network terminals to increase capacity and/or efficiency).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KASHIF SIDDIQUI whose telephone number is (571)270-3188. The examiner can normally be reached on Monday through Thursday 6:30-16:30 (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamran Afshar can be reached on (571)272-7796. 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.

/KASHIF SIDDIQUI/
Examiner, Art Unit 2646

Notice of References Cited	Application/Control No. 13/499,924	Applicant(s)/Patent Under Reexamination OOSTVEEN ET AL.	
	Examiner KASHIF SIDDIQUI	Art Unit 2646	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2006/0193295 A1	08-2006	White et al.	370/336
*	B	US-2009/0137265 A1	05-2009	Flore et al.	455/525
*	C	US-7,539,175 B2	05-2009	White et al.	370/350
*	D	US-2011/0013587 A1	01-2011	Serravalle, Francesca	370/331
	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	LTE; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (3GPP TS 36.300 version 8.9.0 Release 8); 07-2009
	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.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13499924	OOSTVEEN ET AL.
	Examiner	**Art Unit**
	KASHIF SIDDIQUI	2646

✓	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	04/16/2013								
	1	✓								
	2	O								
	3	O								
	4	O								
	5	O								
	6	O								
	7	✓								
	8	✓								
	9	✓								
	10	O								
	11	O								
	12	O								
	13	✓								
	14	✓								
	15	O								
	16	O								
	17	O								
	18	O								

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	OOSTVEEN, Job Cornelis
Art Unit	
Examiner Name	
Attorney Docket Number	US17827

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2009119699	WO		2009-10-01	NEC CORP	page 7, line 28 - page 9, paragraph 15 page 12, paragraph 13 - page 13, paragraph 24; claims 1, 2-8, 9-14, 75, 76; figure	☐
	2	2009064716	WO		2009-05-22	QUALCOMM INC	paragraph [0052] - paragraph [0056], paragraph [0062] - paragraph [0065], claims 2-8, 10-12, 14	☐
	3	2009019319	WO		2009-02-12	NOKIA SIEMENS NETWORKS OY	abstract, page7, line 15 - page 8, line 3, page 8, line 22 - page 9, line 20, claims 1-14	☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.S./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	OOSTVEEN, Job Cornelis
	Art Unit	
	Examiner Name	
	Attorney Docket Number	US17827

	4	2009045070	WO		2009-04-09	LG ELECTRONICS INC	the whole document, claims 1-14	☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	International Search Report, mailed January 24, 2011 in connection with International Patent Application No. PCT/EP2010/064823	☐

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

EXAMINER SIGNATURE

Examiner Signature	/Kashif Siddiqui/	Date Considered	04/16/2013

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

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.S./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	OOSTVEEN, Job Cornelis
	Art Unit	
	Examiner Name	
	Attorney Docket Number	US17827

CERTIFICATION STATEMENT

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

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

☐ See attached certification statement.

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

☒ None

SIGNATURE

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

Signature	/Natalya Hartmann, Reg.No. 62,119/	Date (YYYY-MM-DD)	2012-04-03
Name/Print	Natalya Hartmann	Registration Number	62119

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

EFS Web 2.1.17

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	5	"2009119699"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 10:04
L2	6	"2009064716"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 10:07
L3	3	"20090137265"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 10:08
L4	2	"20110013587"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 10:12
L5	109	(location same (RSSI or RSS)) and (trigger same (hand$over or hand$off))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 10:15
L6	923	vertical with (hand$off or hand$over)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 10:16
L7	12	L6 and 5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 10:16
L8	3	"20060193295"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 10:18
L9	2	5 and 8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 10:18
L11	61086	(Oostveen-j$ or Jorguseski-l$ or Litjens-r$ or pais-a$ or zhang-h$).IN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 11:54
L12	24298	KONINKLIJKE .as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 11:54
L13	1	11 and 5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 11:55

L14	1	12 and 5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 11:55
L15	18967	455/435.1-445,524-525.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 11:58
L16	26814	370/329-334,336,350.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 11:59
L17	41735	15 or 16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 11:59
L18	53	5 and 17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 11:59
L19	12	6 and 18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 11:59
S1	1	"13499924"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 07:31
S2	5572	(neighbor or neighbour) adj3 (list)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 07:31
S3	923	vertical with (hand$off or hand$over)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 07:31
S4	2230	MAHO	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 07:32
S5	8	S2 same S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 07:32
S6	0	S4 and S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/04/16 07:32

EAST Search History (Interference)

<This search history is empty>

4/16/2013 11:59:57 AM
C:\Users\ksiddiqui\Documents\EAST\Workspaces\13499924.wsp

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

BIB DATA SHEET

CONFIRMATION NO. 7977

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/499,924	04/03/2012 RULE	455	2646	US17827

APPLICANTS

Job Cornelis Oostveen, Haren, NETHERLANDS;
Ljupco Jorguseski, Rijswijk, NETHERLANDS;
Remco Litjens, Voorschoten, NETHERLANDS;
Adrian Victor Pais, Rijswijk, NETHERLANDS;
Haibin Zhang, The Hague, NETHERLANDS;

**** CONTINUING DATA ***************************

This application is a 371 of PCT/EP2010/064823 10/05/2010

**** FOREIGN APPLICATIONS ***************************

EUROPEAN PATENT OFFICE (EPO) 09172399.9 10/07/2009

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

05/16/2012

Foreign Priority claimed ☑ Yes ☐ No 35 USC 119(a-d) conditions met ☑ Yes ☐ No Verified and Acknowledged /KASHIF SIDDIQUI/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		NETHERLANDS	4	18	3

ADDRESS

De Vries & Metman
Overschiestraat 180
Amsterdam, 1062 XK
NETHERLANDS

TITLE

SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

FILING FEE RECEIVED		
1250	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

BIB (Rev. 05/07).

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13499924	OOSTVEEN ET AL.
	Examiner	Art Unit
	KASHIF SIDDIQUI	2646

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
455	435.1-445,524-525	4/16/2013	KS
370	329-334,336,350	4/16/2013	KS

SEARCH NOTES		
Search Notes	Date	Examiner
Searched EAST	4/16/2013	KS
Searched Google Patents	4/16/2013	KS
Searched Inventor	4/16/2013	KS
Searched Assignee	4/16/2013	KS
Searched EPO/WIPO	4/16/2013	KS

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/KASHIF SIDDIQUI/ Examiner.Art Unit 2646	

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United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/499,924	04/03/2012	Job Cornelis Oostveen	US17827

CONFIRMATION NO. 7977

90057
De Vries & Metman
Overschiestraat 180
Amsterdam, 1062 XK
NETHERLANDS

PUBLICATION NOTICE

OC00000056378010

Title:SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

Publication No.US-2012-0225658-A1
Publication Date:09/06/2012

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 Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

S/N 13/499,924 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Job Cornelis Oostveen	Examiner: Unknown
Serial No.: 13/499,924	Group Art Unit: Unknown
Filing Date: April 3, 2012	Docket No.: US17827
Customer No.: 90057	Confirmation No.: 7977
Title: SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE	

MAIL STOP: MISSING PARTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION AND REQUEST FOR FILING RECEIPT

Dear Sir:

As of today, June 1, 2012, we still have not received a Notification to File Missing Requirements. Nonetheless, we would like to provide you with the Declaration herewith.

The Commissioner is hereby authorized to charge Deposit account No. 50-5047 for the surcharge fee of $ 130.00 (large entity) associated with the late submission of the Declaration, and for any fees or deficiencies associated with this submission, or credit any overpayment to Deposit Account No. 50-5047, required to make this response timely and acceptable to the Office.

The office is hereby requested to provide a filing receipt upon the receipt of this letter.

Respectfully submitted,

/Natalya Hartmann, Reg No 62,119/

Natalya Hartmann
Registration No. 62,119

De Vries & Metman
Overschiestraat 180,
1062 XK Amsterdam,
The Netherlands
Telephone: **+31 26 3553160**
Facsimile: **+31 20 5110931**
Agent for Applicants

Date of Deposit: June 1, 2012
This paper is being filed on the date indicated above using the USPTOs electronic filing system EFS-Web, and is addressed to The Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

DE VRIES & METMAN

United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor(s), I/we hereby declare that: each inventor's residence, mailing address and citizenship are as stated below next to his/her name; that

I/we believe I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE,

the application and any applicable preliminary amendment of which is attached hereto.

I/we hereby authorize and request the attorneys or agents handling this application, at De Vries & Metman, located at Overschiestraat 180, 1062 XK Amsterdam, The Netherlands, to insert here in parentheses the serial number of said application (Ser. No.: 13/499,924), the filing date of said application (Application Filing Date: April 3, 2012), and filing date of any preliminary amendment (Preliminary Amendment Filing Date: April 3, 2012) when known.

I/we hereby state that I/we have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I/we acknowledge the duty to disclose information which is material to patentability of this application in accordance with 37 C.F.R. § 1.56 (attached hereto). I/We also acknowledge my/our duty to disclose all information known to be material to patentability which became available between a filing date of a prior application and the national or PCT international filing date in the event this is a Continuation-In-Part application in accordance with 37 C.F.R. § 1.63(e).

Each inventor initial here: RL LJ JO AVP HZ

Authorization to Permit Access to Application by Participating Offices

I/we hereby grant the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the above-identified patent application is filed access to the above-identified patent application. See 37 CFR 1.14(c) and (h).

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the above-identified patent application with respect to: 1) the above-identified patent application-as-filed; 2) any foreign application to which the above-identified patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the above-identified patent application; and 3) any U.S. application-as-filed from which benefit is sought in the above-identified patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing the Authorization to Permit Access to Application by Participating Offices.

The undersigned believes no fee will be charged under 37 CFR 1.19(b)(1) for providing a participating intellectual property office with an electronic copy of the above-identified patent application.

Related Applications

I/we hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or 365(b) of, and incorporate in the present patent application by reference, any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

Foreign Priority Information

Application no.:	Country:	Filed on:
09172399.9	EP	October 7, 2009

I/we hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below:

No such claim for priority is being made at this time.

I/we hereby claim the benefit under 35 U.S.C. § 120 or 365(c) of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose material information as defined in 37 C.F.R. § 1.56(a) which became available between the filing date of the prior application and the national or PCT international filing date of this application:

PCT Benefit Information

Application no.:	Filing Date:	Status:
PCT/EP2010/064823	October 5, 2010	Pending

Each inventor initial here: RC LJ JO AVP HZ

Power of Attorney and Correspondence Information

I/we hereby appoint the attorneys and agents associated with the customer number listed below to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

Customer Number: 90057

I/we hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/agent/firm/organization/who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct De Vries & Metman to the contrary.

Please direct all correspondence in this case to **De Vries & Metman** at the address indicated below:

Customer Number: 90057

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

Full Name of Inventor Number 1: **OOSTVEEN, Job Cornelis**
Citizenship: **NL** Residence: **Haren, The Netherlands**
Mailing Address: **Bilderdijklaan 2, 9752 EN Haren, The Netherlands**

Signature: _____ Date: 3-4-2012
OOSTVEEN, Job Cornelis

Full Name of Inventor Number 2: **JORGUSESKI, Ljupco**
Citizenship: **NL** Residence: **Rijswijk, The Netherlands**
Mailing Address: **Jozef Israellaan 234, 2282 TR Rijswijk, The Netherlands**

Signature: _____ Date: 30-3-2012
JORGUSESKI, Ljupco

Full Name of Inventor Number 3: **LITJENS, Remco**
Citizenship: **NL** Residence: **Voorschoten, The Netherlands**
Mailing Address: **Van Kempenstraat 22, 2352 VH Voorschoten, The Netherlands**

Signature: _____ Date: 28-3-2012
LITJENS, Remco

Each inventor initial here: RC LJ JO NVP 1/2

Full Name of Inventor Number 4: **PAIS, Adrian Victor**
Citizenship: **NL** Residence: **Rijswijk, The Netherlands**
Mailing Address: **Caan van Necklaan 25, 2281 BA Rijswijk, The Netherlands**

Signature: _____ Date: 17/4/2012
PAIS, Adrian Victor

Full Name of Inventor Number 5: **ZHANG, Haibin**
Citizenship: **CN** Residence: **The Hague, The Netherlands**
Mailing Address: **Usselincxstraat 142, 2593 VP The Hague, The Netherlands**

Signature: _____ Date: 30/04/2012
ZHANG, Haibin

Each inventor initial here: _____

37 CFR § 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application:

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.

Each inventor initial here: RC LJ JO AVP HZ

Electronic Patent Application Fee Transmittal

Application Number:	13499924
Filing Date:	03-Apr-2012
Title of Invention:	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE
First Named Inventor/Applicant Name:	Job Cornelis Oostveen
Filer:	Natalya Hartmann/Tessa Koning
Attorney Docket Number:	US17827

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:	12909518
Application Number:	13499924
International Application Number:	
Confirmation Number:	7977
Title of Invention:	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE
First Named Inventor/Applicant Name:	Job Cornelis Oostveen
Customer Number:	90057
Filer:	Natalya Hartmann/Tessa Koning
Filer Authorized By:	Natalya Hartmann
Attorney Docket Number:	US17827
Receipt Date:	01-JUN-2012
Filing Date:	03-APR-2012
Time Stamp:	09:29:36
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	8217
Deposit Account	505047
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)

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

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

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	17827_Transmittal_Letter.pdf	15394 a2ef128787b559d87adc412e0daec3d354258795	no	2
Warnings:					
Information:					
2	Oath or Declaration filed	17827_Declaration.pdf	278269 bcc5e37849489b58b9aad665931d7c1d2313d07d	no	6
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30781 91902b48623aa7e644cf1e18975b84d644f821b1	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	324444		

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.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/499,924

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	380
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	490
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	250
TOTAL CLAIMS (37 CFR 1.16(i))	18 minus 20 =	*			OR	x 60 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 250 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1120

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

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

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.
13/499,924	Job Cornelis Oostveen	US17827

90057
De Vries & Metman
Overschiestraat 180
Amsterdam, 1062 XK
NETHERLANDS

INTERNATIONAL APPLICATION NO.	
PCT/EP2010/064823	
I.A. FILING DATE	PRIORITY DATE
10/05/2010	10/07/2009

CONFIRMATION NO. 7977

371 ACCEPTANCE LETTER

OC000000054323938

Date Mailed: 05/29/2012

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:

04/03/2012	04/07/2012
DATE OF RECEIPT OF 35 U.S.C. 371(c)(1), (c)(2) and (c)(4) REQUIREMENTS	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 04/03/2012
- Copy of the International Search Report filed on 04/03/2012
- Preliminary Amendments filed on 04/03/2012
- Information Disclosure Statements filed on 04/03/2012
- Oath or Declaration filed on 04/03/2012
- U.S. Basic National Fees filed on 04/03/2012
- Priority Documents filed on 04/03/2012

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)

TAMALA D HOLLAND

Telephone: (571) 272-9120

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/499,924	04/03/2012		1120	US17827	18	3

CONFIRMATION NO. 7977

90057
De Vries & Metman
Overschiestraat 180
Amsterdam, 1062 XK
NETHERLANDS

FILING RECEIPT



Date Mailed: 05/29/2012

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)

Job Cornelis Oostveen, Haren, NETHERLANDS;
Ljupco Jorguseski, Rijswijk, NETHERLANDS;
Remco Litjens, Voorschoten, NETHERLANDS;
Adrian Victor Pais, Rijswijk, NETHERLANDS;
Haibin Zhang, The Hague, NETHERLANDS;

Assignment For Published Patent Application

KONINKLIJKE KPN N.V., The Hague, NETHERLANDS
NEDERLANDSE ORGANISATIE VOOR TOEGEPAST- NATUURWETENSCHAPPELIJK ONDERZOEK, Delft, NETHERLANDS

Power of Attorney: The patent practitioners associated with Customer Number 90057

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/EP2010/064823 10/05/2010

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
EUROPEAN PATENT OFFICE (EPO) 09172399.9 10/07/2009

If Required, Foreign Filing License Granted: 05/16/2012
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/499,924**
Projected Publication Date: 09/06/2012
Non-Publication Request: No
Early Publication Request: No

Title

SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

Preliminary Class

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 AssetsControl, 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).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage, facilitate, and accelerate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET

Substitute for Form PTO-1360
(For use with Form PTO/SB/06)

Application Number	Filing Date
13499924	

Applicant(s) Job Oostveen

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT	
	Indep	Depend	Indep	Depend	Indep	Depend
1	1		1			
2		1		1		
3		1		1		
4		(1)		1		
5		(1)		1		
6		1		1		
7		(1)		1		
8		(1)		1		
9	1		1			
10		1		1		
11		2		1		
12		1		1		
13		(1)	1			
14		(1)		1		
15				1		
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Total Indep	2		3		0	
Total Depend	13	↵	15	↵	0	↵
Total Claims	15		18		0	

	*		*		*	
	Indep	Depend	Indep	Depend	Indep	Depend
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UNITED STATES PATENT AND TRADEMARK OFFICE

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

U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
13/499,924	Job Cornelis Oostveen	US17827

90057
De Vries & Metman
Overschiestraat 180
Amsterdam, 1062 XK
NETHERLANDS

INTERNATIONAL APPLICATION NO.	
PCT/EP2010/064823	
I.A. FILING DATE	PRIORITY DATE
10/05/2010	10/07/2009

CONFIRMATION NO. 7977

371 ACCEPTANCE LETTER

OC000000054323938

Date Mailed: 05/21/2012

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:

04/03/2012	04/07/2012
DATE OF RECEIPT OF 35 U.S.C. 371(c)(1), (c)(2) and (c)(4) REQUIREMENTS	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 04/03/2012
- Copy of the International Search Report filed on 04/03/2012
- Preliminary Amendments filed on 04/03/2012
- Information Disclosure Statements filed on 04/03/2012
- Oath or Declaration filed on 04/03/2012
- U.S. Basic National Fees filed on 04/03/2012
- Priority Documents filed on 04/03/2012

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)

TAMALA D HOLLAND

Telephone: (571) 272-9120

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/499,924	04/03/2012		1120	US17827	18	3

CONFIRMATION NO. 7977

90057
De Vries & Metman
Overschiestraat 180
Amsterdam, 1062 XK
NETHERLANDS

FILING RECEIPT



Date Mailed: 05/21/2012

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)

Job Cornelis Oostveen, Haren, NETHERLANDS;
Ljupco Jorguseski, Rijswijk, NETHERLANDS;
Remco Litjens, Voorschoten, NETHERLANDS;
Adrian Victor Pais, Rijswijk, NETHERLANDS;
Haibin Zhang, The Hague, NETHERLANDS;

Assignment For Published Patent Application

KONINKLIJKE KPN N.V., The Hague, NETHERLANDS
NEDERLANDSE ORGANISATIE VOOR TOEGEPAST- NATUURWETENSCHAPPELIJK ONDERZOEK, Delft, NETHERLANDS

Power of Attorney: The patent practitioners associated with Customer Number 90057

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/EP2010/064823 10/05/2010

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
EUROPEAN PATENT OFFICE (EPO) 09172399.9 10/07/2009

If Required, Foreign Filing License Granted: 05/16/2012
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/499,924**
Projected Publication Date: 371 Perfected
Non-Publication Request: No
Early Publication Request: No

Title

SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

Preliminary Class

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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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.

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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 AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

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SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage, facilitate, and accelerate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/499,924

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	380
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	490
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	250
TOTAL CLAIMS (37 CFR 1.16(i))	18 minus 20 =	*			OR	x 60 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 250 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1120

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

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

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET

Substitute for Form PTO-1360
(For use with Form PTO/SB/06)

Application Number	Filing Date
13499924	

Applicant(s) Job Oostveen

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT	
	Indep	Depend	Indep	Depend	Indep	Depend
1	1		1			
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7		(1)		1		
8		(1)		1		
9	1		1			
10		1		1		
11		2		1		
12		1		1		
13		(1)	1			
14		(1)		1		
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Total Indep	2		3		0	
Total Depend	13	↵	15	↵	0	↵
Total Claims	15		18		0	

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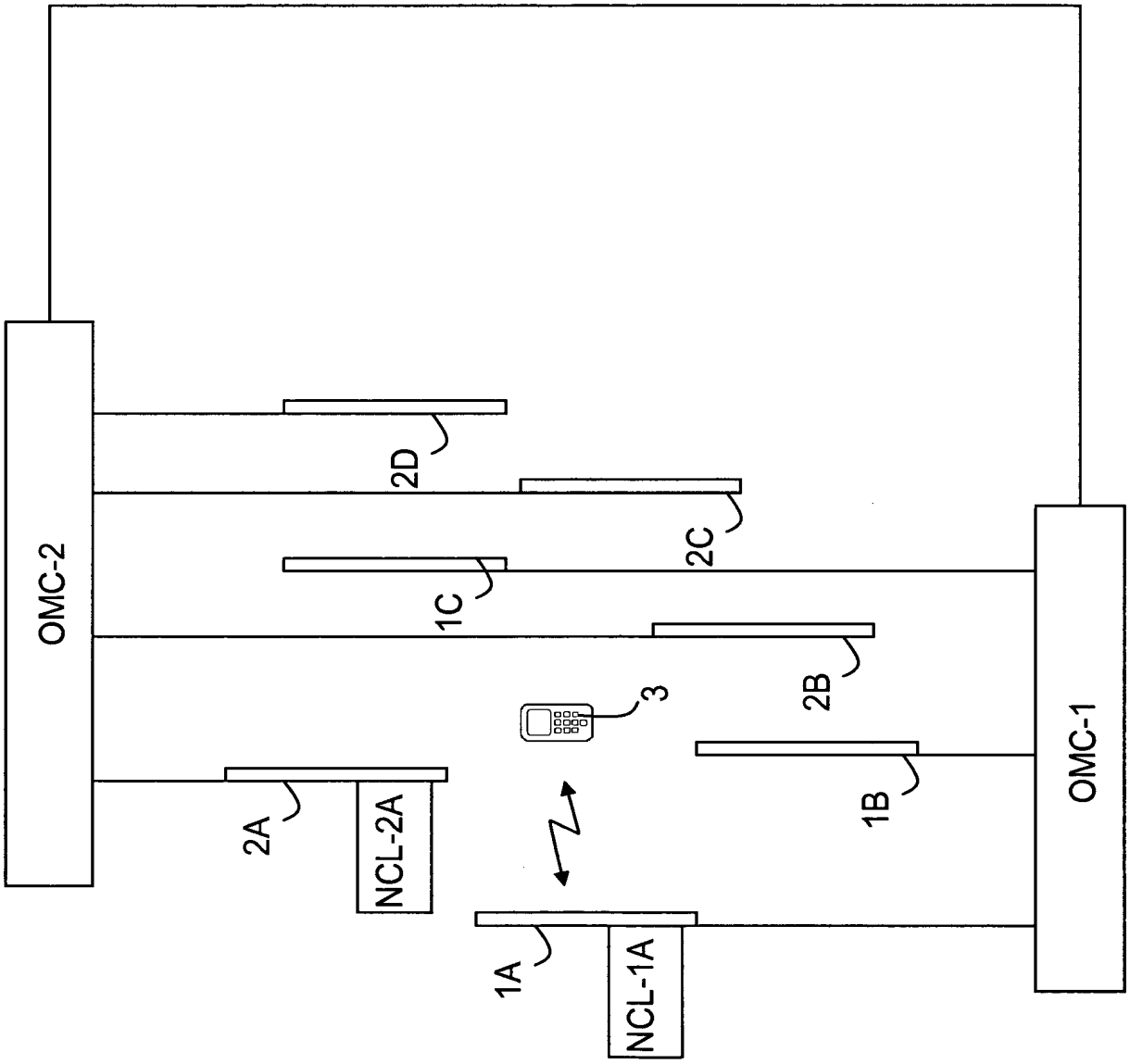


FIG. 1

2/4

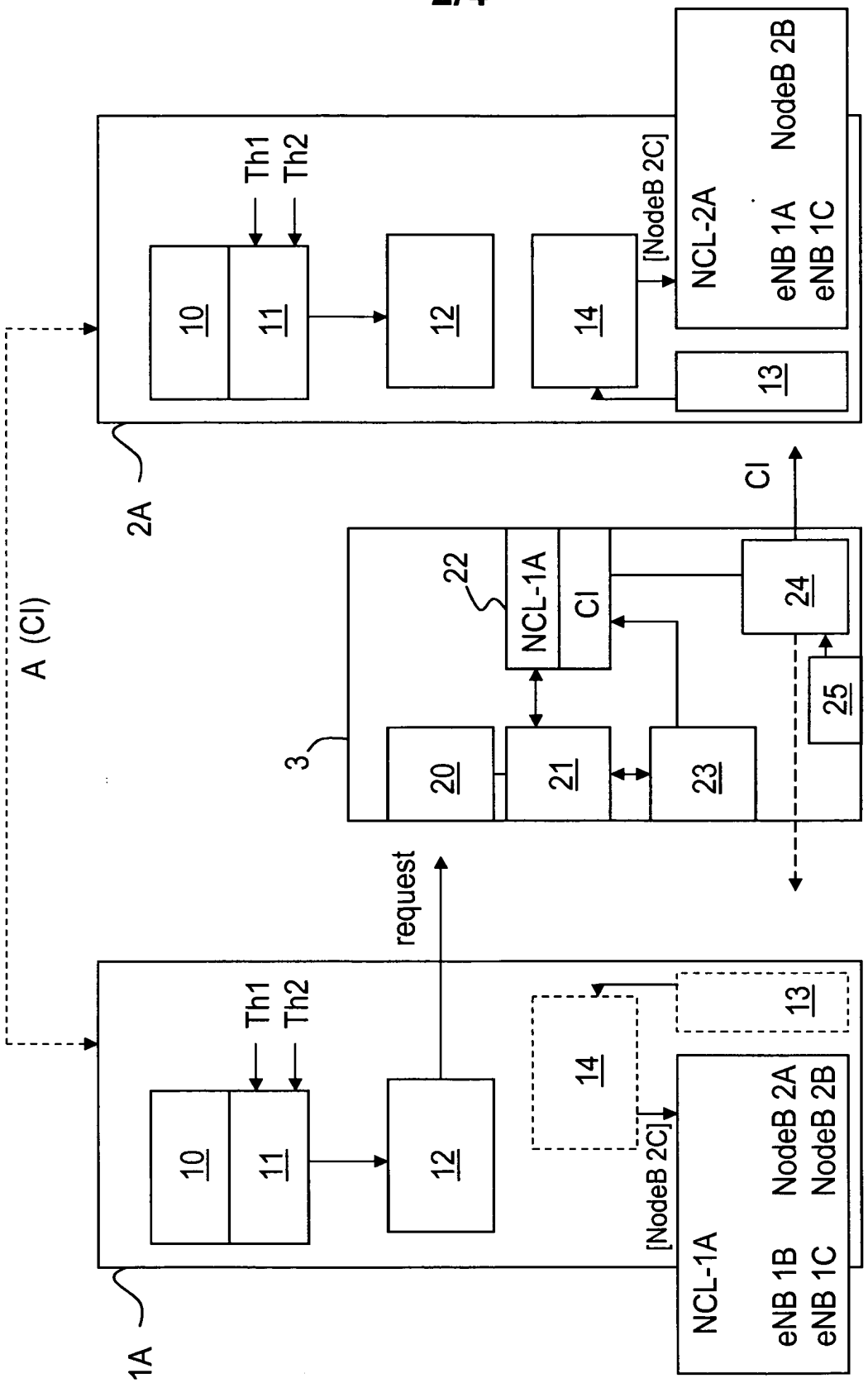

2A
NCL-2A
eNB 1A
eNB 1C
NodeB 2B
[NodeB 2C]
Th1
Th2
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11
12
13
14
A (CI)
CI
3
22
NCL-1A
CI
20
21
23
24
25
request
1A
NCL-1A
eNB 1B
eNB 1C
NodeB 2A
NodeB 2B
[NodeB 2C]

FIG. 2

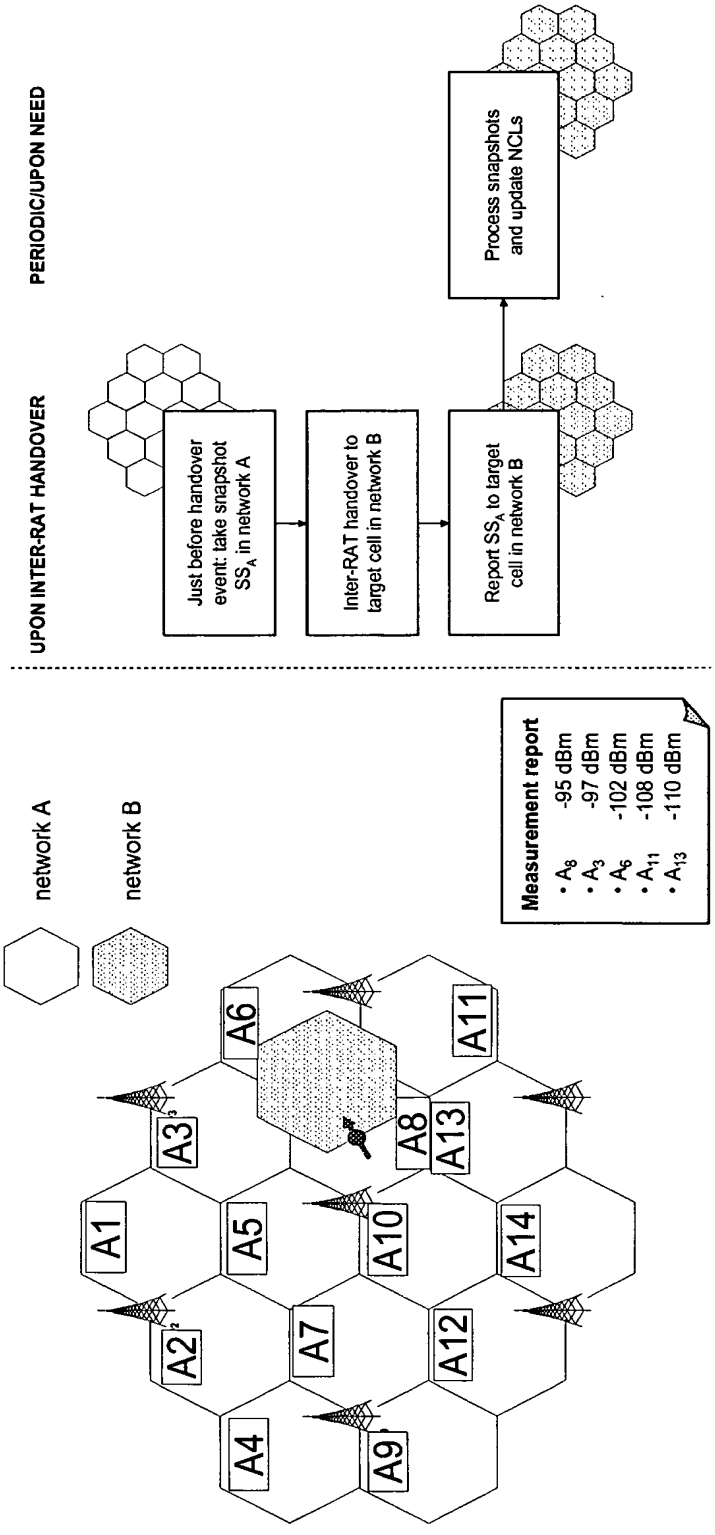

network A
network B
A1
A2
A3
A4
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A12
A13
A14
Measurement report
• A_8 -95 dBm
• A_3 -97 dBm
• A_6 -102 dBm
• A_{11} -108 dBm
• A_{13} -110 dBm
UPON INTER-RAT HANDOVER
Just before handover event: take snapshot SS_A in network A
Inter-RAT handover to target cell in network B
Report SS_A to target cell in network B
PERIODIC/UPON NEED
Process snapshots and update NCLs

FIG. 3A

FIG. 3B

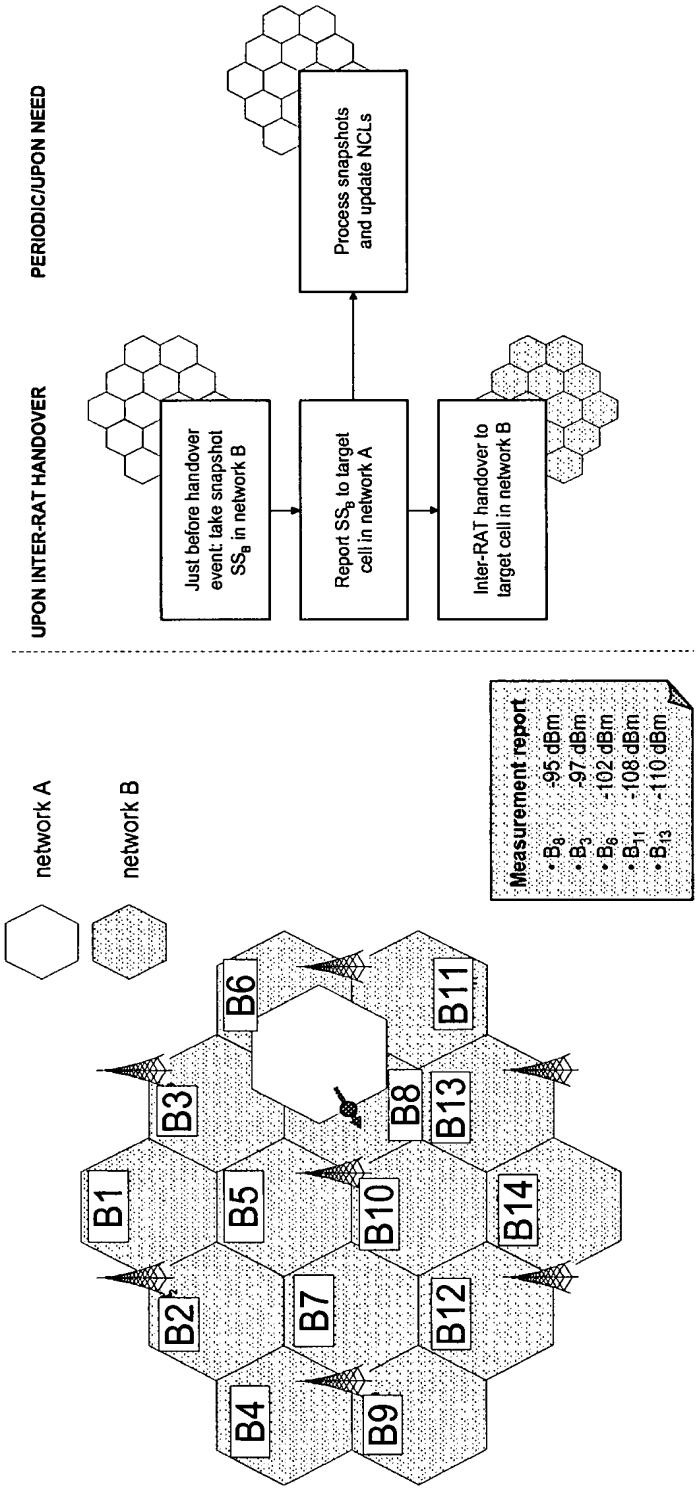

network A
network B
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
B14
Measurement report
• B_8 -95 dBm
• B_3 -97 dBm
• B_6 -102 dBm
• B_{11} -108 dBm
• B_{13} -110 dBm
UPON INTER-RAT HANDOVER
Just before handover event: take snapshot SS_B in network B
Report SS_B to target cell in network A
Inter-RAT handover to target cell in network B
PERIODIC/UPON NEED
Process snapshots and update NCLs

FIG. 4A

FIG. 4B

CLAIMS

1. A system for updating a neighbour cell list in a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined, the system comprising:

- a detector configured for detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;
- a selector configured for selecting a part of the user terminals;
- a request generator configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;
- a receiver configured for receiving the cell information from the one or more of the selected user terminals; and
- updating means configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

2. The system according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node.

3. The system according to claim 2, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

4. The system according to one or more of the preceding claims,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node.

5. The system according to claim 4, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

6. The infrastructure according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node

further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

7. The system according to one or more of the preceding claims, wherein the telecommunications system is further configured for receiving location information from one or more of the detected user terminals and wherein the location information is used as a selection parameter for selecting the part of the detected user terminals.

8. The system according to one or more of the preceding claims , wherein one or more thresholds, possibly service-dependent, are defined in the telecommunications system for transferring the user terminals between the first wireless access network and the second wireless access network and wherein at least one of the thresholds is used as a selection parameter for selecting the part of the detected user terminals.

9. In a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is

defined, a method for updating at least one of the first and second neighbour cell lists comprising the steps of:

- detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;

- selecting a part of the user terminals;

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

- receiving the cell information from the one or more of the selected user terminals; and

- updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

10. The method according to claim 9, comprising the steps of:

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

- receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node,

- transferring the selected user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node, and

- optionally, transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

11. The method according to claim 9 or 10, comprising the steps of:

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node,

- transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node, and

- optionally, transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

12. The method according to claim 9, comprising the steps of;

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node

- transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

13. A computer program comprising software code portions configured for, when executed by at least one processor, performing the method of one or more of the claims 9-12.

14. A mobile user terminal configured for use in the method according to one or more of the claims 9-11, wherein the mobile terminal, in use, contain a neighbour cell list of the first wireless access node, the terminal comprising:

- a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

- scanning means for detecting the cell information from the wireless access nodes, at least one of the wireless access nodes being absent in the neighbour cell list,

- a transmitter for transmitting the detected cell information,

- wherein the mobile user terminal is arranged for temporarily storing the detected cell information and transmitting the detected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

FIELD OF THE INVENTION

The invention relates to the field of telecommunications systems and a method in telecommunications architecture. More specifically, the invention relates to a telecommunications architecture comprising at least a first and a second wireless access network between which user terminals can be transferred and a method in such a telecommunications system, wherein the neighbour cell lists (NCLs) of at least a wireless access node of the first and/or second wireless access network can be updated using a system.

BACKGROUND OF THE INVENTION

When moving through the coverage area of a wireless access cellular network, mobile user terminals continuously scan the spectrum for pilot or reference signals (beacons) in order to determine which cell (base station) to camp on. In idle mode, this is referred to as cell reselection, while in active/dedicated mode, this is referred to as handover. The cell-specific list of surrounding cells that are considered for cell reselection or handover is called the neighbour cell list (NCL), which is stored in each base station and broadcast within the cell. The mobile user terminal receives and stores the NCL. The NCL contains the cells for which the mobile user terminal should send measurement reports (when certain criteria are met) to the base station currently serving the user terminal.

In case of multiple, cooperating wireless access cellular networks, each cell not only has an intra-network NCL, but also an inter-network NCL.

The optimisation of the NCLs is traditionally done with the aid of off-line planning tools, using path loss predictions and (off-line) optimisation algorithms. Currently, automated configuration and optimisation of intra-network NCLs and inter-network NCLs, based on e.g. actual measurement feedback from

user terminals, observed mobility patterns, base station scans and handover statistics, are being investigated.

3GPP TS 36.300, V8.9.0, discloses an automatic neighbour relation (ANR) function to relieve an operator from the burden of manually managing neighbour relations. Such an ANR function resides in the eNode-B (eNB) of an LTE network and manages a conceptual neighbour relation table (NRT). A neighbour detection function is used to find new neighbours and to add them to the NRT, whereas a neighbour removal function removes outdated neighbours from the NRT. The eNB instructs a user terminal from a serving cell to look for neighbour cells of other networks by scanning all cells. The user terminal first reports the physical cell identifier (PCI) of the detected cells in the other network. When the eNB receives the reports from the user terminals containing the PCI's of the cells, the eNB instructs the user terminal, using the newly discovered cell as a parameter, to read the Cell Global Identifier (CGI) and further cell information from the neighbouring cells. The user terminal also reports this information to the serving cell. The eNB may then update the NRT using the information reported from the user terminals.

SUMMARY OF THE INVENTION

A system is disclosed for a telecommunications architecture that comprises a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined.

The system comprises a detector configured for detecting user terminals about to be transferred, i.e. for which cell reselection or handover will be performed, from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network.

The system also comprises a request generator configured for requesting from the first wireless access node one or

more of the detected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The telecommunications system, particularly at least one of the first and the second wireless access node, also comprises a receiver configured for receiving the cell information from one or more of the detected user terminals. Updating means are provided configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

A method in a telecommunications architecture is also disclosed. User terminals about to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network are detected. From the first wireless access node, one or more of the detected user terminals are requested to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The cell information is received from one or more of the detected user terminals and at least one of the first neighbour cell list and the second neighbour cell list is updated using the received cell information.

Furthermore, a mobile user terminal containing at least one neighbour cell list of the first wireless access node is disclosed. The terminal comprises a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The mobile terminal also contains scanning means configured for detecting the cell information from the wireless access nodes, at least one of the wireless access nodes being absent in the neighbour cell list, and a transmitter for transmitting the detected cell information. At present, standardization does not allow mobile terminals to measure cells not present in the NCL. However, there are no intrinsic obstacles for making performing such measurements. The mobile terminal is arranged for temporarily storing the detected cell information and transmitting the de-

tected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

It is noted that in the present application the terms wireless access node and cell are used as similar terms. The skilled person will appreciate that a single wireless access node may provide multiple cells and that, typically, a neighbour cell list is defined for each of the cells of such a node.

The plurality of wireless access nodes of which cell information is requested may exclude the first wireless access node, or more particularly, the cell thereof currently serving the user terminal. On the other hand, the plurality of wireless access nodes would typically include cells that are absent in the neighbour cell list stored in the user terminal for regularly reporting measurement reports to the serving cell. Otherwise, since the neighbour cell list is obtained from the serving cell, the detection of the cell information by the user terminal would be restricted to this list and would therefore only be suitable for verifying the existing NCL and not for adding new neighbouring cells to the list. In an embodiment, the user terminal performs a complete scan for all cells in the first wireless access network (possibly excluding the currently serving cell) and/or all cells in the second wireless access network to allow the telecommunications system to obtain a complete picture of the available cells around the first wireless access node. This complete information containing the scan of all cells may then be used for updating the NCL(s). Alternatively, the user terminal may compare the received complete information with the NCL it has obtained from the first wireless access node and only report cell information of cells not present on the current NCL.

The first and second wireless access networks may differ in radio access technology (e.g. GSM and UMTS or UMTS and LTE), the deployed release of a given radio access technology, the used frequency spectrum (e.g. the 900 MHz and 1800 MHz frequency bands (the latter also being referred to as a DCS network) for GSM, different 5MHz carriers for UMTS) and/or wire-

less access networks of different mobile operators. The wireless access network may also differ in the type of cells provided, e.g. macro cells and pico cells.

The disclosed system and method are able to specifically direct the request for cell information for the first and/or second network to user terminals in the regions where cell reselection or handover from the first to the second wireless access network is about to occur. By collecting this information specifically at cell reselection or handover moments, the updating of the NCL is inherently based on the inter-network neighbours that a user terminal experiences in the cell reselection or handover region, where the reports of the user terminal measurements are most relevant for construing the NCL.

In some instances, user terminals may move rapidly through an area and cell reselection and handover to the second wireless access network should be performed quickly. In such cases, insufficient time may be available for performing the scan for obtaining the cell information for the first wireless access network and for reporting the cell information to the telecommunications system via the first wireless access network. The embodiments of the invention as defined in claims 2 and 10 provide additional time for completing the method by performing the cell reselection or handover as soon as the mobile user terminal has been instructed for performing the scan for cell information for the first and/or the second wireless access network. By temporarily storing the cell information resulting from the scan at the mobile user terminal, the user terminal may carry the cell information to the second network where it has sufficient time to report the cell information of the plurality of wireless access nodes of the first wireless access network via the second network.

The cell information of the wireless access nodes of the first wireless access network may be used for updating the neighbour cell list of the first wireless access node and/or for updating the neighbour cell list of the second wireless access node, or the cells thereof.

The updating of the neighbour cell list of the second wireless access node is relevant for user terminals reselecting cells or handed over from the second wireless access node to the first wireless access network, i.e. in the cell reselection or handover direction reverse to the direction travelled by the terminals reporting the cell information. Since other user terminals will be transferred from the second wireless access network to the first wireless access network, the neighbour cell list of the first wireless access node may also be updated in this way.

The cell information of the plurality of access nodes of the first wireless access network as received via the second wireless access node may also be transferred back to the first wireless access node, e.g. for updating the intra-network neighbour cell list, as defined in claim 3 and, optionally, in claim 10. In a particular example, this embodiment may be used to reduce the so-called 'missing neighbour' effect in a UMTS network, here being the first wireless access network. User terminals equipped to connect to UMTS networks are restricted to gathering cell information as defined in the neighbour cell list received from the base station currently serving the user terminal. An absent cell in the neighbour cell list of the base station will thus never be measured and reported by the user terminal as a result of this restriction of the user terminal. When the signal of a missing neighbour is too strong, call drops may occur. The present embodiments may reduce this problem by instructing the user terminals to also scan for cell information of wireless access nodes of the UMTS network being absent in the neighbour cell list (and thus possibly revealing the existence of cells not present in the neighbour cell list of the base station) and to report this via the second wireless access network back to the first wireless access node. The NCL of the first wireless access node may then be updated with the missing neighbour cell.

The user terminals may also be instructed to obtain the cell information of the plurality of wireless access nodes of the second wireless access network shortly before cell reselec-

tion or handover to the second wireless access node of this network and report the cell information to the telecommunications system via this second wireless access node, i.e. after cell reselection or handover. This embodiment is defined in claims 4 and 11.

Again, the cell information of the wireless access nodes of the second wireless access network may be used for updating the neighbour cell list of the first wireless access node and/or for updating the neighbour cell list of the second wireless access node. The cell information obtained for the access nodes of the second wireless access network may be relevant for the second wireless access network itself, e.g. for updating the intra-network NCL, in view of the 'missing neighbour' effect occurring in particular types of network such as UMTS, as discussed above for the first wireless access network.

The cell information of the plurality of access nodes of the second wireless access network as received via the second wireless access node may be transferred back to the first wireless access node as defined in claim 5 and, optionally, in claim 11. In doing so, the first wireless access node may update its neighbour cell list using the received cell information obtained shortly before cell reselection or handover, even when the user terminals have insufficient time for reporting the cell information for the plurality of wireless access nodes of the second wireless access network directly to the first wireless access node. The updated NCL is relevant for cell reselection or handover from the first wireless access node to the second wireless access network for other user terminals.

Of course, when sufficient time for reporting the cell information of the plurality of wireless access nodes of the second network is available, this cell information obtained shortly before cell reselection or handover to the second wireless access network can be reported directly to the first wireless access node, as defined in the embodiments of claims 6 and 12.

It is not required that all handover or cell reselection instances trigger a scan for cell information by the user

terminals. A wireless access node may for instance indicate on its broadcast channel not only whether handovers and/or cell re-selections should trigger such reporting, but also a likelihood parameter which the terminal can use to flip a (biased) coin in determining whether it should send cell information at a specific handover or cell reselection instance. Alternatively, the wireless access node may explicitly signal to the specific user terminal whether it should do the cell measurement and reporting. In this manner, the amount of cell information reporting can be tuned, which relates to a trade-off between the measurement overhead (signalling load) and the potential for neighbour cell list optimisation.

One embodiment of tuning the amount of cell list optimisation traffic is to use the location information from the user terminals as a selection criterion as defined in claim 7. The location information may e.g. be obtained from a GPS module in the user terminal or by means of measurements using the first and/or the second wireless access network. This location information can be useful e.g. in identifying where handover regions exist, and in solving location-specific outages or problems, e.g. dropped calls due to 'missing neighbour'. It may also be useful when an operator changes configuration (optimisation of downlink power, antenna tilt, etc) and wants to measure the effect on the cells relevant for inter-RAT cell change or handover.

Another advantageous selection criterion for determining which user terminals should report cell information is the transfer threshold that may have been set by the operator(s) of the telecommunication system, as defined in claim 8. The transfer threshold determines at what level (typically involving pilot signal measurements) cell reselection or handover would occur. The transfer threshold for cell reselection or handover from the first wireless access network to the second wireless access network may be asymmetric (i.e. a different transfer threshold Th2 applies for a transfer from the second to the first wireless access network) and may also be dependent on the service type of the service received by the user terminal when

connected to the first wireless access node. As an example, a user terminal provided with a voice service by a cell of an LTE network that is handed over to a GSM network might not be handed over back to the LTE network. This is because the operator chooses this mode of operation. In such a case, although this user terminal is a detected user terminal in the sense that it is about to be transferred to the second wireless access network (GSM), it is not selected for reporting requested to report cell information of the plurality of wireless access nodes of the first wireless access network (the LTE network), since the hand-over in the direction back to the first network (the LTE network) will generally not be made. On the other hand, for a user terminal using a data service that is temporarily handed over from an LTE network to a GSM network, a handover back to the LTE network is generally preferred and such user terminals can be selected to report cell information of the plurality of wireless access nodes of the second network. The embodiment of the telecommunications system of claim 8 may also be used for the method in the telecommunications system as defined in claims 10-13.

Hereinafter, embodiments of the invention will be described in further detail. It should be appreciated, however, that these embodiments may not be construed as limiting the scope of protection for the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 provides a schematic illustration of a telecommunication system comprising a first and a second wireless access network, each having a plurality of wireless access nodes, according to an embodiment of the invention;

FIG. 2 provides a schematic illustration of a mobile user terminal and wireless access nodes configured for performing a method according to an embodiment of the invention;

FIGS. 3A and 3B provide a schematic illustration of a telecommunications system and a flow chart for operating such a system, wherein cell information of wireless access nodes of the

first wireless access network is obtained and reported via the second wireless access network; and

FIGS. 4A and 4B provide a schematic illustration of a telecommunications system and a flow chart for operating such a system, wherein cell information of wireless access nodes of the second wireless access network is obtained and reported via the first wireless access network.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of first wireless access nodes 1A-1C of a first wireless access network and second wireless access nodes 2A-2D of a second wireless network. As an example, the first wireless access nodes 1A-1C are eNBs of an Long Term Evolution (LTE) network, whereas the second wireless access nodes 2A-2D are NodeBs of an UMTS network. Other examples includes wireless access networks differing in other radio access technologies (RATs), e.g. GSM and UMTS, differences in the deployed release of a given radio access technology, differences in the used frequency spectrum (e.g. the 900 MHz and 1800 MHz frequency bands (the latter also being referred to as a DCS network) for GSM, different 5MHz carriers for UMTS) and/or wireless access networks of different mobile operators. The wireless access network may also differ in the type of cells provided, e.g. macro cells and pico cells.

The wireless access nodes 1A-1C and 2A-2D can be controlled by control systems as schematically illustrated in FIG. 1. As an example, the control system may be Operation and Maintenance Centres (OMCs) as generally known in the art. The OMCs of the wireless access networks can be interconnected. Other connections between the wireless access networks can be used as well. If the wireless access nodes of the first and second wireless access networks originate from the same vendor, a single OMC can be used.

Each of the wireless access nodes 1A-1C and 2A-2D may contain at least one neighbour cell list (NCL). In FIG. 1, NCL-1A and NCL-2A are indicated as NCL of the corresponding wireless

access nodes. When a wireless access node provides multiple cells, typically each cell has a corresponding NCL.

A wireless access node broadcasts the NCL and mobile user terminals 3 camping on such a cell receive and store the NCL. The NCL is typically used to instruct the mobile terminal 3 which cells to monitor and to report every now and then the received signal strengths of each of the monitored cells, such that the network can make a decision whether or not the mobile terminal 3 should select or should be handed over to another cell.

As an example, the mobile terminal 3 receives the NCL-1A from wireless access node 1A to which it is currently connected. NCL-1A contains the cell(s) of neighbouring access nodes 1B and 1C and mobile terminal 3 monitors the signal strengths of these cells and reports these to the wireless access node 1A. Such an NCL-1A is referred to as an intra-network NCL. NCL-1A may also list neighbouring access nodes 2A and 2B of the second wireless access network, in which case NCL-1A would be referred to as an inter-network NCL. NCL-1A may also be a combined NCL, i.e. a combination of an intra-network and an inter-network NCL. Currently, automated configuration and optimisation of intra-network NCLs and inter-network NCLs is based on e.g. actual measurement feedback from user terminals 3 as disclosed in 3GPP TS 36.300, V8.9.0.

Referring also to FIG. 2, an embodiment will now be described in further detail, wherein intra-network NCL-1A contains the cells of eNBs 1B and 1C and inter-network NCL-1A contains the cells of NodeBs 2A and 2B. Note that inter-network NCL-1A does not yet contain NodeBs 2C and 2D.

Mobile user terminal 3 is assumed to camp on a cell of eNB 1A and is monitoring the cells of eNB's 1B, 1C and NodeBs 2A and 2B as indicated in the intra-network and inter-network NCLs transmitted in the cell under consideration. The mobile user terminal 3 regularly sends measurement reports to the eNB 1A as generally known in the art.

As illustrated schematically in FIG. 2, eNB 1A contains a cell reselection/handover detector 10 that recognizes that mo-

bile terminal 3 requires a cell reselection or handover to NodeB 2A of the second wireless access network. The cell reselection or handover indication triggers the following sequence of events in eNB 1A.

First, it may be determined whether or not the mobile terminal 3 for which a cell reselection or handover indication is received should participate, i.e. should be selected, in the process for updating (which includes the verification of the correctness) of an NCL, such as NCL-1A or NCL-2A. To that end, the eNB 1A contains a selection module 11 for selecting a part of the user terminals 3 for which a cell reselection or handover indication is detected. In this manner, it is possible to filter an appropriate portion the user terminals for which cell reselection or handover is about in order to reduce unnecessary signalling over the first and/or second wireless access network. The decision whether or not to participate in the updating process, i.e. whether or not to provide information to the telecommunication system allowing the updating of the NCL's, may either be taken at the mobile terminal or at the telecommunications system, particularly eNB 1A.

As an example, eNB 1A may indicate on its broadcast channel not only whether handovers and/or cell reselections should trigger such reporting, but also a likelihood parameter which the terminal 3 can use to flip a biased coin in determining whether it should send information at a specific handover or cell reselection instance. Alternatively, eNB 1A may explicitly signal to the specific user terminal 3 whether it should do the cell measurement and reporting. In this manner, the amount of cell information reporting can be tuned, which relates to a trade-off between the measurement overhead (signalling load) and the potential for neighbour cell list optimisation.

An advantageous selection criterion at the side of the eNB 1A for determining which user terminals 3 should report cell information is the transfer threshold that may have been set by the operator(s) of the telecommunications system between the first and the second wireless access networks. The transfer threshold determines at what level (typically involving pilot

signal measurements) cell reselection or handover would occur. The transfer threshold Th1 for cell reselection or handover from the first wireless access network to the second wireless access network may be asymmetric (i.e. a different transfer threshold Th2 applies for a transfer from the second to the first wireless access network) and may also be dependent on the service type of the service enjoyed by the user terminal when connected to the first wireless access node.

In FIG. 1, the user terminal 3 camping on a cell of eNB 1A of an LTE network using a data service that is about to be handed over to NodeB 2A of an UMTS network will generally be handed over back to the LTE network, if possible, because the operator applies a low threshold for handing over the user terminal 3 from the UMTS network to the LTE network for data services but a much higher threshold for handing over the user terminal to the UMTS network. In such a case, since a transfer between the networks is more likely in one direction than in the other, the terminal 3 may or may not be selected for providing information useful for the NCL updating process as will now be described in further detail.

The selection stage of user terminals 3 may be omitted completely or may be selectively applied, e.g. during particular hours of the day or at particular stages of the configuration and optimisation of the network.

Once user terminal 3 has been selected, request generator 12 in FIG. 2 is activated in order to request the user terminal 3 to report cell information of a plurality of wireless access nodes.

The plurality of wireless access nodes of which cell information is requested may exclude the cell of eNB 1A currently serving the user terminal 3. On the other hand, the plurality of wireless access nodes would typically include cells that are absent in the neighbour cell list NCL-1A stored in the user terminal 3 for regularly reporting measurement reports to the serving cell. In the example of FIG. 1, the cell information requested would typically include cell information of at least one of the cells NodeB 2C or NodeB 2D. In other words, the user

terminal 3 should at least monitor other cells than included in the neighbour cell list NCL-1A.

The user terminal 3, to that end, contains a receiver 20 (see FIG. 2) for receiving the request for reporting cell information of a plurality of wireless access nodes. The actual determination for which cells the cell information should be obtained and/or should be reported may be performed in the eNB 1A (and than being signalled to the user terminal 3) and/or internally in the user terminal 3.

When the updating of e.g. NCL-1A would only involve the determination whether additional cells should be included in the list, cell information may only be obtained for the cells of NodeB 2C and NodeB 2D. NCL-1A may be used to determine which cell(s) should be excluded for the gathering of cell information for the purpose of updating the NCL in such a case. However, when NCL-2A should be updated, the cells listed in NCL-1A should not necessarily be excluded.

On the other hand, if the NCL updating is also used to verify the existing NCL, cell information for one or more cells of the existing NCL should be gathered as well. In a particular embodiment, user terminal 3 comprises a determination module 21 for determining for which cells the cell information for the purpose of the NCL update should be gathered. As mentioned, the determination by the determination module 21 may be fully based on instructions received from the wireless access node eNB 1A or may be (partly) based on an internal comparison algorithm of the user terminal 3, using the copy of NCL-1A stored in a section of storage 22. The stored NCL may also be applied (illustrated by the arrow between scanning module 23 and determination module 21) after detecting (a part of) the cell information of all the available cells, as will be explained in further detail below.

The gathering of cell information for the purpose of updating an NCL may also be performed independently of the NCL stored in the user terminal 3. In such a case, the user terminal 3 preferably gathers cell information of all measurable cells.

The measurement is performed by a scanning module 23. The scanning module 23 detects the cell information of one or

more cells of wireless access nodes of the first and/or the second wireless access network.

The user terminal 3 is configured for storing the obtained cell information CI, or a derivative thereof, in a section of the storage means 22. While NCL-1A is normally erased from the storage means 22 after cell reselection or handover (in order to store the NCL of the new cell), the cell information remains stored for at least a particular period after the cell reselection or handover in order to transmit the cell information CI to the telecommunications system via the new cell using transmitter 24.

After cell reselection or handover to a cell of NodeB 2A, the transmitter 24 transmits the cell information CI, obtained while camping on the cell of eNB 1A, to a receiver 13 of NodeB 2A. Receiver 13 forwards the cell information to an updater 14 configured for updating (including verification) of the NCL-2A using the cell information CI.

When sufficient time is available, the mobile user terminal 3 may also transmit the cell information CI to the first wireless access network, particularly eNB 1A, in order to e.g. update NCL-1A, prior to cell reselection or handover to NodeB 2A. This transmission is shown by the dashed arrow from transmitter 23 towards eNB 1A.

In a particular example, a request is sent from request generator 12 to user terminal 3 to obtain cell information of the second wireless access network when user terminal is about to be handed over to this network. First, user terminal 3, using scanning means 23 detects as many PCI’s (physical cell identifiers) as possible. As an example, the PCI’s of the cells of nodes 2A-2D are detected. The PCI’s are generally transmitted on a specialized channel (a pilot channel for UMTS). Using NCL-1A stored in storage 22 and determination module 21, the PCI’s of NodeB 2A and NodeB 2B are omitted from the further processing, since these are already present in NCL-1A. The scanning means then detects the signal strengths of the pilot channel of the remaining cells identified by the PCI’s of NodeB 2C and NodeB 2D. It may turn out that the signal strength for the cell of

NodeB 2D is too low and, therefore, determination module 21 also omits further processing for cell NodeB 2D.

Subsequently, the scanning means tunes to the broadcast channel BCH of the cell of NodeB 2C and detects the GCID (global cell identifier) of this cell. If sufficient time is available before handover to the NodeB 2A occurs, the GCID and (possibly) other information is transmitted as cell information, using transmitter 24, to eNB 1A where it is received by receiver 13. Updater 14 may be used to update NCL-1A by adding wireless access node NodeB 2C, as illustrated. The other information may e.g. comprise location information of the mobile terminal 3, obtained using GPS module 25, when the scanning for available cells was performed.

However, time may be insufficient to complete the cell information gathering process and transmission of the cell information via the currently serving cell prior to handover. The GCID of NodeB 2C may then be stored as cell information CI in storage 22. User terminal 3 may then be handed over to NodeB 2A and transmission of the cell information CI may be performed using transmitter 24 to transmit the cell information CI to receiver 13 of NodeB 2A.

The cell information CI revealing the existence of NodeB 2C, i.e. the cell thereof, as an appropriate neighbour cell may be used for updating NCL-2A (for which the cell of NodeB 2C can be called a 'missing neighbour', since it was not present in NCL-2A) and for updating NCL-1A via a connection between the first wireless access network and the second wireless access network transporting cell information CI or a derivative thereof. This connection is indicated by the dashed arrow A in FIG. 2 and may e.g. be implemented using the OMC-2 and OMC-1 presented in FIG. 1.

Instead of or in addition to obtaining and reporting cell information of the second wireless access network, the mobile user terminal 3 may obtain cell information related to the first wireless access terminal. Reference is made to FIGS. 3A and 3B for an example of this.

In order to aid the automated optimisation of inter-network NCL, in one embodiment of the presented invention as illustrated in FIGS. 3A and 3B, an active terminal 3, just before making a handover from network A to network B, takes a snapshot of the pilot channel strengths it sees in network A, indicated by the measurement report. The terminal 3 performs a global scan and does not limit itself to considering only cells on the current NCL in order to identify potential cell candidates for adoption in the existing NCLs. Once the handover to network B is completed, user terminal 3 reports this snapshot to the new serving cell in network B. The new serving cell in network B can combine this report with other equivalent reports obtained from other handed-over terminals, in order to periodically optimise its inter-network NCL. The intra-network NCL of the originally serving cell may be updated as well by making the obtained cell information available to this cell using a connection between the wireless access networks.

FIGS. 4A and 4B provide another representation of an embodiment already discussed with reference to FIG. 2. The active terminal, just before making a handover from network A to network B, takes a snapshot of the pilot channel strengths it sees in network B, reports this to its source cell in network A (if sufficient time is available) and then undergoes the handover to the target cell in network B. Equivalently to the above description, now the source cell in network A can use these reports to self-optimise its inter-network NCL. The advantage of the second embodiment is that the cell in which the NCL is updated is in accordance with the direction of mobility. In other words, user motion from a source cell in network A to a target cell in network B makes use of the NCL in the source cell and hence the snapshot information generated at its handover can be used to update the NCL in the source cell. This advantage is primarily relevant in regions where inter-cell mobility is asymmetric. This is relevant when the operator favours one network over another for providing one or more particular services. This is also relevant in the case where mobility predominantly occurs in one direction (e.g. a one-way street).

Again, the cell information may also be stored using storage 22 and be transmitted to wireless access network A via wireless access network B. Also, the cell information of network B may be relevant for updating the intra-network NCL of the cell of this network.

The cell information CI (e.g. measurement reports) are periodically, or upon observed need, processed in each cell (access node) in order to re-optimise the inter-network NCL. This can be done by ranking all reported global cell IDs based on some weighted combination of the relative frequency at which they are reported and the associated pilot power strengths. This ranked list can then be combined with the actual handover statistics, as this indicates to what extent existing inter-network neighbour relations are actually used.

In an embodiment, a significant part of the processed reports of the mobile user terminals 3 (e.g. say more than 30% of the reported measurements) indicates a Cell ID with sufficient pilot (beacon) quality which is not included in the current inter-network NCL. Then this Cell ID should be added in the NCL.

Another example includes the case where an insignificant part of the processed UE reports (e.g. less than 1%) indicates a Cell ID with sufficient pilot (beacon) quality which is already included in the NCL. Then, this Cell ID should be removed from the NCL. Additionally, a listed neighbour to which hardly ever inter-network handover takes place, may be a candidate for removal from the NCL.

Additions or removals of cells in Network A and Network B may automatically be reflected in the ranking of the Cell IDs with sufficient pilot (beacon) strengths that are reported by the UEs. Consequently, these cells are then automatically added or removed from the NCL and no manual configuration is necessary.

As an alternative to optimising NCLs for each network separately, in an embodiment a single integrated NCL in each cell, containing cells both in the same network and in other (cooperative) networks, and both on the same carrier and differ-

ent carriers is automatically optimised. It is noted that optimisation of such an integrated list may then also implicitly involve a ranking of networks and carriers for potential adoption in the NCL (and possibly even for potential handovers).

One embodiment of the invention may be implemented as a program product for use with a computer system. The program(s) of the program product define functions of the embodiments (including the methods described herein) and can be contained on a variety of computer-readable storage media. Illustrative computer-readable storage media include, but are not limited to: (i) non-writable storage media (e.g., read-only memory devices within a computer such as CD-ROM disks readable by a CD-ROM drive, flash memory, ROM chips or any type of solid-state non-volatile semiconductor memory) on which information is permanently stored; and (ii) writable storage media (e.g., floppy disks within a diskette drive or hard-disk drive or any type of solid-state random-access semiconductor memory) on which alterable information is stored.

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Declarations under Rule 4.17:

[Continued on next page]

(54) Title: SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

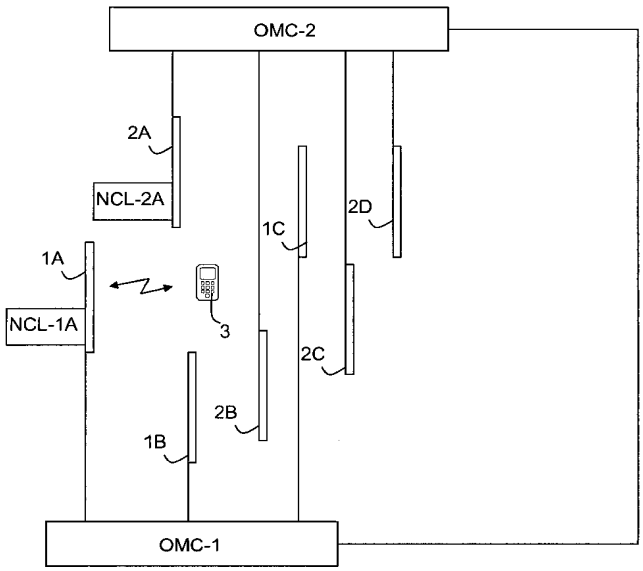


FIG. 1

(57) Abstract: The invention relates to a system and method for updating a neighbour cell list of a wireless access node. User terminals to be to be transferred from a first wireless access node of a first wireless access network to a second wireless access node of a second wireless access network are detected. From the first wireless access node, one or more of the detected user terminals are requested to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The cell information is received from the one or more of the detected user terminals and at least one of the first neighbour cell list and the second neighbour cell list is updated using the received cell information.

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Attorney Docket No.: US17827

PATENT APPLICATION TRANSMITTAL

Mail Stop: PCT
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Alexandria, VA 22313-1450

We are submitting herewith the following attached items and information:

- Transmittal Letter (Form PTO-1390) to the DO/EO/US concerning a PCT-U.S. National Stage filing under 35 U.S.C. 371 (4 pages)
- Authorization to charge Deposit Account 50-5047 in the amount of $ 1120.00 to pay the filing fee for large entity
- Incorporation by Reference herein in its entirety: *The entire disclosure of the prior application, PCT/EP2010/064823, filed October 5, 2010, and published April 14, 2011 as WO 2011/042433 A1 is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein in its entirety*
- Copy of International Application No. PCT/EP2010/064823 as published (Int'l Publ. No. WO 2011/042433A1), including specification (25 pages and a cover page (2 pages) including abstract, 14 claims), 4 sheets of drawings, and International Search Report (3 pages)
- Information Disclosure Statement (2 pages), Form PTO/SB/08a, and copies of cited references (4)
- Preliminary Amendment (9 pages)
- Application Data Sheet (6 pages)
- A copy of a PCT Notification of International Application Number and International Filing Date with PCT Request (10 pages)

Please charge any additional required fees or credit overpayment to Deposit Account No. 50-5047.

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By: /Natalya Hartmann, Reg. No. 62,119/
Natalya Hartmann

Registration No. 62,119

Date of Deposit: April 3d, 2012
This paper is being filed on the date indicated above using the USPTOs electronic filing system EFS-Web, and is addressed to The Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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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	
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U.S. APPLICATION NO. (If known, see 37 CFR 1.5)	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP2010/064823	October 5, 2010	October 7, 2009

TITLE OF INVENTION
SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ...

APPLICANT(S) FOR DO/EO/US
OOSTVEEN, Job Cornelis

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☑ This is a **FIRST** submission of items concerning a submission under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a submission under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☑ The US has been elected (Article 31).
5. ☑ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   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 U.S.C. 371(c)(2)).
   a. ☐ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   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 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☑ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☑ A preliminary amendment.
14. ☑ An Application Data Sheet under 37 CFR 1.76.
15. ☐ A substitute specification.
16. ☐ A power of attorney and/or change of address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13*ter*.3 and 37 CFR 1.821- 1.825.
18. ☐ A second copy of the published International Application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).

This collection of information is required by 37 CFR 1.414 and 1.491-1 .492. The information is required to obtain or retain a b enefit by the public, w hich is to file (and by the USPTO to pro cess) an application . Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 15 minutes to complete, including gathering information, preparing, and submitting the completed form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEE S OR COMPLE TED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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	PCT/EP2010/064823	US17827

20. Other items or information:

The following fees have been submitted	CALCULATIONS	PTO USE ONLY
21. ☑ Basic national fee (37 CFR 1.492(a))..... **$380**	$ 380	
22. ☑ Examination fee (37 CFR 1.492(c)) If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... **$0** All other situations..... **$250**	$ 250	
23. ☑ Search fee (37 CFR 1.492(b)) 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** Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority..... **$120** International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB..... **$490** All other situations..... **$620**	$ 490	
TOTAL OF 21, 22 and 23 =	$ 1120	

☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)).
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Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round **up** to a whole number)	RATE	
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Total claims	- 20 =		x $ **60**	$	
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MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$450**	$	
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SEND ALL CORRESPONDENCE TO:

/Natalya Hartmann,Reg.No.62,119/
SIGNATURE

Natalya Hartmann
NAME

62,119
REGISTRATION NUMBER

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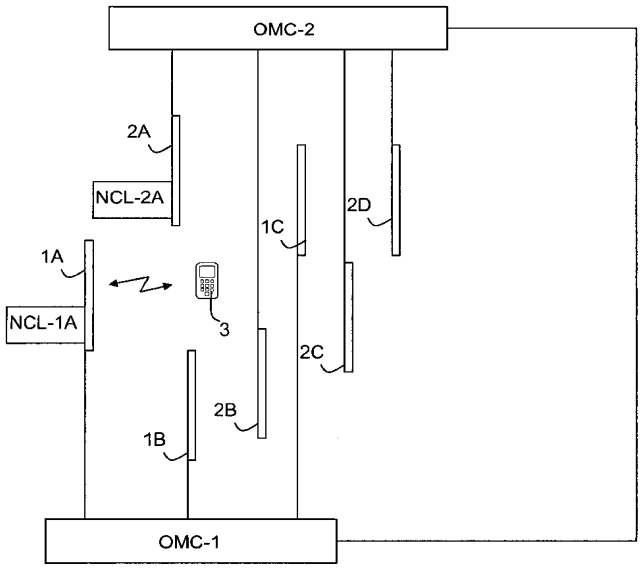


FIG. 1

(57) Abstract: The invention relates to a system and method for updating a neighbour cell list of a wireless access node. User terminals to be to be transferred from a first wireless access node of a first wireless access network to a second wireless access node of a second wireless access network are detected. From the first wireless access node, one or more of the detected user terminals are requested to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The cell information is received from the one or more of the detected user terminals and at least one of the first neighbour cell list and the second neighbour cell list is updated using the received cell information.

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SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

FIELD OF THE INVENTION

The invention relates to the field of telecommunications systems and a method in telecommunications architecture. More specifically, the invention relates to a telecommunications architecture comprising at least a first and a second wireless access network between which user terminals can be transferred and a method in such a telecommunications system, wherein the neighbour cell lists (NCLs) of at least a wireless access node of the first and/or second wireless access network can be updated using a system.

BACKGROUND OF THE INVENTION

When moving through the coverage area of a wireless access cellular network, mobile user terminals continuously scan the spectrum for pilot or reference signals (beacons) in order to determine which cell (base station) to camp on. In idle mode, this is referred to as cell reselection, while in active/dedicated mode, this is referred to as handover. The cell-specific list of surrounding cells that are considered for cell reselection or handover is called the neighbour cell list (NCL), which is stored in each base station and broadcast within the cell. The mobile user terminal receives and stores the NCL. The NCL contains the cells for which the mobile user terminal should send measurement reports (when certain criteria are met) to the base station currently serving the user terminal.

In case of multiple, cooperating wireless access cellular networks, each cell not only has an intra-network NCL, but also an inter-network NCL.

The optimisation of the NCLs is traditionally done with the aid of off-line planning tools, using path loss predictions and (off-line) optimisation algorithms. Currently, automated configuration and optimisation of intra-network NCLs and inter-network NCLs, based on e.g. actual measurement feedback from

user terminals, observed mobility patterns, base station scans and handover statistics, are being investigated.

3GPP TS 36.300, V8.9.0, discloses an automatic neighbour relation (ANR) function to relieve an operator from the burden of manually managing neighbour relations. Such an ANR function resides in the eNode-B (eNB) of an LTE network and manages a conceptual neighbour relation table (NRT). A neighbour detection function is used to find new neighbours and to add them to the NRT, whereas a neighbour removal function removes outdated neighbours from the NRT. The eNB instructs a user terminal from a serving cell to look for neighbour cells of other networks by scanning all cells. The user terminal first reports the physical cell identifier (PCI) of the detected cells in the other network. When the eNB receives the reports from the user terminals containing the PCI's of the cells, the eNB instructs the user terminal, using the newly discovered cell as a parameter, to read the Cell Global Identifier (CGI) and further cell information from the neighbouring cells. The user terminal also reports this information to the serving cell. The eNB may then update the NRT using the information reported from the user terminals.

SUMMARY OF THE INVENTION

A system is disclosed for a telecommunications architecture that comprises a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined.

The system comprises a detector configured for detecting user terminals about to be transferred, i.e. for which cell reselection or handover will be performed, from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network.

The system also comprises a request generator configured for requesting from the first wireless access node one or

more of the detected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The telecommunications system, particularly at least one of the first and the second wireless access node, also comprises a receiver configured for receiving the cell information from one or more of the detected user terminals. Updating means are provided configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

A method in a telecommunications architecture is also disclosed. User terminals about to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network are detected. From the first wireless access node, one or more of the detected user terminals are requested to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The cell information is received from one or more of the detected user terminals and at least one of the first neighbour cell list and the second neighbour cell list is updated using the received cell information.

Furthermore, a mobile user terminal containing at least one neighbour cell list of the first wireless access node is disclosed. The terminal comprises a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The mobile terminal also contains scanning means configured for detecting the cell information from the wireless access nodes, at least one of the wireless access nodes being absent in the neighbour cell list, and a transmitter for transmitting the detected cell information. At present, standardization does not allow mobile terminals to measure cells not present in the NCL. However, there are no intrinsic obstacles for making performing such measurements. The mobile terminal is arranged for temporarily storing the detected cell information and transmitting the de-

tected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

It is noted that in the present application the terms wireless access node and cell are used as similar terms. The skilled person will appreciate that a single wireless access node may provide multiple cells and that, typically, a neighbour cell list is defined for each of the cells of such a node.

The plurality of wireless access nodes of which cell information is requested may exclude the first wireless access node, or more particularly, the cell thereof currently serving the user terminal. On the other hand, the plurality of wireless access nodes would typically include cells that are absent in the neighbour cell list stored in the user terminal for regularly reporting measurement reports to the serving cell. Otherwise, since the neighbour cell list is obtained from the serving cell, the detection of the cell information by the user terminal would be restricted to this list and would therefore only be suitable for verifying the existing NCL and not for adding new neighbouring cells to the list. In an embodiment, the user terminal performs a complete scan for all cells in the first wireless access network (possibly excluding the currently serving cell) and/or all cells in the second wireless access network to allow the telecommunications system to obtain a complete picture of the available cells around the first wireless access node. This complete information containing the scan of all cells may then be used for updating the NCL(s). Alternatively, the user terminal may compare the received complete information with the NCL it has obtained from the first wireless access node and only report cell information of cells not present on the current NCL.

The first and second wireless access networks may differ in radio access technology (e.g. GSM and UMTS or UMTS and LTE), the deployed release of a given radio access technology, the used frequency spectrum (e.g. the 900 MHz and 1800 MHz frequency bands (the latter also being referred to as a DCS network) for GSM, different 5MHz carriers for UMTS) and/or wire-

less access networks of different mobile operators. The wireless access network may also differ in the type of cells provided, e.g. macro cells and pico cells.

The disclosed system and method are able to specifically direct the request for cell information for the first and/or second network to user terminals in the regions where cell reselection or handover from the first to the second wireless access network is about to occur. By collecting this information specifically at cell reselection or handover moments, the updating of the NCL is inherently based on the inter-network neighbours that a user terminal experiences in the cell reselection or handover region, where the reports of the user terminal measurements are most relevant for construing the NCL.

In some instances, user terminals may move rapidly through an area and cell reselection and handover to the second wireless access network should be performed quickly. In such cases, insufficient time may be available for performing the scan for obtaining the cell information for the first wireless access network and for reporting the cell information to the telecommunications system via the first wireless access network. The embodiments of the invention as defined in claims 2 and 10 provide additional time for completing the method by performing the cell reselection or handover as soon as the mobile user terminal has been instructed for performing the scan for cell information for the first and/or the second wireless access network. By temporarily storing the cell information resulting from the scan at the mobile user terminal, the user terminal may carry the cell information to the second network where it has sufficient time to report the cell information of the plurality of wireless access nodes of the first wireless access network via the second network.

The cell information of the wireless access nodes of the first wireless access network may be used for updating the neighbour cell list of the first wireless access node and/or for updating the neighbour cell list of the second wireless access node, or the cells thereof.

The updating of the neighbour cell list of the second wireless access node is relevant for user terminals reselecting cells or handed over from the second wireless access node to the first wireless access network, i.e. in the cell reselection or handover direction reverse to the direction travelled by the terminals reporting the cell information. Since other user terminals will be transferred from the second wireless access network to the first wireless access network, the neighbour cell list of the first wireless access node may also be updated in this way.

The cell information of the plurality of access nodes of the first wireless access network as received via the second wireless access node may also be transferred back to the first wireless access node, e.g. for updating the intra-network neighbour cell list, as defined in claim 3 and, optionally, in claim 10. In a particular example, this embodiment may be used to reduce the so-called 'missing neighbour' effect in a UMTS network, here being the first wireless access network. User terminals equipped to connect to UMTS networks are restricted to gathering cell information as defined in the neighbour cell list received from the base station currently serving the user terminal. An absent cell in the neighbour cell list of the base station will thus never be measured and reported by the user terminal as a result of this restriction of the user terminal. When the signal of a missing neighbour is too strong, call drops may occur. The present embodiments may reduce this problem by instructing the user terminals to also scan for cell information of wireless access nodes of the UMTS network being absent in the neighbour cell list (and thus possibly revealing the existence of cells not present in the neighbour cell list of the base station) and to report this via the second wireless access network back to the first wireless access node. The NCL of the first wireless access node may then be updated with the missing neighbour cell.

The user terminals may also be instructed to obtain the cell information of the plurality of wireless access nodes of the second wireless access network shortly before cell reselec-

tion or handover to the second wireless access node of this network and report the cell information to the telecommunications system via this second wireless access node, i.e. after cell reselection or handover. This embodiment is defined in claims 4 and 11.

Again, the cell information of the wireless access nodes of the second wireless access network may be used for updating the neighbour cell list of the first wireless access node and/or for updating the neighbour cell list of the second wireless access node. The cell information obtained for the access nodes of the second wireless access network may be relevant for the second wireless access network itself, e.g. for updating the intra-network NCL, in view of the 'missing neighbour' effect occurring in particular types of network such as UMTS, as discussed above for the first wireless access network.

The cell information of the plurality of access nodes of the second wireless access network as received via the second wireless access node may be transferred back to the first wireless access node as defined in claim 5 and, optionally, in claim 11. In doing so, the first wireless access node may update its neighbour cell list using the received cell information obtained shortly before cell reselection or handover, even when the user terminals have insufficient time for reporting the cell information for the plurality of wireless access nodes of the second wireless access network directly to the first wireless access node. The updated NCL is relevant for cell reselection or handover from the first wireless access node to the second wireless access network for other user terminals.

Of course, when sufficient time for reporting the cell information of the plurality of wireless access nodes of the second network is available, this cell information obtained shortly before cell reselection or handover to the second wireless access network can be reported directly to the first wireless access node, as defined in the embodiments of claims 6 and 12.

It is not required that all handover or cell reselection instances trigger a scan for cell information by the user

terminals. A wireless access node may for instance indicate on its broadcast channel not only whether handovers and/or cell re-selections should trigger such reporting, but also a likelihood parameter which the terminal can use to flip a (biased) coin in determining whether it should send cell information at a specific handover or cell reselection instance. Alternatively, the wireless access node may explicitly signal to the specific user terminal whether it should do the cell measurement and reporting. In this manner, the amount of cell information reporting can be tuned, which relates to a trade-off between the measurement overhead (signalling load) and the potential for neighbour cell list optimisation.

One embodiment of tuning the amount of cell list optimisation traffic is to use the location information from the user terminals as a selection criterion as defined in claim 7. The location information may e.g. be obtained from a GPS module in the user terminal or by means of measurements using the first and/or the second wireless access network. This location information can be useful e.g. in identifying where handover regions exist, and in solving location-specific outages or problems, e.g. dropped calls due to 'missing neighbour'. It may also be useful when an operator changes configuration (optimisation of downlink power, antenna tilt, etc) and wants to measure the effect on the cells relevant for inter-RAT cell change or handover.

Another advantageous selection criterion for determining which user terminals should report cell information is the transfer threshold that may have been set by the operator(s) of the telecommunication system, as defined in claim 8. The transfer threshold determines at what level (typically involving pilot signal measurements) cell reselection or handover would occur. The transfer threshold for cell reselection or handover from the first wireless access network to the second wireless access network may be asymmetric (i.e. a different transfer threshold Th2 applies for a transfer from the second to the first wireless access network) and may also be dependent on the service type of the service received by the user terminal when

connected to the first wireless access node. As an example, a user terminal provided with a voice service by a cell of an LTE network that is handed over to a GSM network might not be handed over back to the LTE network. This is because the operator chooses this mode of operation. In such a case, although this user terminal is a detected user terminal in the sense that it is about to be transferred to the second wireless access network (GSM), it is not selected for reporting requested to report cell information of the plurality of wireless access nodes of the first wireless access network (the LTE network), since the hand-over in the direction back to the first network (the LTE network) will generally not be made. On the other hand, for a user terminal using a data service that is temporarily handed over from an LTE network to a GSM network, a handover back to the LTE network is generally preferred and such user terminals can be selected to report cell information of the plurality of wireless access nodes of the second network. The embodiment of the telecommunications system of claim 8 may also be used for the method in the telecommunications system as defined in claims 10-13.

Hereinafter, embodiments of the invention will be described in further detail. It should be appreciated, however, that these embodiments may not be construed as limiting the scope of protection for the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 provides a schematic illustration of a telecommunication system comprising a first and a second wireless access network, each having a plurality of wireless access nodes, according to an embodiment of the invention;

FIG. 2 provides a schematic illustration of a mobile user terminal and wireless access nodes configured for performing a method according to an embodiment of the invention;

FIGS. 3A and 3B provide a schematic illustration of a telecommunications system and a flow chart for operating such a system, wherein cell information of wireless access nodes of the

first wireless access network is obtained and reported via the second wireless access network; and

FIGS. 4A and 4B provide a schematic illustration of a telecommunications system and a flow chart for operating such a system, wherein cell information of wireless access nodes of the second wireless access network is obtained and reported via the first wireless access network.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of first wireless access nodes 1A-1C of a first wireless access network and second wireless access nodes 2A-2D of a second wireless network. As an example, the first wireless access nodes 1A-1C are eNBs of an Long Term Evolution (LTE) network, whereas the second wireless access nodes 2A-2D are NodeBs of an UMTS network. Other examples includes wireless access networks differing in other radio access technologies (RATs), e.g. GSM and UMTS, differences in the deployed release of a given radio access technology, differences in the used frequency spectrum (e.g. the 900 MHz and 1800 MHz frequency bands (the latter also being referred to as a DCS network) for GSM, different 5MHz carriers for UMTS) and/or wireless access networks of different mobile operators. The wireless access network may also differ in the type of cells provided, e.g. macro cells and pico cells.

The wireless access nodes 1A-1C and 2A-2D can be controlled by control systems as schematically illustrated in FIG. 1. As an example, the control system may be Operation and Maintenance Centres (OMCs) as generally known in the art. The OMCs of the wireless access networks can be interconnected. Other connections between the wireless access networks can be used as well. If the wireless access nodes of the first and second wireless access networks originate from the same vendor, a single OMC can be used.

Each of the wireless access nodes 1A-1C and 2A-2D may contain at least one neighbour cell list (NCL). In FIG. 1, NCL-1A and NCL-2A are indicated as NCL of the corresponding wireless

access nodes. When a wireless access node provides multiple cells, typically each cell has a corresponding NCL.

A wireless access node broadcasts the NCL and mobile user terminals 3 camping on such a cell receive and store the NCL. The NCL is typically used to instruct the mobile terminal 3 which cells to monitor and to report every now and then the received signal strengths of each of the monitored cells, such that the network can make a decision whether or not the mobile terminal 3 should select or should be handed over to another cell.

As an example, the mobile terminal 3 receives the NCL-1A from wireless access node 1A to which it is currently connected. NCL-1A contains the cell(s) of neighbouring access nodes 1B and 1C and mobile terminal 3 monitors the signal strengths of these cells and reports these to the wireless access node 1A. Such an NCL-1A is referred to as an intra-network NCL. NCL-1A may also list neighbouring access nodes 2A and 2B of the second wireless access network, in which case NCL-1A would be referred to as an inter-network NCL. NCL-1A may also be a combined NCL, i.e. a combination of an intra-network and an inter-network NCL. Currently, automated configuration and optimisation of intra-network NCLs and inter-network NCLs is based on e.g. actual measurement feedback from user terminals 3 as disclosed in 3GPP TS 36.300, V8.9.0.

Referring also to FIG. 2, an embodiment will now be described in further detail, wherein intra-network NCL-1A contains the cells of eNBs 1B and 1C and inter-network NCL-1A contains the cells of NodeBs 2A and 2B. Note that inter-network NCL-1A does not yet contain NodeBs 2C and 2D.

Mobile user terminal 3 is assumed to camp on a cell of eNB 1A and is monitoring the cells of eNB's 1B, 1C and NodeBs 2A and 2B as indicated in the intra-network and inter-network NCLs transmitted in the cell under consideration. The mobile user terminal 3 regularly sends measurement reports to the eNB 1A as generally known in the art.

As illustrated schematically in FIG. 2, eNB 1A contains a cell reselection/handover detector 10 that recognizes that mo-

bile terminal 3 requires a cell reselection or handover to NodeB 2A of the second wireless access network. The cell reselection or handover indication triggers the following sequence of events in eNB 1A.

First, it may be determined whether or not the mobile terminal 3 for which a cell reselection or handover indication is received should participate, i.e. should be selected, in the process for updating (which includes the verification of the correctness) of an NCL, such as NCL-1A or NCL-2A. To that end, the eNB 1A contains a selection module 11 for selecting a part of the user terminals 3 for which a cell reselection or handover indication is detected. In this manner, it is possible to filter an appropriate portion the user terminals for which cell reselection or handover is about in order to reduce unnecessary signalling over the first and/or second wireless access network. The decision whether or not to participate in the updating process, i.e. whether or not to provide information to the telecommunication system allowing the updating of the NCL's, may either be taken at the mobile terminal or at the telecommunications system, particularly eNB 1A.

As an example, eNB 1A may indicate on its broadcast channel not only whether handovers and/or cell reselections should trigger such reporting, but also a likelihood parameter which the terminal 3 can use to flip a biased coin in determining whether it should send information at a specific handover or cell reselection instance. Alternatively, eNB 1A may explicitly signal to the specific user terminal 3 whether it should do the cell measurement and reporting. In this manner, the amount of cell information reporting can be tuned, which relates to a trade-off between the measurement overhead (signalling load) and the potential for neighbour cell list optimisation.

An advantageous selection criterion at the side of the eNB 1A for determining which user terminals 3 should report cell information is the transfer threshold that may have been set by the operator(s) of the telecommunications system between the first and the second wireless access networks. The transfer threshold determines at what level (typically involving pilot

signal measurements) cell reselection or handover would occur. The transfer threshold Th1 for cell reselection or handover from the first wireless access network to the second wireless access network may be asymmetric (i.e. a different transfer threshold Th2 applies for a transfer from the second to the first wireless access network) and may also be dependent on the service type of the service enjoyed by the user terminal when connected to the first wireless access node.

In FIG. 1, the user terminal 3 camping on a cell of eNB 1A of an LTE network using a data service that is about to be handed over to NodeB 2A of an UMTS network will generally be handed over back to the LTE network, if possible, because the operator applies a low threshold for handing over the user terminal 3 from the UMTS network to the LTE network for data services but a much higher threshold for handing over the user terminal to the UMTS network. In such a case, since a transfer between the networks is more likely in one direction than in the other, the terminal 3 may or may not be selected for providing information useful for the NCL updating process as will now be described in further detail.

The selection stage of user terminals 3 may be omitted completely or may be selectively applied, e.g. during particular hours of the day or at particular stages of the configuration and optimisation of the network.

Once user terminal 3 has been selected, request generator 12 in FIG. 2 is activated in order to request the user terminal 3 to report cell information of a plurality of wireless access nodes.

The plurality of wireless access nodes of which cell information is requested may exclude the cell of eNB 1A currently serving the user terminal 3. On the other hand, the plurality of wireless access nodes would typically include cells that are absent in the neighbour cell list NCL-1A stored in the user terminal 3 for regularly reporting measurement reports to the serving cell. In the example of FIG. 1, the cell information requested would typically include cell information of at least one of the cells NodeB 2C or NodeB 2D. In other words, the user

terminal 3 should at least monitor other cells than included in the neighbour cell list NCL-1A.

The user terminal 3, to that end, contains a receiver 20 (see FIG. 2) for receiving the request for reporting cell information of a plurality of wireless access nodes. The actual determination for which cells the cell information should be obtained and/or should be reported may be performed in the eNB 1A (and than being signalled to the user terminal 3) and/or internally in the user terminal 3.

When the updating of e.g. NCL-1A would only involve the determination whether additional cells should be included in the list, cell information may only be obtained for the cells of NodeB 2C and NodeB 2D. NCL-1A may be used to determine which cell(s) should be excluded for the gathering of cell information for the purpose of updating the NCL in such a case. However, when NCL-2A should be updated, the cells listed in NCL-1A should not necessarily be excluded.

On the other hand, if the NCL updating is also used to verify the existing NCL, cell information for one or more cells of the existing NCL should be gathered as well. In a particular embodiment, user terminal 3 comprises a determination module 21 for determining for which cells the cell information for the purpose of the NCL update should be gathered. As mentioned, the determination by the determination module 21 may be fully based on instructions received from the wireless access node eNB 1A or may be (partly) based on an internal comparison algorithm of the user terminal 3, using the copy of NCL-1A stored in a section of storage 22. The stored NCL may also be applied (illustrated by the arrow between scanning module 23 and determination module 21) after detecting (a part of) the cell information of all the available cells, as will be explained in further detail below.

The gathering of cell information for the purpose of updating an NCL may also be performed independently of the NCL stored in the user terminal 3. In such a case, the user terminal 3 preferably gathers cell information of all measurable cells.

The measurement is performed by a scanning module 23. The scanning module 23 detects the cell information of one or

more cells of wireless access nodes of the first and/or the second wireless access network.

The user terminal 3 is configured for storing the obtained cell information CI, or a derivative thereof, in a section of the storage means 22. While NCL-1A is normally erased from the storage means 22 after cell reselection or handover (in order to store the NCL of the new cell), the cell information remains stored for at least a particular period after the cell reselection or handover in order to transmit the cell information CI to the telecommunications system via the new cell using transmitter 24.

After cell reselection or handover to a cell of NodeB 2A, the transmitter 24 transmits the cell information CI, obtained while camping on the cell of eNB 1A, to a receiver 13 of NodeB 2A. Receiver 13 forwards the cell information to an updater 14 configured for updating (including verification) of the NCL-2A using the cell information CI.

When sufficient time is available, the mobile user terminal 3 may also transmit the cell information CI to the first wireless access network, particularly eNB 1A, in order to e.g. update NCL-1A, prior to cell reselection or handover to NodeB 2A. This transmission is shown by the dashed arrow from transmitter 23 towards eNB 1A.

In a particular example, a request is sent from request generator 12 to user terminal 3 to obtain cell information of the second wireless access network when user terminal is about to be handed over to this network. First, user terminal 3, using scanning means 23 detects as many PCI's (physical cell identifiers) as possible. As an example, the PCI's of the cells of nodes 2A-2D are detected. The PCI's are generally transmitted on a specialized channel (a pilot channel for UMTS). Using NCL-1A stored in storage 22 and determination module 21, the PCI's of NodeB 2A and NodeB 2B are omitted from the further processing, since these are already present in NCL-1A. The scanning means then detects the signal strengths of the pilot channel of the remaining cells identified by the PCI's of NodeB 2C and NodeB 2D. It may turn out that the signal strength for the cell of

NodeB 2D is too low and, therefore, determination module 21 also omits further processing for cell NodeB 2D.

Subsequently, the scanning means tunes to the broadcast channel BCH of the cell of NodeB 2C and detects the GCID (global cell identifier) of this cell. If sufficient time is available before handover to the NodeB 2A occurs, the GCID and (possibly) other information is transmitted as cell information, using transmitter 24, to eNB 1A where it is received by receiver 13. Updater 14 may be used to update NCL-1A by adding wireless access node NodeB 2C, as illustrated. The other information may e.g. comprise location information of the mobile terminal 3, obtained using GPS module 25, when the scanning for available cells was performed.

However, time may be insufficient to complete the cell information gathering process and transmission of the cell information via the currently serving cell prior to handover. The GCID of NodeB 2C may then be stored as cell information CI in storage 22. User terminal 3 may then be handed over to NodeB 2A and transmission of the cell information CI may be performed using transmitter 24 to transmit the cell information CI to receiver 13 of NodeB 2A.

The cell information CI revealing the existence of NodeB 2C, i.e. the cell thereof, as an appropriate neighbour cell may be used for updating NCL-2A (for which the cell of NodeB 2C can be called a 'missing neighbour', since it was not present in NCL-2A) and for updating NCL-1A via a connection between the first wireless access network and the second wireless access network transporting cell information CI or a derivative thereof. This connection is indicated by the dashed arrow A in FIG. 2 and may e.g. be implemented using the OMC-2 and OMC-1 presented in FIG. 1.

Instead of or in addition to obtaining and reporting cell information of the second wireless access network, the mobile user terminal 3 may obtain cell information related to the first wireless access terminal. Reference is made to FIGS. 3A and 3B for an example of this.

In order to aid the automated optimisation of inter-network NCL, in one embodiment of the presented invention as illustrated in FIGS. 3A and 3B, an active terminal 3, just before making a handover from network A to network B, takes a snapshot of the pilot channel strengths it sees in network A, indicated by the measurement report. The terminal 3 performs a global scan and does not limit itself to considering only cells on the current NCL in order to identify potential cell candidates for adoption in the existing NCLs. Once the handover to network B is completed, user terminal 3 reports this snapshot to the new serving cell in network B. The new serving cell in network B can combine this report with other equivalent reports obtained from other handed-over terminals, in order to periodically optimise its inter-network NCL. The intra-network NCL of the originally serving cell may be updated as well by making the obtained cell information available to this cell using a connection between the wireless access networks.

FIGS. 4A and 4B provide another representation of an embodiment already discussed with reference to FIG. 2. The active terminal, just before making a handover from network A to network B, takes a snapshot of the pilot channel strengths it sees in network B, reports this to its source cell in network A (if sufficient time is available) and then undergoes the handover to the target cell in network B. Equivalently to the above description, now the source cell in network A can use these reports to self-optimise its inter-network NCL. The advantage of the second embodiment is that the cell in which the NCL is updated is in accordance with the direction of mobility. In other words, user motion from a source cell in network A to a target cell in network B makes use of the NCL in the source cell and hence the snapshot information generated at its handover can be used to update the NCL in the source cell. This advantage is primarily relevant in regions where inter-cell mobility is asymmetric. This is relevant when the operator favours one network over another for providing one or more particular services. This is also relevant in the case where mobility predominantly occurs in one direction (e.g. a one-way street).

Again, the cell information may also be stored using storage 22 and be transmitted to wireless access network A via wireless access network B. Also, the cell information of network B may be relevant for updating the intra-network NCL of the cell of this network.

The cell information CI (e.g. measurement reports) are periodically, or upon observed need, processed in each cell (access node) in order to re-optimise the inter-network NCL. This can be done by ranking all reported global cell IDs based on some weighted combination of the relative frequency at which they are reported and the associated pilot power strengths. This ranked list can then be combined with the actual handover statistics, as this indicates to what extent existing inter-network neighbour relations are actually used.

In an embodiment, a significant part of the processed reports of the mobile user terminals 3 (e.g. say more than 30% of the reported measurements) indicates a Cell ID with sufficient pilot (beacon) quality which is not included in the current inter-network NCL. Then this Cell ID should be added in the NCL.

Another example includes the case where an insignificant part of the processed UE reports (e.g. less than 1%) indicates a Cell ID with sufficient pilot (beacon) quality which is already included in the NCL. Then, this Cell ID should be removed from the NCL. Additionally, a listed neighbour to which hardly ever inter-network handover takes place, may be a candidate for removal from the NCL.

Additions or removals of cells in Network A and Network B may automatically be reflected in the ranking of the Cell IDs with sufficient pilot (beacon) strengths that are reported by the UEs. Consequently, these cells are then automatically added or removed from the NCL and no manual configuration is necessary.

As an alternative to optimising NCLs for each network separately, in an embodiment a single integrated NCL in each cell, containing cells both in the same network and in other (cooperative) networks, and both on the same carrier and differ-

ent carriers is automatically optimised. It is noted that optimisation of such an integrated list may then also implicitly involve a ranking of networks and carriers for potential adoption in the NCL (and possibly even for potential handovers).

One embodiment of the invention may be implemented as a program product for use with a computer system. The program(s) of the program product define functions of the embodiments (including the methods described herein) and can be contained on a variety of computer-readable storage media. Illustrative computer-readable storage media include, but are not limited to: (i) non-writable storage media (e.g., read-only memory devices within a computer such as CD-ROM disks readable by a CD-ROM drive, flash memory, ROM chips or any type of solid-state non-volatile semiconductor memory) on which information is permanently stored; and (ii) writable storage media (e.g., floppy disks within a diskette drive or hard-disk drive or any type of solid-state random-access semiconductor memory) on which alterable information is stored.

CLAIMS

1. A system for updating a neighbour cell list in a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined, the system comprising:

- a detector configured for detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;

- a selector configured for selecting a part of the user terminals;

- a request generator configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

- a receiver configured for receiving the cell information from the one or more of the selected user terminals; and

- updating means configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

2. The system according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node.

3. The system according to claim 2, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

4. The system according to one or more of the preceding claims,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node.

5. The system according to claim 4, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

6. The infrastructure according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node

further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

7. The system according to one or more of the preceding claims, wherein the telecommunications system is further configured for receiving location information from one or more of the detected user terminals and wherein the location information is used as a selection parameter for selecting the part of the detected user terminals.

8. The system according to one or more of the preceding claims , wherein one or more thresholds, possibly service-dependent, are defined in the telecommunications system for transferring the user terminals between the first wireless access network and the second wireless access network and wherein at least one of the thresholds is used as a selection parameter for selecting the part of the detected user terminals.

9. In a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is

defined, a method for updating at least one of the first and second neighbour cell lists comprising the steps of:

- detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;

- selecting a part of the user terminals;

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

- receiving the cell information from the one or more of the selected user terminals; and

- updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

10. The method according to claim 9, comprising the steps of:

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

- receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node,

- transferring the selected user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node, and

- optionally, transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

11. The method according to claim 9 or 10, comprising the steps of:

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node,

- transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node, and

- optionally, transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

12. The method according to claim 9, comprising the steps of;

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node

- transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

13. A computer program comprising software code portions configured for, when executed by at least one processor, performing the method of one or more of the claims 9-12.

14. A mobile user terminal configured for use in the method according to one or more of the claims 9-11, wherein the mobile terminal, in use, contain a neighbour cell list of the first wireless access node, the terminal comprising:

- a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;
- scanning means for detecting the cell information from the wireless access nodes, at least one of the wireless access nodes being absent in the neighbour cell list,
- a transmitter for transmitting the detected cell information,
- wherein the mobile user terminal is arranged for temporarily storing the detected cell information and transmitting the detected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

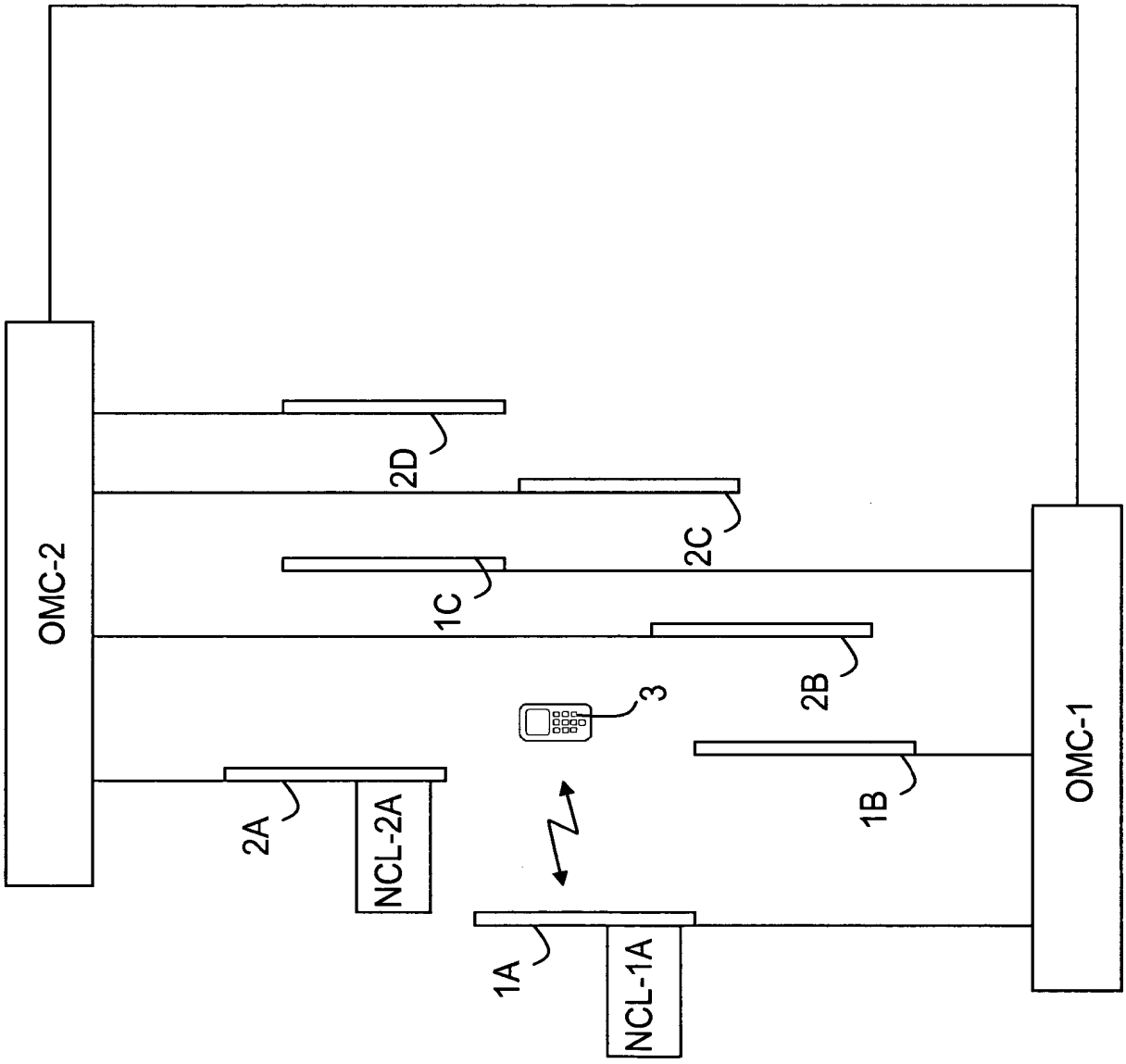


FIG. 1

2/4

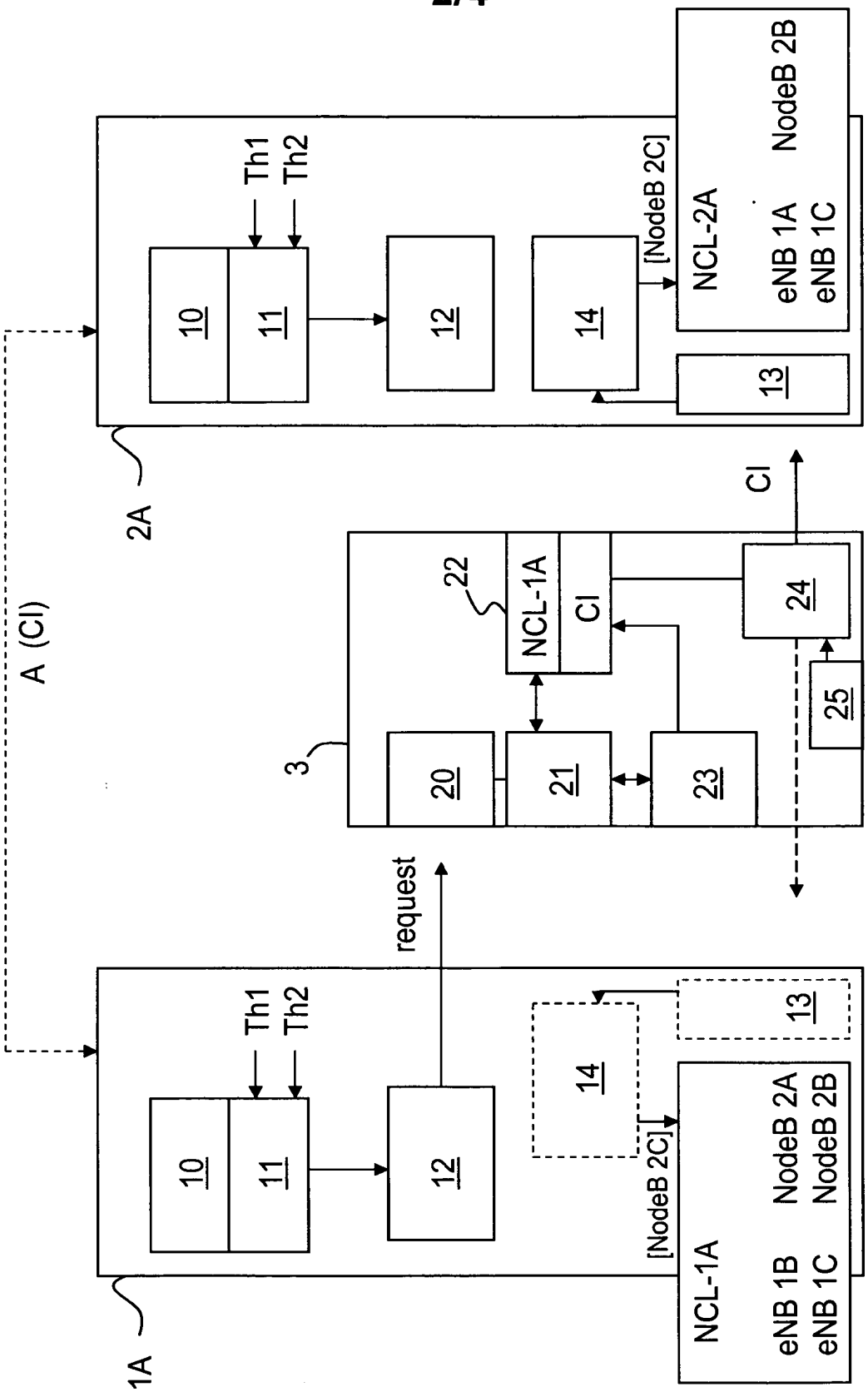

2A
NCL-2A
eNB 1A
eNB 1C
NodeB 2B
[NodeB 2C]
Th1
Th2
10
11
12
13
14
A (CI)
CI
3
22
NCL-1A
CI
20
21
23
24
25
request
1A
NCL-1A
eNB 1B
eNB 1C
NodeB 2A
NodeB 2B
[NodeB 2C]

FIG. 2

3/4

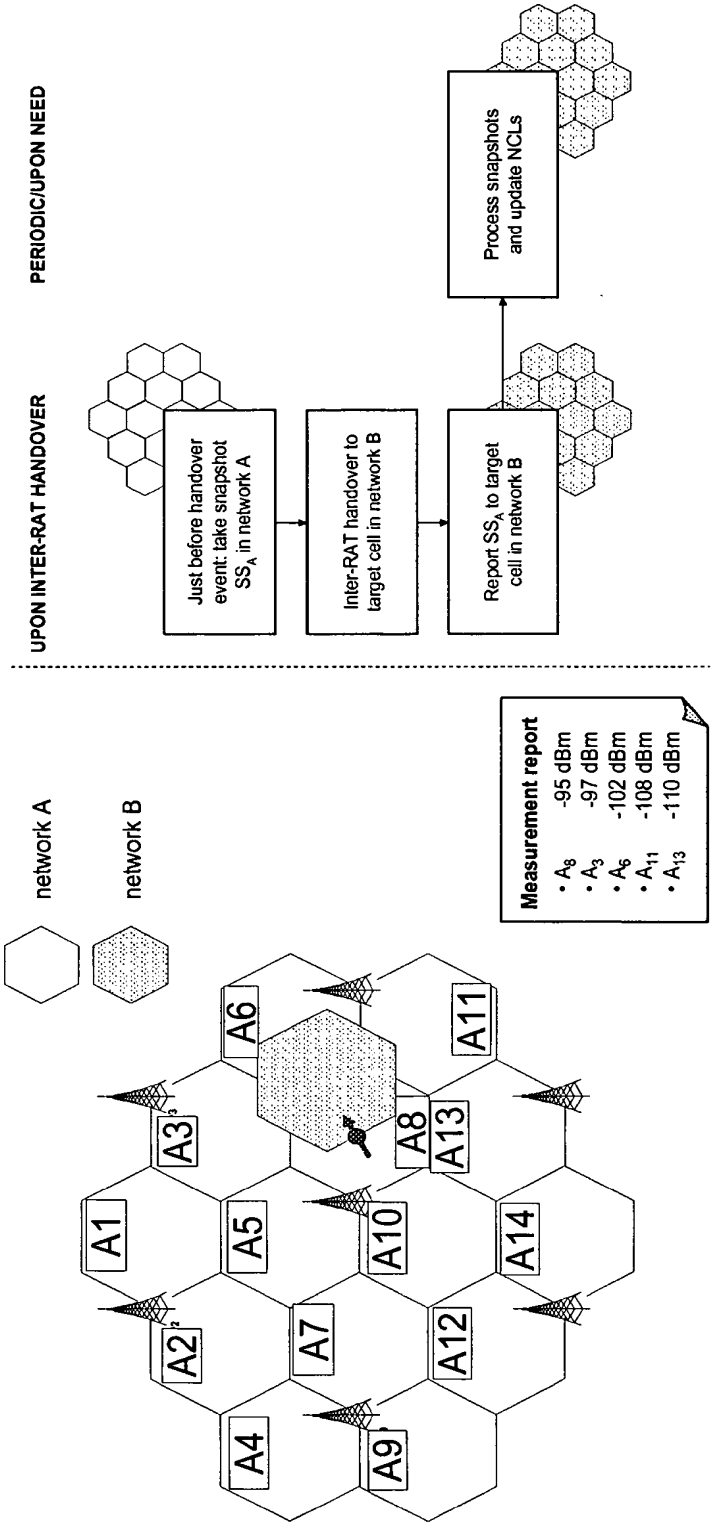


FIG. 3A

FIG. 3B

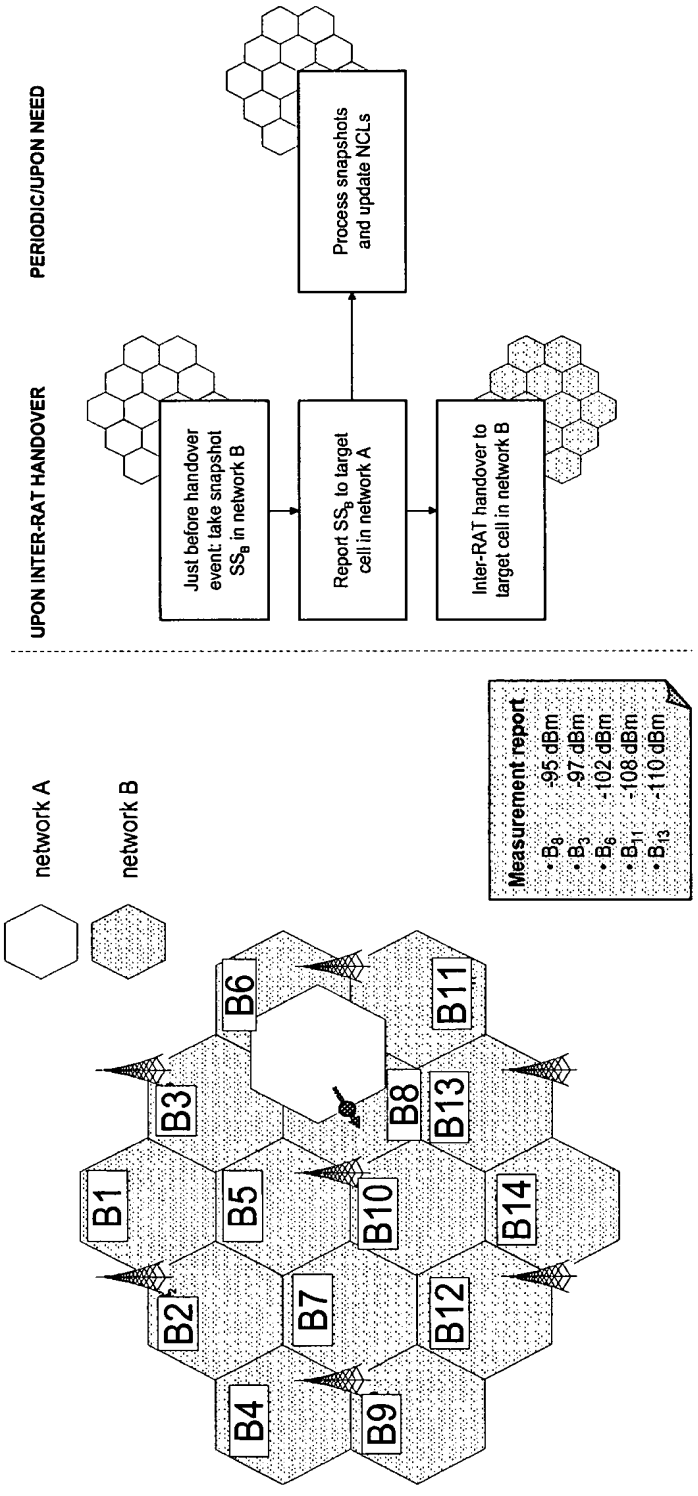

PERIODIC/UPON NEED
Process snapshots and update NCLs
UPON INTER-RAT HANDOVER
Just before handover event: take snapshot SS_B in network B
Report SS_B to target cell in network A
Inter-RAT handover to target cell in network B
Measurement report
• B_8 -95 dBm
• B_3 -97 dBm
• B_6 -102 dBm
• B_{11} -108 dBm
• B_{13} -110 dBm
network A
network B
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
B14

FIG. 4B

FIG. 4A

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/064823

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W36/02 H04W24/10
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2009/119699 A2 (NEC CORP [JP]; SERRAVALLE FRANCESCA [GB]) 1 October 2009 (2009-10-01)	1,9,13
Y	page 7, line 28 - page 9, paragraph 15 page 12, paragraph 13 - page 13, paragraph 24 claims 1,75,76 figures 3,5,8,9,10	2-8, 10-12,14
Y	WO 2009/064716 A1 (QUALCOMM INC [US]; FLORE ORONZO [US]; GRILLI FRANCESCO [US]; CHAPONNIE) 22 May 2009 (2009-05-22) paragraph [0052] - paragraph [0056] paragraph [0062] - paragraph [0065]	2-8, 10-12,14

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 January 2011	24/01/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Patras, Paula Larisa

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2009/019319 A2 (NOKIA SIEMENS NETWORKS OY [FI]; CENTONZA ANGELO [GB]) 12 February 2009 (2009-02-12) * abstract page 7, line 15 - page 8, line 3 page 8, line 22 - page 9, line 20	1-14
A	WO 2009/045070 A2 (LG ELECTRONICS INC [KR]; PARK GI WON [KR]; KIM YONG HO [KR]; LEE JIN [) 9 April 2009 (2009-04-09) the whole document	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2010/064823

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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WO 2009045070 A2	09-04-2009	KR 20090034261 A	07-04-2009
		US 2010216474 A1	26-08-2010

S/N Unknown **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: OOSTVEEN, Job Cornelis et al.	Examiner: Unknown
Serial No.: Unknown	Group Art Unit: Unknown
Filed: Concurrently herewith	Docket No.: US17827
Customer No.: 90057	Confirmation No.: Unknown
Title: SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE	

MAIL STOP: AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Dear Sir:

In compliance with the duty imposed by 37 C.F.R. § 1.56, and in accordance with 37 C.F.R. §§ 1.97 *et. seq.*, the enclosed materials are brought to the attention of the Examiner for consideration in connection with the above-captioned patent application. Applicants respectfully request that this Information Disclosure Statement be entered and the documents listed on the attached PTO SB/08a Form be considered by the Examiner and made of record. Pursuant to the provisions of MPEP 609, Applicants request that a copy of the PTO SB/08a Form, initialed as being considered by the Examiner, be returned to the Applicants with the next official communication.

Although Applicants believe that no additional fees are due in connection with this submission, the Commissioner is hereby authorized to charge any fees or deficiencies associated with this submission, or credit any overpayment to Deposit Account No. 50-5047.

Pursuant to 37 C.F.R. § 1.98(a)(2), copies of cited U.S. Patents and Published Applications, and Non-Published Applications identifiable by USPTO Serial Number, are no longer required to be provided to the Office. Applicants acknowledge the requirement to submit copies of foreign patent documents and non-

patent literature in accordance with 37 C.F.R § 1.98(a)(2). Copies of foreign patent documents are enclosed. If any of the references were uncovered by an international or foreign search part of a counterpart application filed by the Applicants, then a copy of the search report is also enclosed.

The Examiner is invited to contact the Applicants' Representative at the telephone number indicated if there are any questions regarding this communication.

Respectfully submitted,

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Agent for Applicants

Date of Deposit: April 3d, 2012
This paper is being filed on the date indicated above using the USPTOs electronic filing system EFS-Web, and is addressed to The Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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18 March 2009 (18.03.2009)

(25) Filing Language: English

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(30) Priority Data:
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(72) Inventor; and
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(74) Agents: **IKEDA, Noriyasu** et al.; Hibiya Daibiru Bldg., 2-2, Uchisaiwaicho 1-chome, Chiyoda-ku, Tokyo 1000011 (JP).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, 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, LY, MA, MD, ME, 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, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

(54) **Title**: INTER-NETWORK HANDOVER SYSTEM AND METHOD

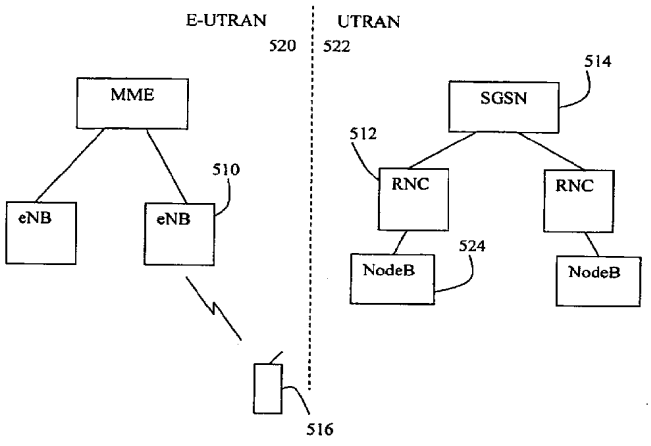


Figure 5

(57) **Abstract**: There is described a method of facilitating handover of a user device between a source base station component in a first communications network of a first network type and a target base station component in a second communications network of a second network type. The method includes determining an identifier of at least one target gateway component connected to the target base station component in the second communications network. A handover request message is then generated in the first communications network, the handover request message incorporating the identifier of the at least one target gateway component. The handover request message is then transmitted to the second communications network. Apparatus for performing this and other related methods is also described, for example eNodeB, gateway and user device components.

WO 2009/119699 A2

DESCRIPTION

INTER-NETWORK HANDOVER SYSTEM AND METHOD

TECHNICAL FIELD:

The present invention relates to connections in communications networks, particularly but not exclusively networks operating according to the 3GPP standards or equivalents or derivatives thereof.

BACKGROUND ART:

As the requirements and operation of communications systems have changed, several different types of telecommunications networks have been developed. One type of network is a Universal Terrestrial Radio Access Network (UTRAN). In addition, Evolved-UTRAN or E-UTRAN networks are being developed based on UTRAN, but with increased flexibility, simplified architecture and other advantages for users and service providers. Some items of user equipment (UE) are able to connect both to UTRAN and to E-UTRAN networks. Therefore, it is desirable if the different network types interwork. In particular, it would be advantageous if components of one network type could perform handover of a UE to components of another network type.

DISCLOSURE OF INVENTION:

According to one aspect, there is provided a method of facilitating handover of a user device between a source base station component in a first communications network of a first network type and a target base station component in a second communications network of a second network type, the method comprising:

determining a gateway identifier of at least one target gateway

component connected to the target base station component in the second communications network;

generating a handover request message in the first communications network, the handover request message incorporating the gateway identifier of the at least one target gateway component; and

transmitting the handover request message to the second communications network.

Hence handover of the user device from the network of the first type to the network of the second type is enabled by the source base station component addressing the target gateway component using the gateway identifier.

According to a further aspect, there is provided a method of operating a gateway device in a second communications network of a first type, the method comprising:

receiving a first handover request message from a source base station component;

extracting a cell identifier from the handover request message;

obtaining an identifier of a target base station component based on the cell identifier; and

generating a second handover request message and forwarding the second handover request message to the target base station component.

This aspect advantageously enables a gateway device of a target network, such as a target SGSN, to handle handover of a UE from a source base station component to a target base station component without the source base station component having to be aware of an identifier for the target base station component.

According to a further aspect, there is provided a method of operating a user device in a first communications network, the method comprising:

receiving a request from a base station component of the first communications network for information relating to a cell in a second communications network;

obtaining a cell identifier of the cell in the second communications network;

obtaining an identifier of a gateway component associated with the cell in the second communications network; and

transmitting the cell identifier and the identifier of the gateway component to the base station component of the first communications network.

The present aspect may enable a user device to obtain the necessary information to enable handover of the user device from a component in a network of a first type to a component in a network of a second type.

According to a further aspect, there is provided a method of operating a user device in a first communications network, the method comprising:

receiving a request from a first base station component of the first communications network for information relating to a cell in a second communications network;

obtaining a cell identifier of the cell in the second communications network;

obtaining an identifier of a second base station component associated with the cell in the second communications network; and

transmitting the cell identifier and the identifier of the second base station component to the first base station component of the first communications network.

In the present aspect, the user device may therefore obtain all of the information necessary to facilitate handover of the user device to the second network. In particular, the identifier of the second base station component to which the user device is being handed over.

According to a further aspect, there is provided a method of operating a first base station component in a first communications network, the method

comprising:

transmitting a request to a user device operating in the first communications network for information relating to a cell in a second communications network;

receiving a cell identifier of the cell in the second communications network; and

obtaining an identifier of a second base station component associated with the cell in the second communications network.

This aspect enables a base station component to obtain information necessary for handover of a UE to a component in a second network without any changes or additional steps being taken in the UE.

The various acronyms applicable in the telecommunications network will of course be familiar to those skilled in the art, but a glossary is appended for the benefit of lay readers. Although for efficiency of understanding for those of skill in the art the invention will be described in detail in the context of a E-UTRAN and UTRAN system, the principles of the identifier system can be applied to other systems, e.g. 3G, CDMA or other wireless systems in which base station components, such as eNodeB components, communicate with each other or with other devices, such as gateway devices, in the telecommunications network, with the corresponding elements of the system changed as required. The present methods and systems may also be implemented in wireless local area networks (WLANs) or other local or wide area networks (LANs or WANs).

Aspects of the invention are set out in the independent claims. Preferred features of the aspects are set out in the dependent claims. The invention provides, for all methods disclosed, corresponding computer programs or computer program products for execution on corresponding equipment, the equipment itself (user equipment, nodes, networks or

components thereof, including gateway and base station nodes for carrying out the methods described) and methods of configuring and updating the equipment. Features of one aspect may be applied to other aspects.

Exemplary embodiments of the systems and methods described herein will now be described in more detail with reference to the accompanying figures in which:

BRIEF DESCRIPTION OF THE DRAWINGS:

Figure 1 is a schematic diagram of a portion of a E-UTRAN network;

Figure 2 is a schematic diagram of a portion of a UTRAN network;

Figure 3 illustrates an Automatic Neighbour Relation process;

Figure 4 is a schematic illustration of a Global Cell Identity message;

Figure 5 illustrates an Inter-RAT handover according to one embodiment;

Figure 6 illustrates a relationship between Location Areas and SGSN serving areas;

Figure 7 is a schematic diagram of an Iu Flex scenario;

Figure 8 is a block diagram illustrating the main components of one of the base stations shown in Figure 1;

Figure 9 is a block diagram illustrating the main components of one of the mobile telephones shown in Figure 1; and

Figure 10 is a block diagram illustrating the main components of one of the gateways shown in Figure 2.

BEST MODE FOR CARRYING OUT THE INVENTION:

The following description sets out a number of specific exemplary embodiments of the method and system claimed herein. It will be clear to one skilled in the art that variations of the features and method steps may be

provided and that many of the features described are not essential to the invention.

Figure 1 schematically illustrates a mobile (cellular) telecommunication system 1 according to the E-UTRAN protocol in which users of mobile (or cellular) telephones (MT) 3-0, 3-1, and 3-2 (which may be termed user devices or user equipment (UE)) can communicate with other users (not shown) via one of the base stations 5-1, 5-2 or 5-3 (which may be termed eNodeBs or eNBs) and a telephone network 7 or Core Network (CN). The telephone network 7 includes a plurality of components including gateway components 9-1, 9-2, in one exemplary embodiment MMEs. It will be appreciated by the skilled person that the each base station 5-1, 5-2, 5-3 may connect to the telephone network 7 via either gateway 9-1, 9-2 and that all base stations 5-1, 5-2, 5-3 may connect via the same gateway 9-1, 9-2. Similarly, each mobile telephone 3 may connect to the telephone network 7 via either base station 5 and that all mobile telephones 3 may connect via the same base station 5.

When a mobile telephone 3 enters the network 7, for example by being switched on, a connection is established between the mobile telephone 3 and a base station 5 and between the base station 5 and a gateway device 9. This enables communication between the mobile telephone 3 and other components in the network 7.

Also, when a mobile telephone 3 moves from the cell of a source base station (e.g. base station 5-1) to a target base station (e.g. base station 5-2), a handover procedure (protocol) is carried out in the source and target base stations 5 and in the mobile telephone 3, to control the handover process. The handover is enabled by the establishment of a connection between the source and target base stations 5. As part of the handover process, the gateway device 9-1, 9-2 via which communications from a mobile telephone 3 are transmitted to the telephone network may change. Alternatively, the gateway

device 9-1, 9-2 through which communications are transmitted may remain the same, but the base station 5-1, 5-2 to which the mobile device is connected may change. These transfers are also enabled by the establishment of connections between the base stations 5 and the gateways 9.

An E-UTRAN protocol network may also be termed an LTE or Long Term Evolution of UTRAN network.

Figure 2 schematically illustrates a mobile (cellular) telecommunication system 2 according to the UTRAN protocol in which users of mobile (or cellular) telephones (MT) 210-1, 210-2 and 210-3 (which may be termed user devices or user equipment (UE)) can communicate with other users (not shown) via one of the base stations 212-1, 212-2 and 212-3 (which may be termed NodeBs or NBs). Each of the base stations is associated with a network controller 214-1, 214-2, or RNC (Radio Network Controller), which is then connected to a telephone network 218 or Core Network (CN). The telephone network 218 includes a plurality of components including gateway components 216-1, 216-2, in one embodiment SGSNs.

In a UTRAN network, handover of UEs may also be performed between base stations. The handover of a UE between base stations in a UTRAN network may also involve a handover between controllers in the network and a handover between gateway components in the network.

A UTRAN protocol network may also be referred to as a UMTS network (Universal Mobile Telecommunications System network).

Each type of telecommunications network may be termed a Radio Access Technology (RAT).

One skilled in the art will appreciate that each type of network may include fewer or additional network components and Figures 1 and 2 are not intended to be limiting in any way.

One exemplary embodiment of the Automatic Neighbour Relation

(ANR) function will now be described with reference to Fig. 3. This process enables a base station, such as an eNB in an LTE network, to discover information relating to neighbour cells. In a situation where different types of networks overlap, ANR enables an eNB to look for neighbour cells using different Radio Access Technologies (RATs) or different frequencies.

As illustrated in Fig. 3, a first base station 310 in an LTE network may use the process to determine whether there are other neighbouring base stations in the area, for example base stations that are part of other types of networks.

The base station 310 sends a Report Neighbour Request message 316 to a user device (UE) 314 that is connected to the base station 310, requesting that the UE 314 reports the presence of any neighbouring base stations to the first base station 310.

The UE 314 sends a Report Neighbour Response message 318 to the first base station 310 reporting the presence of a second base station 312, which is part of a different type of network, in this case a UTRAN network. The response message 318 includes information relating to the second base station 312, such as the signal level from the second base station and the Physical-layer Cell Identity (Phy-CID) of the base station 312.

The first base station 310 may then request further information about the second base station 312 by sending a Report Global Cell Identity (Global-CID) Request 320 to the UE 314, identifying the second base station using the Phy-CID supplied in the Report Neighbour Response message 318.

The UE 314 obtains the Global-CID information 322 from the second base station 312 and reports this information back to the first base station 310 using a Report Global-CID message 324.

The first base station 310 then updates its Inter-Radio Access Technology (Inter-RAT) neighbour relation list, which it maintains in memory, to

store details of the new neighbour node.

The UE 314 obtains the Global-CID information from the second base station from a Global-CID message 400 that the second base station broadcasts from time to time. One example of a Global-CID message 400 is illustrated in Fig. 4. The message includes information locating the cell to which it relates. In particular, the Mobile Country Code (MCC) 410, which identifies the country of the cell, the Mobile Network Code (MNC) 412, which identifies the carrier or network operator associated with the cell, and the Location Area Code (LAC) 414, which identifies a group of cells within the network. This information together forms the Location Area Identification (LAI) 420. The Global-CID message 400 further includes the Cell Identity (CI) 416. As noted above, the Global-CID information is broadcast in each cell.

A specific example of how a source eNB 510 in a E-UTRAN or LTE network 520 performs handover of a UE 516 to a NodeB 524 and RNC 512 in a UTRAN network 522 is set out below with reference to Figure 5.

As set out above, the eNB 510 in the E-UTRAN network 520 determines the existence of a cell in a UTRAN network 522 via the UE 516 using the ANR method described above. The eNB 510 obtains and stores information provided in the Global-CID of the UTRAN cell.

In order for the source eNB 510 to hand over the UE 516 to the UTRAN target RNC 512, the eNB 510 needs to address the SGSN 514 associated with the target cell and, in some embodiments as described in more detail below, to provide information for the SGSN to address the target RNC. However, the Global-CID does not contain sufficient information to enable the source eNB 510 to address the target SGSN 514.

In order to address the target SGSN 514, the MCC and MNC (which together form the Public Land Mobile Network (PLMN) ID), and the LAC are required and these can be obtained from the Global-CID. However, to address

the target SGSN 514, the source eNB 510 also needs the Routing Area Code (RAC) associated with the target SGSN 514. This additional information is needed since one location area (identified by the LAC) may cover more than one SGSN service area, as illustrated in Figure 6.

Figure 6 illustrates the situation in which a plurality of SGSNs service a single location area. For example RNC3 614, serviced by SGSN1 610 and RNC1 616 serviced by SGSN2 612 are within the same location area, LA1 618. Therefore an LAC identifying LA1 618 would not uniquely identify an SGSN, since SGSN1 610 and SGSN2 612 are both within LA1. However, the RAC is not included in the Global-CID obtained by the UE.

In the present exemplary embodiment, therefore, the UE 516 is arranged to obtain the RAC of the target cell and report this information to the source eNB 510 together with the Global-CID. In order to obtain the RAC, the UE 516 reads the RAC from the core network (CN) system information in the System Information Block 1 (SIB 1). SIB 1 is one of a number of system information blocks broadcast by the target cell in order to provide information about the target cell.

The UE 516 is preferably pre-programmed, on receipt of a "Report Global-CID Request" message from a source eNB 510, to obtain both the Global-CID information and the RAC from information periodically broadcast by UTRAN cell.

In an alternative embodiment, the source eNB 510 may specifically request the UE 516 to obtain the RAC, either in the Report Global-CID request message or as a separate message.

The source eNB 510 can then use the RAC obtained by the UE 516 to address the target SGSN 514, enabling the handover of the UE 516 to the target SGSN 514. It is noted that the source eNB 510 also needs to use information from the Global-CID, in particular the LAI, to address the target

SGSN in addition to the RAC.

With reference to Figure 7, in an Iu Flex network, in which a many-to-many relationship between SGSNs and RNCs is permitted within a pool area, a single RNC 710 may be served by more than one SGSN, e.g. SGSNs 712 and 714. Therefore the RAC no longer necessarily identifies a single SGSN. In this embodiment, preferably the RAC is assumed to address the default SGSN within the pool area, for example SGSN 712 in Figure 7.

It is not currently proposed but it is possible, in some implementations, that the Network Resource Identifier (NRI) could be used to uniquely identify a particular SGSN in the pool area.

Turning again to Figure 5, once the source eNB 510 has addressed the target SGSN 514, according to the current UMTS specification, the target SGSN 514 addresses the target RNC 512. That is, the target SGSN 514 forwards the Relocation Request to the target RNC 512 according to the RNC identifier received from the source system. However, in the case of Inter-RAT handover, the source eNB 510 does not know the identifier of the target RNC 512.

In one exemplary embodiment, the routing information in the target SGSN 514 is changed to enable the target SGSN 514 to address the target RNC 512 based on the Global-CID. The Global-CID is sent from the source eNB 510 to the target SGSN 514. The target SGSN 514 is arranged to store the structure of the Radio Access Network (RAN) and a mapping between the Global-CID and the RNC identifier. Hence the target SGSN 514 can address the target RNC 512 based on the Global-CID. The mapping between the Global-CID and the RNC identifier may be stored internally or the SGSN may query an external database, such as a Domain Name Server (DNS) to obtain the target RNC identifier.

In an alternative exemplary embodiment, the UTRAN network may be

changed so that, together with the Global-CID, the RNC identifier of the target cell is also broadcast. The UE 516 would then report the identifier of the target RNC 512 to the source eNB 510 with the Global-CID when the cell is detected. Hence the source eNB 510 can address the target SGSN 514 and provide the identifier of the target RNC 512 in the Handover Request message.

Alternatively, the source eNB 510 may be configured to query a lookup table using the Global-CID, which will then return the corresponding RNC identifier. This may then be transmitted to the target SGSN 514 as set out above.

Advantageously, the present systems and methods described my enable handover from LTE to UMTS networks without requiring pre-configuration in the source eNB of the LTE network.

Figure 8 is a block diagram illustrating the main components of one of the base stations 5 shown in Figure 1 and used in an exemplary embodiment of the invention. As shown, the base station 5 includes a transceiver circuit 21 which is operable to transmit signals to and to receive signals from the mobile telephones 3 via one or more antennae 23 and which is operable to transmit signals to and to receive signals from the telephone network 7 via a network interface 25. The operation of the transceiver circuit 21 is controlled by a controller 27 in accordance with software stored in memory 29. The software includes, among other things, an operating system 31, an Identifier Management Module 33 and a Handover Module 35. The Identifier Management Module 33 is operable for requesting information relating to identifiers of target gateway and base station components and of storing, processing and managing this information. As shown in Figure 3, the software also includes a Handover module 35 for generating and transmitting handover requests based on the identifier information.

Figure 9 is a block diagram illustrating the main components of one of

the mobile telephones shown in Figure 1 according to one exemplary embodiment. As shown, the mobile telephones 3 include a transceiver circuit 71 which is operable to transmit signals to and to receive signals from the base station 5 via one or more antennae 73. As shown, the mobile telephone 3 also includes a controller 75 which controls the operation of the mobile telephone 3 and which is connected to the transceiver circuit 71 and to a loudspeaker 77, a microphone 79, a display 81, and a keypad 83. The controller 75 operates in accordance with software instructions stored within memory 85. As shown, these software instructions include, among other things, an operating system 87 and an Identifier Request Module 89. The identifier request module 89 is operable to request identifiers, such as Global-CID and RAC identifier and manage the transmission of this information to base station components in the network.

Figure 10 is a block diagram illustrating the main components of each of the gateway components 9 used in this exemplary embodiment. As shown, each gateway 9 includes a transceiver circuit 41, which is operable to transmit signals to and to receive signals from at least controller 214-1 via a base station interface 43 and which is operable to transmit signals to and receive signals from the rest of the telephone network 7 via a network interface 45. A controller 47 controls the operation of the transceiver circuit 41 in accordance with software stored in memory 49. The software includes, among other things, an operating system 51, an identifier management module 53 for obtaining and handling identifiers of target base stations and a handover module 55 for receiving and handling handover requests.

In the above description, the base stations 5, the gateways 9 and the mobile telephones 3 are described for ease of understanding as having respective discrete modules which operate according to the methods described herein. Whilst the features may be provided in this way for certain applications,

for example where an existing system has been modified to implement the invention, in other applications, for example in systems designed with the inventive features in mind from the outset, these features may be built into the overall operating system or code and so the modules described above may not be discernable as discrete entities.

Hence, Inter-RAT handover of UEs may be achieved using the systems and methods described above.

While the invention has been particularly shown and described with reference to exemplary embodiments thereof, the invention is not limited to these embodiments. It will be understood by those ordinary skill in the art that various changes in form and details may be made therein without departing from the sprit and scope of the present invention as defined by the claims.

Glossary of 3GPP terms

LTE - Long Term Evolution (of UTRAN)

eNodeB - E-UTRAN Node B

AGW - Access Gateway

UE - User Equipment - mobile communication device

DL - downlink - link from base to mobile

UL - uplink - link from mobile to base

AM - Acknowledge Mode

UM - Unacknowledge Mode

MME - Mobility Management Entity

UPE - User Plane Entity

CN - Core Network

HO - Handover

RAN - Radio Access Network

RANAP - Radio Access Network Application Protocol

RLC - Radio Link Control

RNC - Radio Network Controller

RRC - Radio Resource Control

RRM - Radio Resource Management

SDU - Service Data Unit

SRNC - Serving Radio Network Controller

PDU - Protocol Data Unit

NAS - Non Access Stratum

ROHC - Robust Header Compresion

TA - Tracking Area

U-plane or UP - User Plane

TNL - Transport Network Layer

S1 Interface - Interface between Access Gateway and eNodeB

X2 Interface - Interface between two eNodeBs

MMEs / SAE Gateway - Access Gateway having both MME and UPE entities

Global-CID - Global Cell Identity

SGSN - Serving GPRS Support Node

LAC - Location Area Code

RAC - Routing Area Code

The following is a detailed description of the way in which the present inventions may be implemented in the currently proposed 3GPP LTE standard. Whilst various features are described as being essential or necessary, this may only be the case for the proposed 3GPP LTE standard, for example due to other requirements imposed by the standard. These statements should not, therefore, be construed as limiting the present invention in any way.

Title: Inter-RAT ANR enhancement: Target Node Addressing in UTRAN

1 Introduction

In the last RAN3 meeting, stage 2 specifications have been updated in order to include the ANR IRAT functionality.

This proposal focuses to the LTE-UTRAN scenario. In particular this contribution proposes necessary enhancement to the functionality to allow the addressing of the target node in the target node in UTRAN.

2 RAN3 current status

Below is a summary of the ANR IRAT, illustrated in Figure 3:

- The eNB instructs the UE to look for neighbor cells in the target RATs/frequencies
- The UE reports the Phy-CID of the detected cells in the target RATs/frequencies. The Phy-CID is defined by the Primary Scrambling Code (PSC) in case of UTRAN FDD cell, by the cell parameter ID in case of UTRAN TDD cell and by the BSIC in case of GERAN cell
- The eNB instructs the UE, to read the Global-CID of the detected neighbour cell in the target RAT/frequency. It is FFS how this is achieved
- The UE reports the detected Global-CID to the serving cell eNB
- The eNB updates its inter-RAT/frequency neighbour relation list.

2.1 Discussion

Execution of the IRAT HO involves addressing the target node. This issue can be split into two main issues:

- Addressing the target SGSN
- Addressing the target RNC.

The only information the eNB knows about the target system is the Global cell id of the reported cell.

According to [1], Global cell id or Global cell definition is defined as illustrated in Figure 4.

As explained below, this information is not enough for the source eNB

to address the target node in UTRAN.

2.1.1 Target SGSN Addressing

Following information are needed to address the target SGSN

- PLMN id (MCC and MNC)
- LAC
- RAC

RAC is needed since one Location Area may cover more than one SGSN service area (see below).

Figure 6 illustrates Location Area and SGSN Serving Area

Proposal 1: UE should report the RAC of the target cell together with the target Global cell id. UE will read the RAC from the CN system information in the SIB 1.

In case of Iu Flex, the target RNC will be connected to all the SGSN in the pool area, i.e. same RAC may be served by more than one SGSN. In this case, the target SGSN is addressed as follow:

- Together with the PLMN id, LAC and RAC, also the NRI is needed to identify the target SGSN
- The NRI is used to identify the SGSN in a pool area

Figure 7 illustrates a possible Iu flex scenario

Proposal 2: no use of NRI will be made from the source system in order to address the target SGSN in a pool area i.e. always the default SGSN will be addressed.

2.1.2 Target RNC Addressing

According to the current UMTS specification, target SGSN address the target RNC e.g. forward the Relocation Request to the target RNC according to the RNC id received from the source system.

In the case of IRAT ANR, the source eNB does not know the target RNC id. In order to allow the addressing of the target RCN, following proposals

are listed:

- Proposal 3:
  - Changing the routing information in the SGSN in order to allow the RNC to be addressed by means of Global cell id. As a consequence:
    - Global cell id to be send to the target SGSN
    - SGSN should either know the structure of cells in the RAN and store the mapping Global cell id-RNC id or querying the DNS to get it.
- Proposal 4
  - Change the System information in UTRAN so that the RNC id is also broadcasted. The UE would then reports the RNC id to the source eNB whenever the cell is detected
- Proposal 5
  - Query a look up table with the Global cell id in order to get the RNC id back which will then be informed to the target SGSN

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3 Conclusion

In this contribution we propose to enhance the IRAT ANR in order to allow the target node in UTRAN to be addressed.

It is proposed to discuss the contribution and agree on the proposals in section 2. NEC is available to prepare the necessary CRs to update the stage 2 specification accordingly.

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4 Reference

[1] 23.003: Technical Specification Group Core Network and Terminals; Numbering, addressing and identification

This application is based upon and claims the benefit of priority from

United Kingdom patent application No. 0805436.3, filed on March 25, 2008, the disclosure of which is incorporated herein in its entirety by reference.

CLAIMS

1. A method of facilitating handover of a user device between a source base station component in a first communications network of a first network type and a target base station component in a second communications network of a second network type, the method comprising:

determining an identifier of at least one target gateway component connected to the target base station component in the second communications network;

generating a handover request message in the first communications network, the handover request message incorporating the identifier of the at least one target gateway component; and

transmitting the handover request message to the second communications network.

2. A method according to Claim 1 wherein determining an identifier of the target gateway component comprises receiving the identifier from the user device.

3. A method according to Claim 1 or 2 further comprising sending a request message to the user device to request that the user device obtain identification information relating to the target gateway component.

4. A method according to Claim 2 or 3 wherein the user device extracts the identifier of the target gateway component from system information broadcast by the second communications network.

5. A method according to any of Claims 1 to 4 further comprising receiving

from the user device a cell identifier of a cell in the second communications network, the cell being associated with the target base station component.

6. A method according to any of Claims 1 to 5 wherein the handover request message further includes an identifier of the target base station component.

7. A method according to Claim 6 further comprising obtaining the identifier of the target base station component.

8. A method according to Claim 7 wherein obtaining the identifier of the target base station component comprises receiving from the user device an identifier of a cell in the second communications network and performing a lookup in a lookup table of the identifier of the target base station component.

9. A method according to Claim 7 wherein obtaining the identifier of the target base station component comprises receiving an identifier of the target base station component from the user device.

10. A method according to any of Claims 1 to 9 wherein the first network type comprises E-UTRAN.

11. A method according to any of Claims 1 to 10 wherein the second network type comprises UTRAN.

12. A method according to any of Claims 1 to 10 wherein the second network type comprises GERAN.

13. A method according to of Claims 1 to 12 further comprising:

receiving the handover request message at the gateway component in the second communications network;

extracting a cell identifier from the handover request message;

obtaining an identifier of a target base station component based on the cell identifier; and

generating a second handover request message and forwarding the second handover request message to the target base station component.

14. A method according to any of Claims 1 to 13 wherein the identifier of the at least one target gateway component identifies a group of gateway components in the second communications network.

15. A method according to Claim 13 wherein the user device is assigned to a target gateway component in the group of gateway components by the second communications network.

16. Apparatus for facilitating a handover of a user device from a source base station component in a first communications network of a first network type to a target base station component in a second communications network of a second network type, the apparatus comprising:

means for determining an identifier of at least one target gateway component connected to the target base station component in the second communications network;

means for generating a handover request message in the first communications network, the handover request message incorporating the identifier of the at least one target gateway component; and

means for transmitting the handover request message to the second

communications network.

17. Apparatus according to Claim 16 wherein the means for determining an identifier of the target gateway component comprises means for receiving the identifier from the user device.

18. Apparatus according to Claim 16 or 17 further comprising means for sending a request message to the user device to request that the user device obtain identification information relating to the target gateway component.

19. Apparatus according to any of Claims 16 to 18 further comprising means for receiving from the user device a cell identifier of a cell in the second communications network, the cell being associated with the target base station component.

20. Apparatus according to any of Claims 16 to 19 wherein the handover request message further includes an identifier of the target base station component.

21. Apparatus according to any of Claims 16 to 20 further comprising means for obtaining the identifier of the target base station component.

22. Apparatus according to any of Claims 16 to 21 wherein the means for obtaining the identifier of the target base station component comprises:

means for receiving from the user device an identifier of a cell in the second communications network; and

means for performing a lookup in a lookup table of the identifier of the target base station component.

23. Apparatus according to any of Claims 16 to 22 wherein the means for obtaining the identifier of the target base station component comprises means for receiving an identifier of the target base station component from the user device.

24. Apparatus according to any of Claims 16 to 23 wherein the first network type comprises E-UTRAN.

25. Apparatus according to any of Claims 16 to 24 wherein the second network type comprises UTRAN.

26. Apparatus according to any of Claims 16 to 24 wherein the second network type comprises GERAN.

27. Apparatus according to any of Claims 16 to 26 further comprising:

means for receiving the handover request message at the gateway component in the second communications network;

means for extracting a cell identifier from the handover request message;

means for obtaining an identifier of a target base station component based on the cell identifier; and

means for generating a second handover request message and forwarding the second handover request message to the target base station component.

28. Apparatus for facilitating a handover of a user device from a source base station component in a first communications network of a first network type to a target base station component in a second communications network of a

second network type, the apparatus comprising:

a processor for determining an identifier of at least one target gateway component connected to the target base station component in the second communications network;

a processor for generating a handover request message in the first communications network, the handover request message incorporating the identifier of the at least one target gateway component; and

a transmitter for transmitting the handover request message to the second communications network.

29. Apparatus according to Claim 28 wherein the processor is further operable to extract the identifier of the target gateway component from a message received from the user device.

30. A method of operating a gateway device in a second communications network of a second type, the method comprising:

receiving a first handover request message from a source base station component;

extracting a cell identifier from the handover request message;

obtaining an identifier of a target base station component based on the cell identifier; and

generating a second handover request message and forwarding the second handover request message to the target base station component.

31. A method according to Claim 30 wherein the second communications network comprises a UTRAN network.

32. A method according to Claim 30 or 31 wherein the source base station

component comprises a base station component in a first communications network of a first type.

33. A method according to Claim 32 wherein the first communications network comprises an E-UTRAN network.

34. A method according to any of Claims 30 to 33 wherein obtaining an identifier of a target base station component comprises requesting the identifier of the target base station component from a database based on the extracted cell identifier.

35. A method according to any of Claims 28 to 32 further comprising storing a mapping of cell identifiers to identifiers of target base station components internally in a database in the gateway device.

36. A method according to Claim 35 wherein requesting comprises requesting the identifier of the target base station component from a database stored externally.

37. A method according to any of Claims 1 to 15 or 30 to 36 wherein the gateway device comprises a Serving GPRS Support Node (SGSN).

38. A method according to any of Claims 1 to 15 or 30 to 37 wherein the target base station component comprises a Radio Network Controller (RNC).

39. A gateway device operating in a second communications network of a second type, the gateway device comprising:

means for receiving a first handover request message from a source

base station component;

means for extracting a cell identifier from the handover request message;

means for obtaining an identifier of a target base station component based on the cell identifier;

means for generating a second handover request message; and

means for forwarding the second handover request message to the target base station component.

40. A gateway according to Claim 39 wherein the second communications network comprises a UTRAN network.

41. A gateway according to Claim 39 or 40 wherein the source base station component comprises a base station component in a first communications network of a first type.

42. A gateway according to Claim 41 wherein the first communications network comprises an E-UTRAN network.

43. A gateway according to any of Claims 39 to 42 wherein the means for obtaining an identifier of a target base station component comprises means for requesting the identifier of the target base station component from a database based on the extracted cell identifier.

44. A gateway according to any of Claims 39 to 43 further comprising means for storing a mapping of cell identifiers to identifiers of target base station components internally in a database in the gateway device.

45. A gateway according to any of Claims 39 to 43 further comprising means

for requesting the identifier of the target base station component from a database stored externally.

46. Apparatus according to any of Claims 16 to 27 or 39 to 45 wherein the gateway device comprises a Serving GPRS Support Node (SGSN).

47. Apparatus according to any of Claims 16 to 27 or 39 to 46 wherein the target base station component comprises a Radio Network Controller (RNC).

48. A gateway device operating in a second communications network of a second type, the gateway device comprising:

a receiver for receiving a first handover request message from a source base station component;

a processor for extracting a cell identifier from the handover request message;

a processor for obtaining an identifier of a target base station component based on the cell identifier;

a processor for generating a second handover request message; and

a transmitter for forwarding the second handover request message to the target base station component.

49. A method of operating a user device in a first communications network, the method comprising:

receiving a request from a base station component of the first communications network for information relating to a cell in a second communications network;

obtaining a cell identifier of the cell in the second communications network;

obtaining an identifier of a gateway component associated with the cell in the second communications network; and

transmitting the cell identifier and the identifier of the gateway component to the base station component of the first communications network.

50. A method according to Claim 49 wherein obtaining comprises receiving information broadcast by the cell in the second communications network.

51. A method according to Claim 49 or 50 wherein the cell identifier comprises a Global Cell Identity.

52. A method according to any of Claims 49 to 51 wherein the identifier of the gateway component comprises a Routing Area Code associated with the cell in the second communications network.

53. A method according to any of Claims 49 to 52 wherein the identifier of the gateway component comprises a Location Area Code associated with the cell in the second communications network.

54. A method according to any of Claims 49 to 53 wherein the identifier of the second gateway component comprises an SGSN identifier.

55. A method according to any of Claims 49 to 54 further comprising:

obtaining an identifier of a second base station component associated with the cell in the second communications network; and

transmitting the cell identifier and the identifier of the second base station component to the first base station component of the first communications network.

56. A user device operating in a first communications network, the user device comprising:

means for receiving a request from a base station component of the first communications network for information relating to a cell in a second communications network;

means for obtaining a cell identifier of the cell in the second communications network;

means for obtaining an identifier of a gateway component associated with the cell in the second communications network; and

means for transmitting the cell identifier and the identifier of the gateway component to the base station component of the first communications network.

57. A user device according to Claim 56 wherein the means for obtaining comprises means for receiving information broadcast by the cell in the second communications network.

58. A user device according to Claim 53 or 54 wherein the cell identifier comprises a Global Cell Identity.

59. A user device according to any of Claims 56 to 58 wherein the identifier of the gateway component comprises a Routing Area Code associated with the cell in the second communications network.

60. A user device according to any of Claims 56 to 59 wherein the identifier of the gateway component comprises a Location Area Code associated with the cell in the second communications network.

61. A user device according to any of Claims 56 to 60 wherein the identifier of the second gateway component comprises an SGSN identifier.

62. A user device according to any of Claims 56 to 61 further comprising:
means for obtaining an identifier of a second base station component associated with the cell in the second communications network; and
means for transmitting the cell identifier and the identifier of the second base station component to the first base station component of the first communications network.

63. A user device operating in a first communications network, the user device comprising:

a receiver for receiving a request from a base station component of the first communications network for information relating to a cell in a second communications network;

a processor for obtaining a cell identifier of the cell in the second communications network;

a processor for obtaining an identifier of a gateway component associated with the cell in the second communications network; and

a transmitter for transmitting the cell identifier and the identifier of the gateway component to the base station component of the first communications network.

64. A method of operating a user device in a first communications network, the method comprising:

receiving a request from a first base station component of the first communications network for information relating to a cell in a second communications network;

obtaining a cell identifier of the cell in the second communications network;

obtaining an identifier of a second base station component associated with the cell in the second communications network; and

transmitting the cell identifier and the identifier of the second base station component to the first base station component of the first communications network.

65. A method according to Claim 64 wherein obtaining a cell identifier and an identifier of a second base station component comprises receiving information broadcast by the cell in the second communications network.

66. A method according to Claim 64 or 65 wherein the cell identifier comprises a Global Cell Identity.

67. A method according to any of Claims 64 to 66 wherein the identifier of the second base station component comprises an Radio Network Controller identifier.

68. A method according to any of Claims 64 to 67 wherein obtaining an identifier of a second base station component comprises performing a lookup of the identifier of the second base station component based on the cell identifier.

69. A user device operating in a first communications network, the user device comprising:

means for receiving a request from a first base station component of a first communications network for information relating to a cell in a second communications network;

means for obtaining a cell identifier of the cell in the second communications network;

means for obtaining an identifier of a second base station component associated with the cell in the second communications network; and

means for transmitting the cell identifier and the identifier of the second base station component to the first base station component of the first communications network.

70. A user device according to 66 wherein the means for obtaining a cell identifier and the identifier of the second base station component comprises means for receiving information broadcast by the cell in the second communications network.

71. A user device according to Claim 69 or 70 wherein the cell identifier comprises a Global Cell Identity.

72. A user device according to any of Claims 69 to 71 wherein the identifier of the second base station component comprises an Radio Network Controller identifier.

73. A user device according to any of Claims 69 to 72 wherein the identifier of the gateway component comprises a Location Area Code associated with the cell in the second communications network.

74. A user device according to any of Claims 69 to 73 wherein the means for obtaining an identifier of a second base station component comprises means for performing a lookup of the identifier of the second base station component based on the cell identifier.

75. A user device operating in a first communications network, the user device comprising:

a receiver for receiving a request from a first base station component of a first communications network for information relating to a cell in a second communications network;

a processor for obtaining a cell identifier of the cell in the second communications network;

a processor for obtaining an identifier of a second base station component associated with the cell in the second communications network; and

a transmitter for transmitting the cell identifier and the identifier of the second base station component to the first base station component of the first communications network.

76. A method of operating a first base station component in a first communications network, the method comprising:

transmitting a request to a user device operating in the first communications network for information relating to a cell in a second communications network;

receiving a cell identifier of the cell in the second communications network; and

obtaining an identifier of a second base station component associated with the cell in the second communications network.

77. A method according to Claim 76 further comprising obtaining an identifier of a gateway component associated with the cell in the second communications network.

78. A method according to Claim 76 or 77 further comprising generating a handover request message comprising the identifier of the second base station component and transmitting the handover request message to a gateway component in the second communications network.

79. A method according to any of Claims 76 to 78 wherein obtaining an identifier of the second base station component comprises receiving the identifier from the user device operating in the first communications network.

80. A method according to any of Claims 76 to 79 wherein obtaining an identifier of the second base station component comprises performing a lookup of the identifier based on the cell identifier of the cell in the second communications network.

81. A base station component operating in a first communications network, the base station component comprising:

means for transmitting a request to a user device operating in the first communications network for information relating to a cell in a second communications network;

means for receiving a cell identifier of the cell in the second communications network; and

means for obtaining an identifier of a second base station component associated with the cell in the second communications network.

82. A base station component according to Claim 81 further comprising means for obtaining an identifier of a gateway component associated with the cell in the second communications network.

83. A base station component according to Claim 81 or 82 further comprising means for generating a handover request message comprising the cell identifier and the identifier of the second base station component and means for transmitting the handover request message to a gateway component in the second communications network.

84. A base station component according to any of Claims 81 to 83 wherein the means for obtaining an identifier of the second base station component comprises means for receiving the identifier from the user device operating in the first communications network.

85. A base station component operating in a first communications network, the base station component comprising:

a transmitter for transmitting a request to a user device operating in the first communications network for information relating to a cell in a second communications network;

a receiver for receiving a cell identifier of the cell in the second communications network; and

a processor for obtaining an identifier of a second base station component associated with the cell in the second communications network.

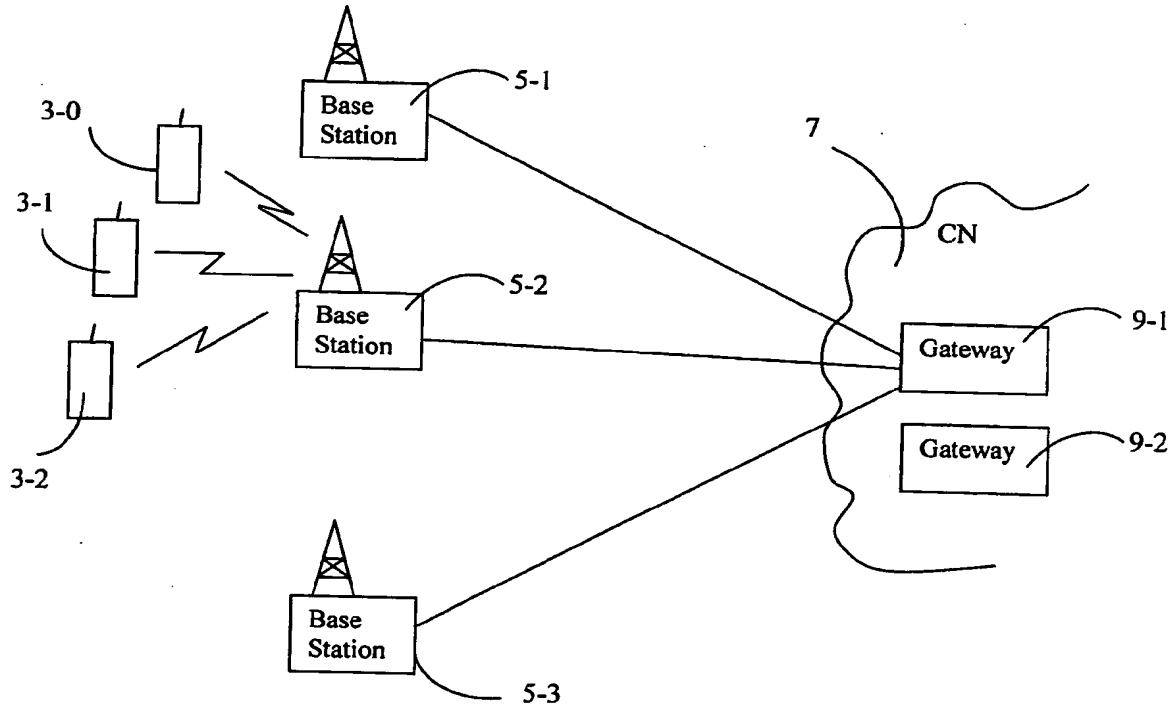

Base Station
5-1
3-0
3-1
3-2
Base Station
5-2
Base Station
5-3
7
CN
Gateway
9-1
Gateway
9-2

Figure 1

1

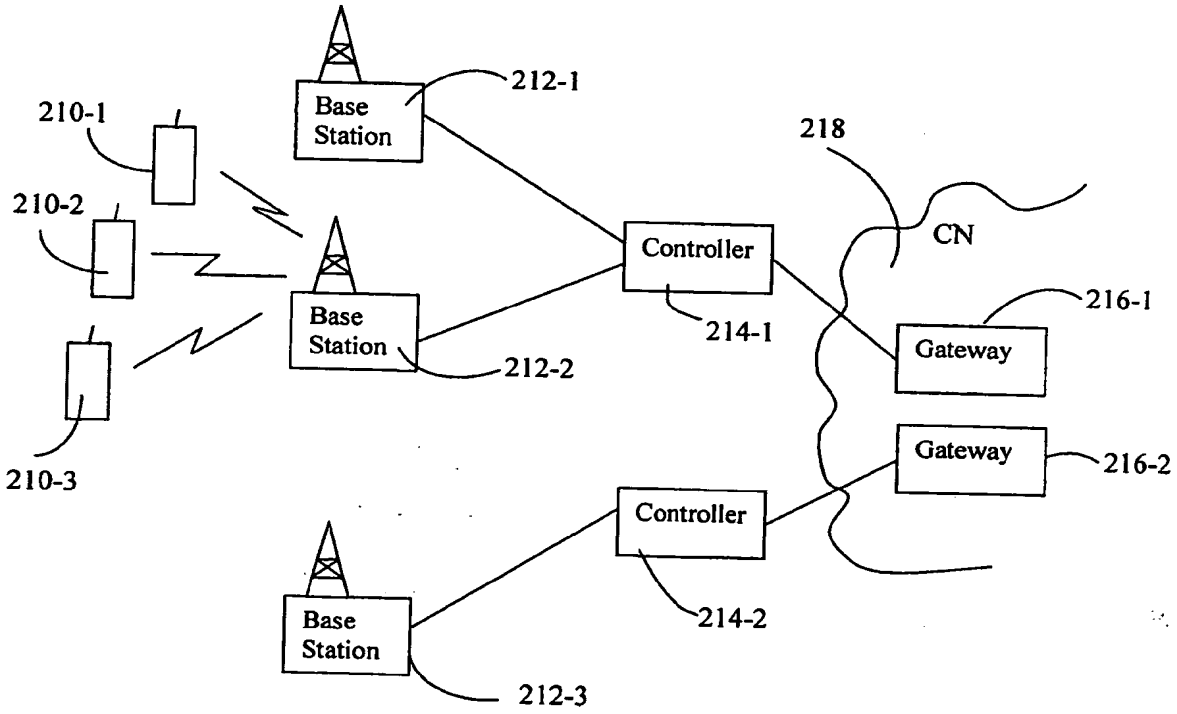

Base Station
212-1
210-1
210-2
Base Station
212-2
210-3
Controller
214-1
218
CN
216-1
Gateway
Gateway
216-2
Controller
214-2
Base Station
212-3

Figure 2

2

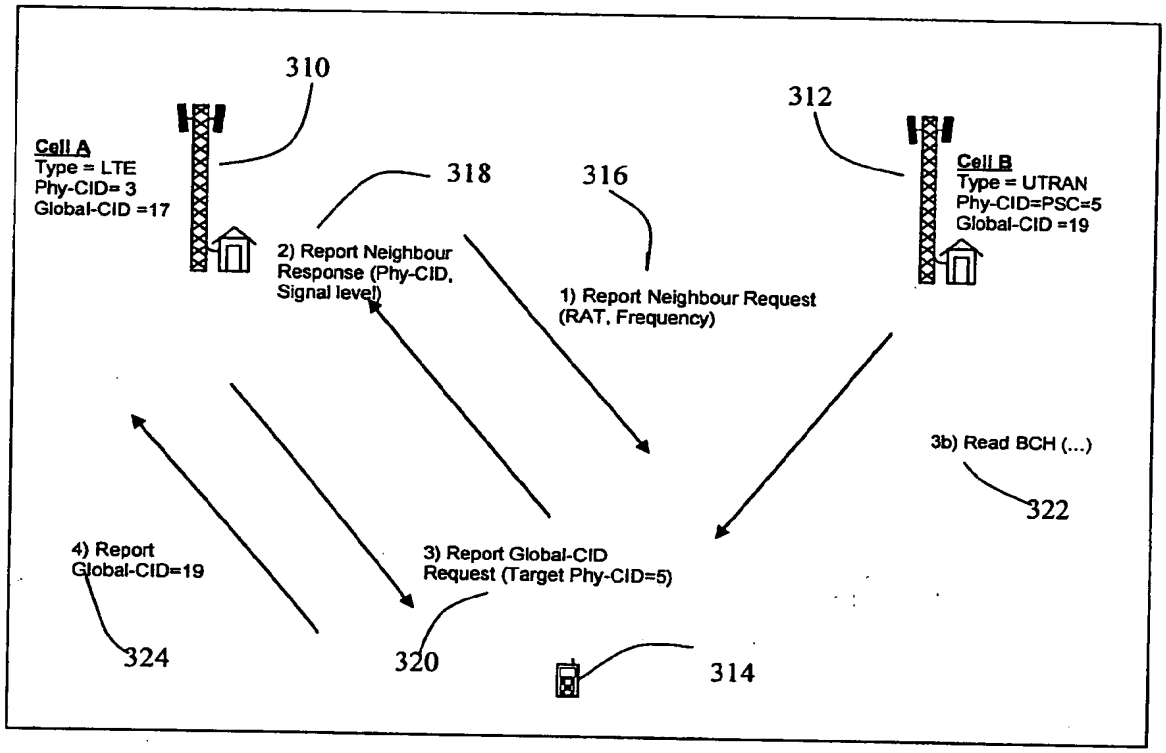

310
312
Cell A
Type = LTE
Phy-CID= 3
Global-CID =17
318
316
Cell B
Type = UTRAN
Phy-CID=PSC=5
Global-CID =19
2) Report Neighbour Response (Phy-CID, Signal level)
1) Report Neighbour Request (RAT, Frequency)
3b) Read BCH (...)
322
4) Report Global-CID=19
3) Report Global-CID Request (Target Phy-CID=5)
324
320
314

Figure 3

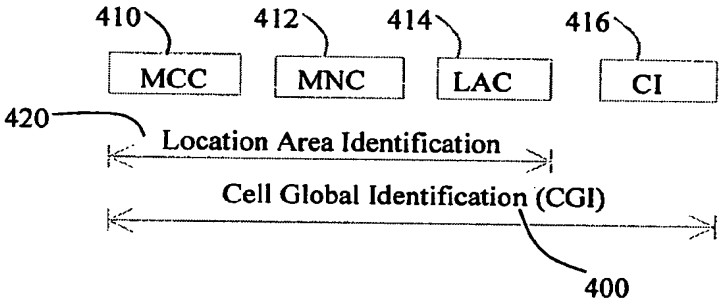

410
412
414
416
MCC
MNC
LAC
CI
420
Location Area Identification
Cell Global Identification (CGI)
400

Figure 4

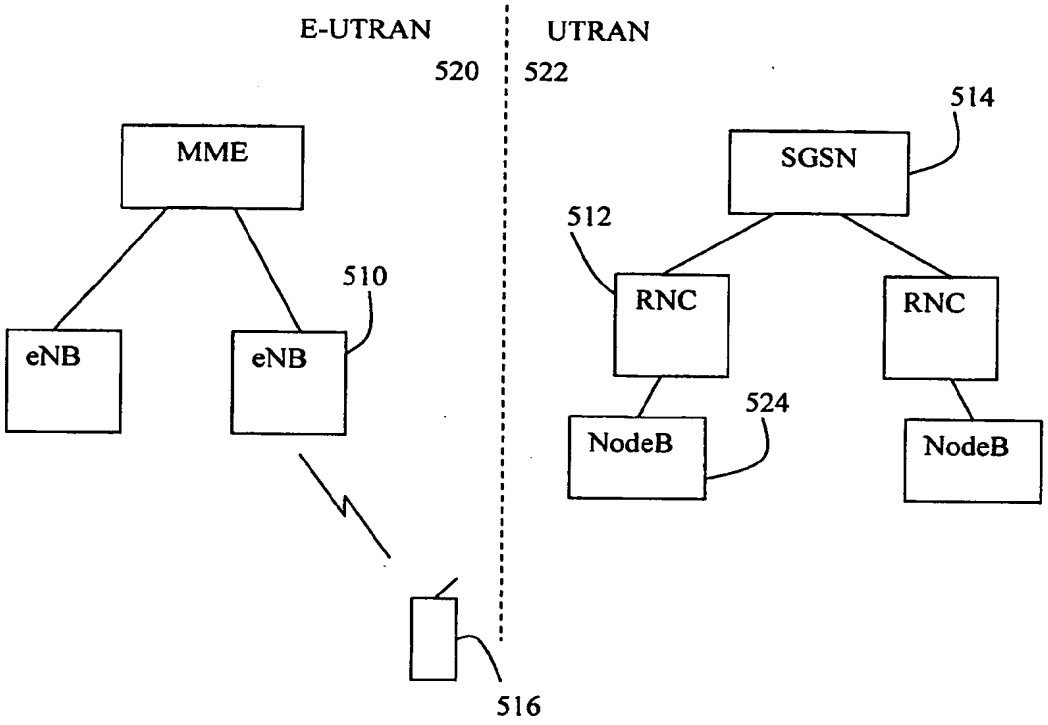

E-UTRAN
520
UTRAN
522
MME
514
SGSN
512
510
RNC
RNC
eNB
eNB
524
NodeB
NodeB
516

Figure 5

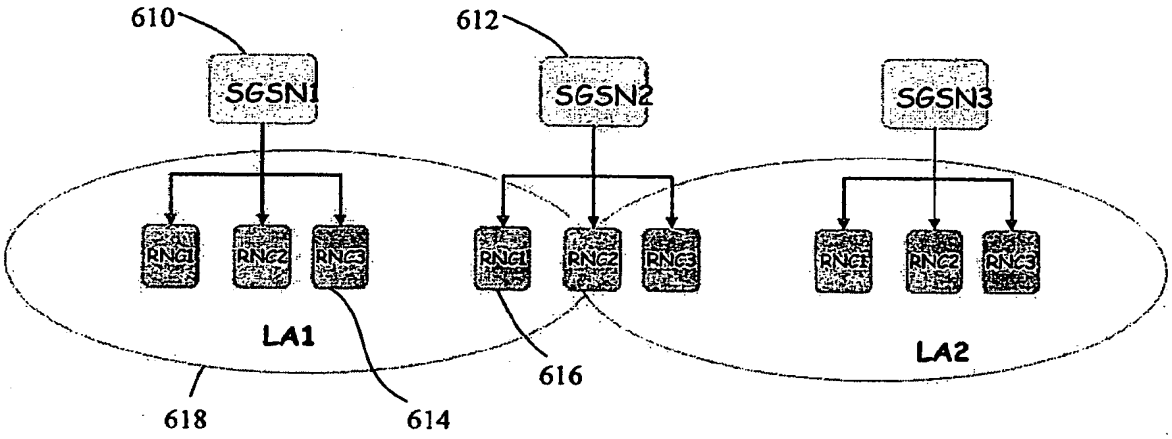

610
612
SGSN1
SGSN2
SGSN3
RNC1
RNC2
RNC3
RNC1
RNC2
RNC3
RNC1
RNC2
RNC3
LA1
LA2
616
618
614

Figure 6

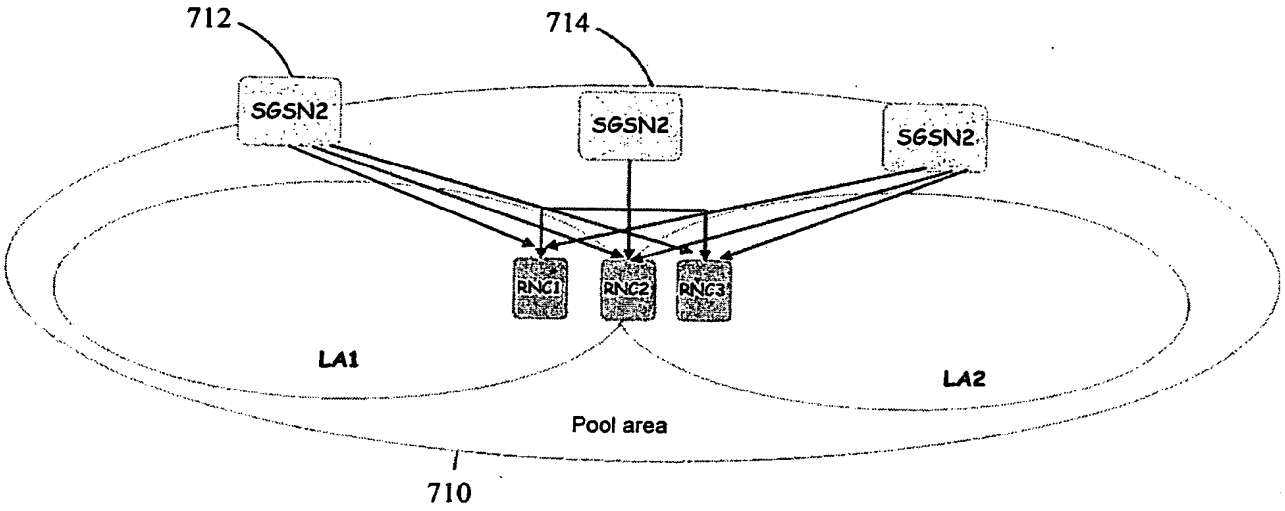

712
714
SGSN2
SGSN2
SGSN2
RNC1
RNC2
RNC3
LA1
LA2
Pool area
710

Figure 7

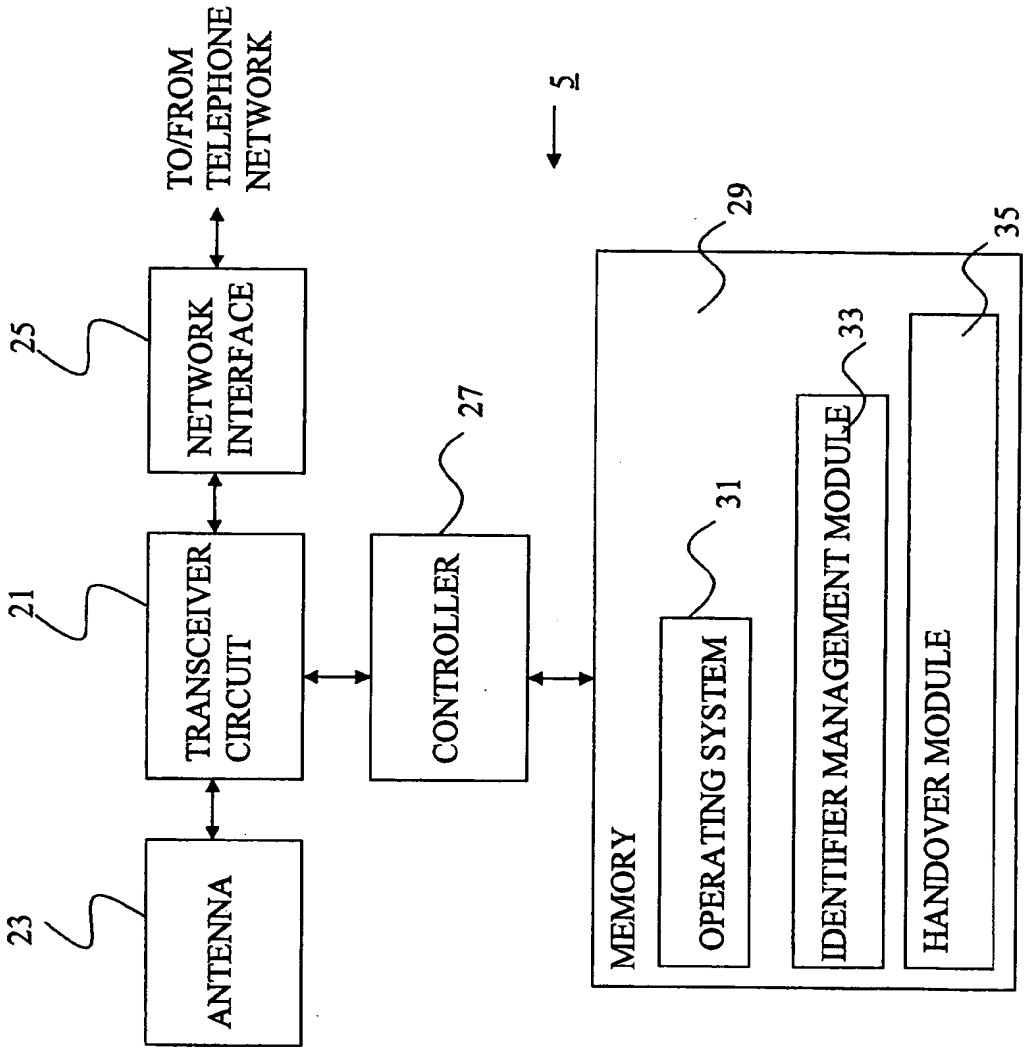

TO/FROM TELEPHONE NETWORK
5
25
NETWORK INTERFACE
21
TRANSCEIVER CIRCUIT
27
CONTROLLER
29
35
MEMORY
31
OPERATING SYSTEM
33
IDENTIFIER MANAGEMENT MODULE
HANDOVER MODULE
23
ANTENNA

Figure 8

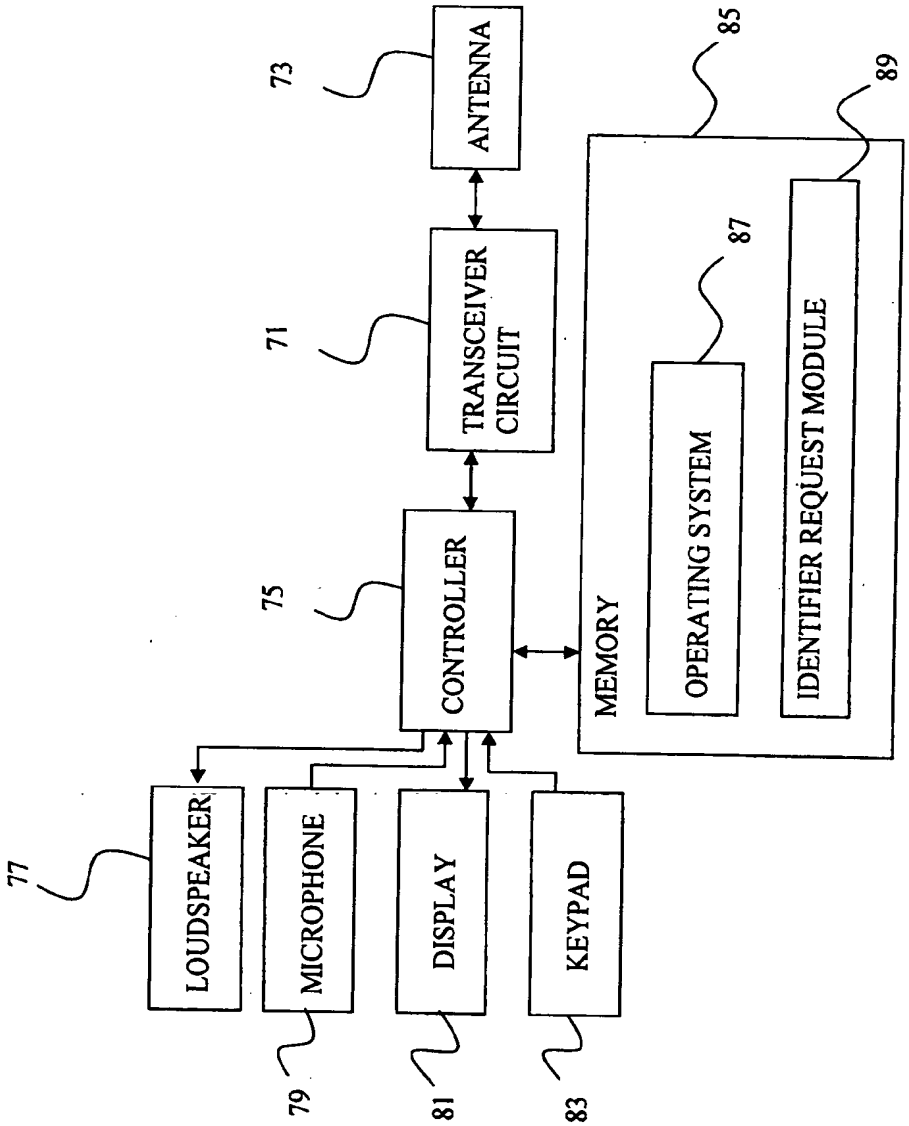

3
ANTENNA
73
TRANSCEIVER CIRCUIT
71
CONTROLLER
75
MEMORY
85
OPERATING SYSTEM
87
IDENTIFIER REQUEST MODULE
89
LOUDSPEAKER
77
MICROPHONE
79
DISPLAY
81
KEYPAD
83

Figure 9

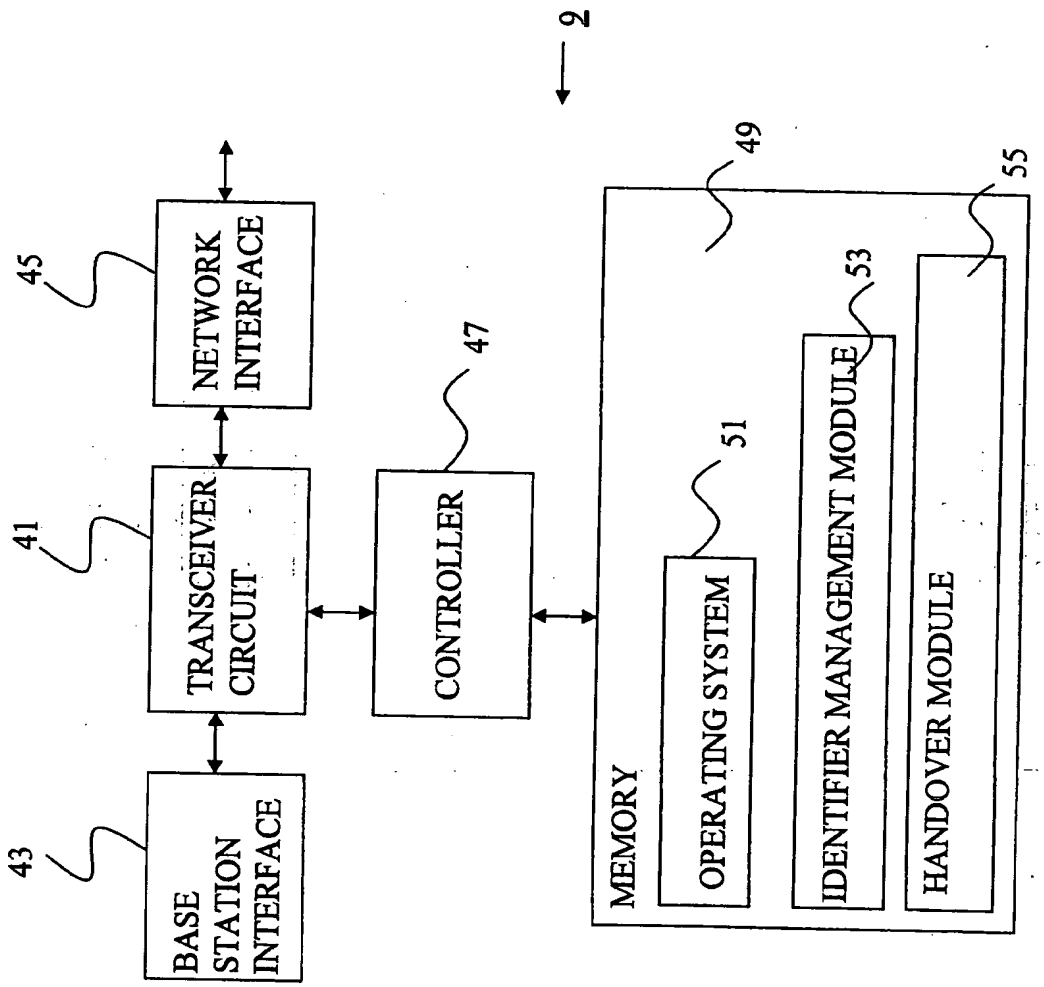

2
NETWORK INTERFACE
45
TRANSCEIVER CIRCUIT
41
CONTROLLER
47
BASE STATION INTERFACE
43
MEMORY
49
OPERATING SYSTEM
51
IDENTIFIER MANAGEMENT MODULE
53
HANDOVER MODULE
55

Figure 10

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[Continued on next page]

(54) Title: BASING NEIGHBOR LIST UPDATES ON A RADIO LINK FAILURE

(57) Abstract: Aspects relate to allowing a mobile device to discover missing neighbor cell relations when there is a radio link failure. At substantially the same time as connecting to a new cell that utilizes the same radio link technology, the failure is reported. If a connection is reestablished with a cell that utilizes a different radio link technology, the radio link failure information (and related missing neighbor information) is retained and reported later when a connection with a cell that utilizes the same radio link technology is established.

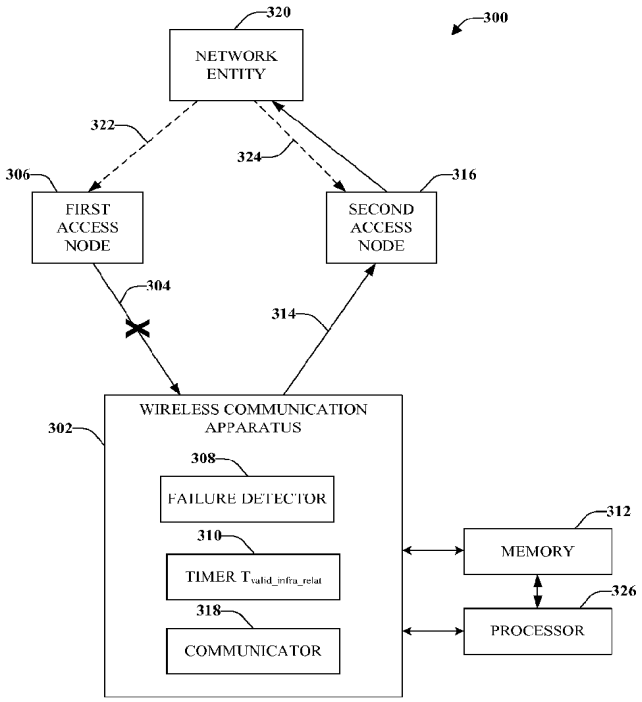


FIG. 3

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RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report*

BASING NEIGHBOR LIST UPDATES ON A RADIO LINK FAILURE

CROSS-REFERENCE

[0001] This application claims the benefit of U.S. Provisional Application Serial No. 60/988,642, filed November 16, 2007, entitled "APPARATUS AND METHOD FOR BASING NEIGHBOR LIST OPTIMIZATION ON A RADIO LINK FAILURE," and assigned to the assignee hereof and the entirety of which is incorporated herein by reference.

BACKGROUND

I. Field

[0002] The following description relates generally to wireless communications and more particularly to updating access node neighbor lists in a wireless communications network.

II. Background

[0003] Wireless communication systems are widely deployed to provide various types of communication and to communicate information regardless of where a user is located (*e.g.,* inside or outside a structure) and whether a user is stationary or moving (*e.g.*, in a vehicle, walking). For example, voice, data, video and so forth can be provided through wireless communication systems. A typical wireless communication system, or network, can by multiple-access systems capable of supporting communication with multiple users by sharing the available system resources (*e.g.,* bandwidth and transmit power). A system can use a variety of multiple access techniques such as Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Code Division Multiplexing (CDM), Orthogonal Frequency Division Multiplexing (OFDM), 3GPP Long Term Evolution (LTE), and others.

[0004] Generally, a wireless multiple-access communication system can simultaneously support communication for multiple wireless terminals. Each terminal communicates with one or more base stations through transmissions on the forward and reverse links. The forward link (or downlink) refers to the communication link from the base stations to the terminals, and the reverse link (or uplink) refers to the

communication link from the terminals to the base stations. This communication link can be established through a single-in-single-out, multiple-in-single-out or a multiple-in-multiple-out (MIMO) system.

[0005] A MIMO system employs multiple (N_T) transmit antennas and multiple (N_R) receive antennas for data transmission. A MIMO channel formed by the N_T transmit and N_R receive antennas can be decomposed into N_S independent channels, which are also referred to as spatial channels, where $N_S \leq \min\{N_T, N_R\}$. Each of the N_S independent channels corresponds to a dimension. The MIMO system can provide improved performance (*e.g.*, higher throughput and/or greater reliability) through utilization of the additional dimensionalities created by the multiple transmit and receive antennas.

[0006] A MIMO system supports time division duplex (TDD) and frequency division duplex (FDD) systems. In a TDD system, the forward and reverse link transmissions are on the same frequency region so that the reciprocity principle allows the estimation of the forward link channel from the reverse link channel. This enables the access point to extract transmit beamforming gain on the forward link when multiple antennas are available at the access point.

[0007] Communication systems can include a multitude of access nodes through which end nodes (*e.g.,* mobile devices) are coupled to a network. End nodes typically communicate with access nodes (*e.g.,* access router) directly through established connections. Such communication systems rely on a bidirectional communications link between the end node and the access node to support two-way communication between the nodes. Access nodes that are serving neighboring geographic cells might be known to each other through manual configuration during which various parameters are configured in an access node corresponding to several of its neighbors. Such configuration can be labor intensive and error prone due to human error and the fact that the network layout of a wireless network can change due to network expansion, gradual phased deployment of a system, environmental conditions, as well as other factors.

SUMMARY

[0008] The following presents a simplified summary of one or more aspects in order to provide a basic understanding of such aspects. This summary is not an extensive overview of all contemplated aspects, and is intended to neither identify key

or critical elements of all aspects nor delineate the scope of any or all aspects. Its sole purpose is to present some concepts of one or more aspects in a simplified form as a prelude to the more detailed description that is presented later.

[0009] In accordance with one or more features and corresponding disclosure thereof, various aspects are described in connection with dynamically updating neighbor lists in an access node based on radio link failures. In situations where a mobile device quickly reestablishes a connection with an access node after a radio link failure, there is a high probability that there is a missing neighbor relationship between the access node with which communication was lost and the access node with which communication was reestablished.

[0010] An aspect relates to a method for facilitating a neighbor list update on an access node based on a radio link failure. The method includes detecting a radio link failure with a first access node, wherein the radio link failure indicates a missing neighbor relation and starting a timer. The method also includes establishing a second link with a second access node before expiration of the timer and notifying the second access node of the missing neighbor relation.

[0011] Another aspect relates to a wireless communications apparatus that includes a memory and a processor. The memory retains instructions related to detecting a radio link failure with a first access node and starting a timer. The memory also retains instructions related to establishing a second link with a second access node before expiration of the timer and notifying the second access node of the missing neighbor relation. The radio link failure indicates a missing neighbor relation. The processor is coupled to the memory and is configured to execute the instructions retained in the memory.

[0012] Another aspect relates to a wireless communications apparatus that enables a neighbor list update on an access node as a function of a radio link failure. The apparatus includes means for detecting a radio link failure with a first access node. The radio link failure indicates a missing neighbor relation. The apparatus also includes means for starting a timer and means for establishing a second link with a second access node before expiration of the timer. Further, apparatus includes means for notifying the second access node of the missing neighbor relation.

[0013] Yet another aspect relates to a computer program product that includes a computer-readable medium. The computer-readable medium includes a first set of codes for causing a computer to detect a radio link failure with a first access node. The radio link failure indicates a missing neighbor relation. The computer-readable medium also includes a second set of codes for causing the computer to activate a timer and a third set of codes for causing the computer to establish a second link with a second access node before expiration of the timer. Also included in the computer-readable medium is a fourth set of codes for causing the computer to notify the second access node of the missing neighbor relation.

[0014] A further aspect relates to at least one processor configured to enable updates to an access node neighbor list based on radio link failures. The processor includes a first module for detecting a radio link failure with a first access node. The radio link failure indicates a missing neighbor relation. The processor also includes a second module for starting a timer and a third module for establishing a second link with a second access node before expiration of the timer. A fourth module for notifying the second access node of the missing neighbor relation is also included in processor.

[0015] Still another aspect relates to a method for facilitating updates to neighbor lists in an access node as a function of a radio link failure. The method includes establishing a radio link with an end node. The method also includes receiving from the end node missing neighbor relationship information that is a function of a radio link failure between the end node and a first access node. Further, method includes reporting to a network entity the radio link failure information.

[0016] Yet another aspect relates to a wireless communications apparatus that includes a memory and a processor. The memory retains instructions related to establishing a radio link with an end node and receiving from the end node missing neighbor relationship information that is a function of a radio link failure between the end node and a first access node. The memory also retains instructions related to reporting to a network entity the radio link failure information. The processor is coupled to the memory and is configured to execute the instructions retained in the memory.

[0017] To the accomplishment of the foregoing and related ends, the one or more aspects comprise the features hereinafter fully described and particularly pointed

out in the claims. The following description and the annexed drawings set forth in detail certain illustrative features of the one or more aspects. These features are indicative, however, of but a few of the various ways in which the principles of the various aspects may be employed. Other advantages and novel features will become apparent from the following detailed description when considered in conjunction with the drawings and the disclosed aspects are intended to include all such aspects and their equivalents.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Fig. 1 illustrates a wireless communication system, according to various aspects presented herein.

[0019] Fig. 2 illustrates a multiple access wireless communication system according to one or more aspects.

[0020] Fig. 3 illustrates a communication system that utilizes a radio link failure-based neighbor list scheme wherein neighboring cells utilize similar radio access technology, according to an aspect.

[0021] Fig. 4 illustrates a communication system that utilizes a radio link failure-based neighbor list scheme in an inter-radio access technology situation, according to an aspect.

[0022] Fig. 5 illustrates a system for self-configuring access node neighbor lists based on a radio link failure.

[0023] Fig. 6 illustrates a method for utilizing a radio link failure-based neighbor list for neighboring cells that utilize similar radio access technology, according to an aspect.

[0024] Fig. 7 illustrates a method for utilizing a radio link failure-based neighbor list scheme in an inter-radio access technology situation, according to an aspect.

[0025] Fig. 8 illustrates a method for reporting a missing neighbor relationship in accordance with the aspects disclosed herein.

[0026] Fig. 9 illustrates a system that facilitates self-configuration of missing neighbor relations in a wireless communications network in accordance with one or more of the disclosed aspects.

[0027] Fig. 10 illustrations a system that facilitates basing neighbor list updates on a radio link failure in accordance with various aspects presented herein.

[0028] Fig. 11 illustrates an exemplary wireless communication system, according to various aspects.

[0029] Fig. 12 illustrates an example system that facilitates a neighbor list update on an access node based on a radio link failure in accordance with an aspect.

[0030] Fig. 13 illustrates an example system 130 that facilitates updates to access node neighbor lists, according to an aspect.

DETAILED DESCRIPTION

[0031] Various aspects are now described with reference to the drawings. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of one or more aspects. It may be evident, however, that such aspect(s) may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate describing these aspects.

[0032] As used in this application, the terms "component", "module", "system", and the like are intended to refer to a computer-related entity, either hardware, firmware, a combination of hardware and software, software, or software in execution. For example, a component may be, but is not limited to being, a process running on a processor, a processor, an object, an executable, a thread of execution, a program, and/or a computer. By way of illustration, both an application running on a computing device and the computing device can be a component. One or more components can reside within a process and/or thread of execution and a component may be localized on one computer and/or distributed between two or more computers. In addition, these components can execute from various computer readable media having various data structures stored thereon. The components may communicate by way of local and/or remote processes such as in accordance with a signal having one or more data packets (*e.g.*, data from one component interacting with another component in a local system, distributed system, and/or across a network such as the Internet with other systems by way of the signal).

[0033] Furthermore, various aspects are described herein in connection with a mobile device. A mobile device can also be called, and may contain some or all of the functionality of a system, subscriber unit, subscriber station, mobile station, mobile, wireless terminal, end node, node, device, remote station, remote terminal, access terminal, user terminal, terminal, wireless communication device, wireless communication apparatus, user agent, user device, or user equipment (UE). A mobile device can be a cellular telephone, a cordless telephone, a Session Initiation Protocol (SIP) phone, a smart phone, a wireless local loop (WLL) station, a personal digital assistant (PDA), a laptop, a handheld communication device, a handheld computing device, a satellite radio, a wireless modem card and/or another processing device for communicating over a wireless system. Moreover, various aspects are described herein in connection with a base station. A base station may be utilized for communicating with wireless terminal(s) and can also be called, and may contain some or all of the functionality of, an access point, access node, node, Node B, e-NodeB, e-NB, or some other network entity.

[0034] Various aspects or features will be presented in terms of systems that may include a number of devices, components, modules, and the like. It is to be understood and appreciated that the various systems may include additional devices, components, modules, *etc.* and/or may not include all of the devices, components, modules *etc.* discussed in connection with the figures. A combination of these approaches may also be used.

[0035] Additionally, in the subject description, the word "exemplary" is used to mean serving as an example, instance, or illustration. Any aspect or design described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other aspects or designs. Rather, use of the word exemplary is intended to present concepts in a concrete manner.

[0036] Referring now to **Fig. 1**, illustrated is a wireless communication system 100, according to various aspects presented herein. System 100 can comprise one or more base stations 102 in one or more sectors that receive, transmit, repeat, and so forth, wireless communication signals to each other and/or to one or more mobile devices 104. Each base station 102 can comprise multiple transmitter chains and receiver chains (*e.g.*, one for each transmit and receive antenna), each of which can in turn comprise a

plurality of components associated with signal transmission and reception (*e.g.*, processors, modulators, multiplexers, demodulators, demultiplexers, antennas, and so forth). Each mobile device 104 can comprise one or more transmitter chains and receiver chains, which can be utilized for a multiple input multiple output (MIMO) system. Each transmitter and receiver chain can comprise a plurality of components associated with signal transmission and reception (*e.g.*, processors, modulators, multiplexers, demodulators, demultiplexers, antennas, and so on), as will be appreciated by one skilled in the art.

[0037] System 100 can be configured to extract information from a radio link failure event and utilize that information for automatic updates to neighbor lists. When a mobile device loses a connection with a first base station (sometimes referred to herein as "cell" or "access node") and is able to reestablish a connection with a second base station, that reestablishment, if performed quickly enough, can be utilized to build neighbor relationships. Generally, each base station maintains a list of neighboring base stations, which can be utilized to facilitate handoff when the mobile device is to be transferred from one base station to another base station due to movement of the mobile device. If there are base stations that are not included in the neighbor list (of an access node), the missing information can impact the handoff procedure as well as other system measurements that are performed by the mobile device to establish and maintain efficient system communications.

[0038] Referring now to **Fig. 2**, a multiple access wireless communication system 200 according to one or more aspects is illustrated. A wireless communication system 200 can include one or more base stations in contact with one or more user devices. Each base station provides coverage for a plurality of sectors. A three-sector base station 202 is illustrated that includes multiple antenna groups, one including antennas 204 and 206, another including antennas 208 and 210, and a third including antennas 212 and 214. According to the figure, only two antennas are shown for each antenna group, however, more or fewer antennas may be utilized for each antenna group. Mobile device 216 is in communication with antennas 212 and 214, where antennas 212 and 214 transmit information to mobile device 216 over forward link 218 and receive information from mobile device 216 over reverse link 220. Forward link (or downlink) refers to the communication link from the base stations to mobile devices,

and the reverse link (or uplink) refers to the communication link from mobile devices to the base stations. Mobile device 222 is in communication with antennas 204 and 206, where antennas 204 and 206 transmit information to mobile device 222 over forward link 224 and receive information from mobile device 222 over reverse link 226. In a FDD system, for example, communication links 218, 220, 224, and 226 might utilize different frequencies for communication. For example, forward link 218 might use a different frequency than the frequency utilized by reverse link 220.

[0039] Each group of antennas and/or the area in which they are designated to communicate may be referred to as a sector of base station 202. In one or more aspects, antenna groups each are designed to communicate to mobile devices in a sector or the areas covered by base station 202. A base station may be a fixed station used for communicating with the terminals.

[0040] In communication over forward links 218 and 224, the transmitting antennas of base station 202 can utilize beamforming in order to improve a signal-to-noise ratio of forward links for the different mobile devices 216 and 222. Also, a base station utilizing beamforming to transmit to mobile devices scattered randomly through its coverage area might cause less interference to mobile devices in neighboring cells than the interference that can be caused by a base station transmitting through a single antenna to all the mobile devices in its coverage area.

[0041] **Fig. 3** illustrates a communication system 300 that utilizes a radio link failure-based neighbor list scheme wherein neighboring cells utilize similar radio access technology, according to an aspect. When there is a lost connection between a first access node (*e.g.,* base station) and a mobile device, the mobile device attempts to reestablish a connection with a second access node. Information related to the reconnection process can be utilized by system 300 to build neighbor relationships and to enable each access nodes to maintain updated information related to neighboring access nodes, such as in a neighbor list, for example. A mobile device can utilize the neighbor list provided by an access node for measurements of the system 300 and for facilitating handovers between the access nodes. Therefore, system 300 can allow automatic building of relationships, which mitigates the need for such relationships to be configured manually and/or by various planning tools.

[0042] System 300 includes a wireless communication apparatus 302 that can communicate with various nodes (*e.g.*, base stations, mobile devices, and so forth) within a communication network. Wireless communication apparatus 302, for example, can be an access terminal (*e.g.*, access terminal 104 of Fig. 1, access terminal 216, 222 of Fig. 2) or the like. As illustrated, communication apparatus 302 establishes a radio link 304 with a first cell or first access node 306 (*e.g.,* $Node_1$). A failure detector 308 can monitor the link 304 and detect a radio link failure, indicated by the "X" on the radio link 304. Upon detection of the failure, a timer $T_{valid\_infra\_relat}$ 310 is started, where wherein "T" indicates timer, "valid" indicates a validity period, "infra" indicates after radio link failure and "relat" indicates relationship. The timer $T_{valid\_infra\_relat}$ 310 has a validity range or period with a limited duration, which can be measured in seconds. Timer $T_{valid\_infra\_relat}$ 310 should have a duration long enough to allow tracking of a reconnection with a neighboring access nodes but not so long as to track a connection with non-neighboring access nodes.

[0043] Information associated with the first access node 306, such as an identity, can be retained in a storage medium associated with communication apparatus 302 (*e.g.,* memory 312). The identity of the last serving cell before the radio link failure (*e.g.,* first access node 306) can be retained before the radio link failure, at substantially the same time as detection of the radio link failure, when the timer 310 is started, or at a different time. At the expiration of timer $T_{valid\_infra\_relat}$ 310, the information related to the first access node 306 is discarded (*e.g.,* no longer maintained by communication apparatus 302 or memory 312).

[0044] Communication apparatus 302 attempts to reestablish a radio link with another cell. In this illustration, communication apparatus 302 establishes a radio link 314 with a second access node 316 (*e.g.,* $Node_2$). Communication apparatus 302 determines if the radio link 314 was established before expiration of the timer $T_{valid\_infra\_relat}$ 310. If the link 314 was established before timer $T_{valid\_infra\_relat}$ 310 timed out, communication apparatus 302 determines if the second access node 316 utilizes the same radio access technology as the first access node 306. If both nodes 306 and 316 utilize the same radio access technology, a communicator 318 reports to the new cell (*e.g.,* second access node 316) the stored identity of the last serving cell (*e.g.,* first

access node 306). Information related to when the nodes 306 and 316 utilize different radio access technology will be discussed with reference to **Fig. 4** below.

[0045] Second access node 316 can report to a network 320 entity (*e.g.,* an operation and maintenance entity) the information about the missing neighbor relation between the first access node 306 and the second access node 316 (*e.g.,* missing $Node_1 \rightarrow Node_2$ neighbor relation). The network 320 can selectively update the neighbor lists of first access node 306 and/or second access node 316, illustrated at 322 and 324.

[0046] System 300 can include memory 312 operatively coupled to communication apparatus 302. Memory 312 can be external to communication apparatus 302 or can reside within communication apparatus 302. Memory 312 can store information related to obtaining and reporting information related to a radio link failure if a radio link was successfully established within a certain interval (*e.g.,* within the validity period of Timer $T_{valid\_infra\_relat}$ 310). Memory 312 can also store other suitable information related to signals transmitted and received in system 300. Memory 312 can store protocols associated with radio link failure, taking action to control communication between communication apparatus 302 and nodes 306, 316, such that system 300 can employ stored protocols and/or algorithms to achieve improved communications in a wireless network as described herein.

[0047] It should be appreciated that the data store (*e.g.,* memories) components described herein can be either volatile memory or nonvolatile memory, or can include both volatile and nonvolatile memory. By way of example and not limitation, nonvolatile memory can include read only memory (ROM), programmable ROM (PROM), electrically programmable ROM (EPROM), electrically erasable ROM (EEPROM), or flash memory. Volatile memory can include random access memory (RAM), which acts as external cache memory. By way of example and not limitation, RAM is available in many forms such as synchronous RAM (DRAM), dynamic RAM (DRAM), synchronous DRAM (SDRAM), double data rate SDRAM (DDR SDRAM), enhanced SDRAM (ESDRAM), Synchlink DRAM (SLDRAM), and direct Rambus RAM (DRRAM). Memory of the disclosed aspects are intended to comprise, without being limited to, these and other suitable types of memory.

[0048] A processor 326 can be operatively connected to communication apparatus 302 (and/or memory 312) to facilitate analysis of information related to

utilization of radio link failure information in a communication network. Processor 326 can be a processor dedicated to analyzing and/or generating information received by communication apparatus 302, a processor that controls one or more components of system 300, and/or a processor that both analyzes and generates information received by communication apparatus 302 and controls one or more components of system 300.

[0049] **Fig. 4** illustrates a communication system 400 that utilizes a radio link failure-based neighbor list scheme in an inter-radio access technology situation, according to an aspect. System 400 includes a wireless communication apparatus 402 that can communicate with various nodes (*e.g.,* base stations, mobile devices and so forth) within a communication network. Wireless communication apparatus 402 can be an access terminal (*e.g.,* access terminal 104 of Fig. 1, access terminal 216, 222 of Fig. 2) or the like.

[0050] As illustrated, communication apparatus 402 establishes a radio link 404 with a first cell or first access node 406 (*e.g.,* $Node_1$). The first access node 406 can utilize a first radio access technology (*e.g.,* LTE). A failure detector 408 can monitor the link 404 and detect a failure, indicated by the "X" on the radio link 404. Upon detection of the failure, a timer $T_{valid\_inter\_relat}$ 410 is started, where "T" indicates timer, "valid" indicates a validity period, "inter" indicates inter-radio access technology and "relat" indicates relationship. Timer $T_{valid\_inter\_relat}$ 410 has a validity period that can have a limited duration, which can be measured in seconds. Timer $T_{valid\_inter\_relat}$ 410 should have a duration long enough to allow a reconnection with a neighboring access node within the validity range of Timer $T_{valid\_inter\_relat}$ 410 but not so long as to make a connection with non-neighboring access nodes with the validity range of Timer $T_{valid\_inter\_relat}$ 410.

[0051] Information associated with the first access node 406, such as an identity, can be retained in a storage medium associated with communication apparatus 402 (*e.g.,* memory 412). The identity of the last serving cell before the radio link failure (*e.g.,* first access node 406) can be retained before the radio link failure, at substantially the same time as detection of the radio link failure, when the Timer $T_{valid\_inter\_relat}$ 410 is started, or at a different time, provided this information has been captured by communication apparatus 402. At the expiration of Timer $T_{valid\_inter\_relat}$ 410, the information related to the first access node 406 is discarded.

[0052] Communication apparatus 402 can declare it is going out of service (OOS) and then re-enter the service area in a different radio access technology/frequency. If communication apparatus 402 re-enters the service area in a different cell (*e.g.,* WCDMA) a radio link 414 with an intermediary access node 416 (*e.g.,* $Node_{int}$) can be established. The intermediary access node 416 utilizes a different radio access technology than the radio access technology utilized by first access node 406. If the radio link 414 with intermediary access node 416 is established within the validity period of Timer $T_{valid\_inter\_relat}$ 410 (*e.g.,* a few seconds) a second Timer T_{miss_relat} 418 is started, where "T" indicates timer and "miss_relat" indicates a missing relationship (*e.g.,* a different radio access technology). Timer T_{miss_relat} 418 can have a validity range that is measured in hours (*e.g.,* two hours, nine hours, twenty-four hours, and so forth). At substantially the same time as starting Timer T_{miss_relat} 418, the missing inter-radio access technology (RAT) neighbor relationship between the first access node 406 and the intermediary access node 416 (*e.g.,* missing $Node_1 \rightarrow Node_{int}$ inter-RAT neighbor relationship) is retained, such as in memory 412. At the expiration of Timer T_{miss_relat} 418, this information is discarded.

[0053] The communication apparatus 402 moves, indicated by arrow 420, and connects, illustrated at 422, to a second access node 424 that utilizes the same radio access technology (*e.g.,* the same public land mobile network (PLMN)) as the first access node 406. If the connection with the second access node 424 is established before expiration of Timer T_{miss_relat} 418, a communicator 426 reports to the second access node 424 the missing first access node 406 to intermediary access node 416 inter-radio access neighbor relationship.

[0054] The second access node 424 can establish a communication link with 428 and report to a network entity 430 the missing first access node 406 to intermediary access node 416 inter-radio access neighbor relationship (*e.g.,* missing $Node_1 \rightarrow Node_{int}$ inter-RAT neighbor relationship). The network entity 430 can selectively update the neighbor list of the first access node 406 (illustrated at 432) and/or the intermediary access node 416 (illustrated at 434).

[0055] Although missing neighbor relations should be collected in the mobile device at substantially the same time as the radio link failure, it is not necessary to report this information to the network during the re-establishment procedure (described

with reference to Fig. 3) or at connection setup (described with reference to Fig. 4), which can occur in a time critical situation and can be based on messages of limited size. Thus, in accordance with some aspects, the reporting can be delayed and performed by the mobile device when radio conditions allow for such reporting.

[0056] **Fig. 5** illustrates a system 500 for self-configuring access node neighbor lists based on a radio link failure. Included in system 500 is a communication apparatus 502 that can be configured to transfer data to a variety of nodes (*e.g.,* mobile devices, base stations, operation and network entity, and so forth). Communication apparatus 502 can be an access node, such as access node 102 of Fig. 1, access node 202 of Fig. 2, and so forth).

[0057] Included in communication apparatus 502 is a receiver 504 that is configured to receive missing neighbor list information from an end node 506 (*e.g.,* mobile device) with which a radio link 508 has been established. For example, the missing neighbor list information can be a missing relationship between a first access node 510 (*e.g.,* $Node_1$) and communication apparatus 502 (*e.g.,* $Node_2$). In accordance with some aspects, the missing neighbor list can be a missing relationship between first access node 510 and an intermediary access node 512 (*e.g.,* $Node_{int}$).

[0058] At substantially the same time as receiving the notification (or at a different time), a reporting mechanism 514 communicates the missing neighbor relation (as reported by end node 506) to an operation and network entity (O&M) 516 over a communication link 518. For example, the reporting mechanism 514 can notify the O&M 516 of the missing $Node_1 \rightarrow Node_2$ neighbor relation. Based on this information, the O&M 516 can update, at 520, a neighbor list 522 of the first access node 510 with the missing $Node_1 \rightarrow Node_2$ neighbor relation. Additionally, the O&M 516 can update, over a communication link 524, a neighbor list 526 of communication apparatus 502 with the missing $Node_2 \rightarrow Node_1$ neighbor relation. In accordance with some aspects, O&M 516 can notify communication apparatus 502 about the missing relationship because, if there is a missing $Node_1 \rightarrow Node_2$ neighbor relation in first access node 510, there most likely is a missing $Node_2 \rightarrow Node_1$ neighbor relation in communication apparatus 502.

[0059] In accordance with some aspects, the information reported to the O&M 516 can be a missing first access node 510 ($Node_1$) to intermediary node 512 ($Node_{int}$)

inter-radio access technology neighbor relation. The O&M 516 updates, at 520, the neighbor list 522 of first access node 510 with the missing $Node_1 \rightarrow Node_{int}$ inter-RAT neighbor relationship. According to some aspects, the O&M 516 can also update, at 528, the neighbor list 530 of intermediary access node 512 with the $Node_{int} \rightarrow Node_1$ inter-RAT neighbor relationship for symmetry reasons.

[0060] Thus, system 500 can dynamically and automatically update the neighbor lists 522, 526, or 530 of the appropriate access nodes. This automatic or self-configuring updates are an advantage over conventional systems that utilize manual techniques to populate neighbor lists and/or that utilize cumbersome planning tools.

[0061] In view of the exemplary systems shown and described above, methodologies that may be implemented in accordance with the disclosed subject matter, will be better appreciated with reference to the following flow charts. While, for purposes of simplicity of explanation, the methodologies are shown and described as a series of blocks, it is to be understood and appreciated that the claimed subject matter is not limited by the number or order of blocks, as some blocks may occur in different orders and/or at substantially the same time with other blocks from what is depicted and described herein. Moreover, not all illustrated blocks may be required to implement the methodologies described herein. It is to be appreciated that the functionality associated with the blocks may be implemented by software, hardware, a combination thereof or any other suitable means (*e.g.,* device, system, process, component). Additionally, it should be further appreciated that the methodologies disclosed hereinafter and throughout this specification are capable of being stored on an article of manufacture to facilitate transporting and transferring such methodologies to various devices. Those skilled in the art will understand and appreciate that a methodology could alternatively be represented as a series of interrelated states or events, such as in a state diagram.

[0062] **Fig. 6** illustrates a method 600 for utilizing a radio link failure-based neighbor list for neighboring cells that utilize similar radio access technology, according to an aspect. Method 600 relates to the situation where there is a radio link failure and a mobile device is able to re-establish a connection with a new cell of the network quickly (*e.g.,* both cells utilize the same radio access technology). The ability to re-establish the connection quickly can indicate that there is a missing neighbor relationship between

the old serving cell (where the radio link failure occurred) and the new cell (where the mobile device was able to quickly re-establish the connection).

[0063] Method 600 starts, at 602, when a radio link failure with a first cell (*e.g.,* access node, base station, and so forth) is detected. While being served by the first cell, the identification of the first cell was known, therefore, due to the radio link failure, the identification of the first cell (*e.g.,* last serving cell) is stored, at 604. A timer is started, at 606. The duration of the timer can be configurable and should be of a short length (*e.g.,* a few seconds). The timer started, at 606, can be referred to as $T_{valid\_infra\_relat}$, where the timer (T) is valid for a relationship between (infra) cells having a common relationship ("relat"), since the cells are in the same network and utilizing the same radio access technology.

[0064] At 608 , a connection with a second cell is established and a determination is made, at 610, whether the connection was reestablished before expiration of the timer ($T_{valid\_infra\_relat}$). If the connection was not reestablished before expiration of the timer ("YES"), the identity of the first cell is discarded, at 612. In accordance with some aspects, the identity of the first cell can be discarded when the Timer $T_{valid\_infra\_relat}$ times out, even if a connection has not been reestablished.

[0065] If the connection was established with the second cell before expiration of the timer ("NO") the second cell is notified of the missing neighbor relation, at 614. Upon receiving this information the second cell can inform a network entity of the missing neighbor relation. The network entity can selectively notify the first cell and/or the second cell of the missing neighbor relation in order for those cell to update their respective neighbor lists.

[0066] **Fig. 7** illustrates a method 700 for utilizing a radio link failure-based neighbor list scheme in an inter-radio access technology situation, according to an aspect. Method 700 relates to the situation where there is a radio link failure and the mobile device is able to re-establish a connection with a new cell that utilizes a different radio access technology than the cell with which there was a radio link failure. The mobile device reports the missing neighbor relation to the network the next time there is a connection to the network. For example, this missing neighbor relation can be reported when the mobile device enters a cell that utilizes the same radio access technology as the original cell (*e.g.,* the cell with which there was a radio link failure).

[0067] Method 700 starts, at 702, when a radio link failure is detected. The radio link failure occurs when being served by a first cell (referred to as $Node_1$). In accordance with some aspects, the first cell is an LTE cell. The identity of the first cell (*e.g.,* last serving cell prior to the radio link failure) is retained, at 704. A timer, referred to as $T_{valid\_inter\_relat}$, is started, at 706, where "T" indicates timer, "valid" indicates a validity period, "inter" indicates inter-radio access technology and "relat" indicates relationship. Timer $T_{valid\_inter\_relat}$ can have a validity range that is a few seconds in length.

[0068] An out-of-service condition can be declared and a service area entered, at 708. The access node serving the entered service area is referred to herein as "intermediary access node" or $Node_{int}$. The service area entered can utilize a technology different from the technology utilized by the first cell. For example, the radio access technology utilized in the entered service area can be a WCDMA cell.

[0069] At 710, a determination is made whether the first timer $T_{valid\_inter\_relat}$ has expired (*e.g.,* timed out). If the first timer $T_{valid\_inter\_relat}$ expired before the new service area was entered ("YES"), the identity of the first cell is discarded. If the new service area was entered before the timer timed out ("NO"), a second timer (T_{miss_relat}) is started, at 714, where "T" indicate timer and "miss_relat" indicates a missing relationship (*e.g.,* a different radio access technology). The missing $Node_1$ to $Node_{int}$ inter-RAT neighbor relationship is stored, at 716.

[0070] At 718, a connection is made to a second cell (*e.g.,* $Node_2$) that utilizes the same radio access technology as the first cell ($Node_1$). At 720, a determination is made whether the second timer expired. If the timer expired ("YES") the inter-rat neighbor relationship is discarded, at 722. If the timer has not expired ("NO"), the missing $Node_1$ to $Node_{int}$ inter-RAT neighbor relationship is reported to the second cell. The second cell can report this information to a network entity that selectively updates the neighbor lists of the first cell and the intermediary cell.

[0071] In accordance with some aspects, the identity of the first cell can be discarded when the Timer $T_{valid\_inter\_relat}$ times out, even if this occurs prior to a connection being reestablished. Additionally or alternatively, the missing $Node_1$ to $Node_{int}$ inter-RAT neighbor relationship can be discarded when second timer T_{miss_relat}

times out, even if the time out occurs prior to a connection being reestablished with a second cell that utilizes the same radio access technology as the first cell.

[0072] **Fig. 8** illustrates a method 800 for reporting a missing neighbor relationship in accordance with the aspects disclosed herein. Method 800 can be utilized if the missing neighbor relationship is between cells that utilize the same radio access technology and/or if the missing neighbor relationship is between cells that utilize different radio access technologies (*e.g.,* inter-RAT). Method 800 can enable that missing neighbor relations located in an access node neighbor list are updated in a self-configuring and dynamic manner.

[0073] Method 800 starts, at 802, when a connection with a mobile device is established. At 804, missing neighbor relationship information is received from the mobile device. This missing neighbor relationship information can be a missing relationship between a first cell (*e.g.* $Node_1$) and the cell to which the mobile device connected, at 802 (*e.g.,* $Node_2$). In accordance with some aspects, the missing neighbor relationship information can be a missing relationship between a first cell (*e.g.,* $Node_1$) that utilizes a first radio access technology and an intermediary cell (*e.g.,* $Node_{int}$) that utilizes a second radio access technology.

[0074] At 806, the missing neighbor relationship is reported to a network entity. In accordance with the aspects where the missing neighbor relationship is between cells that utilize the same radio access technology, the network entity is informed of the missing $Node_1 \rightarrow Node_2$ neighbor relation. The network entity can update the neighbor list of $Node_1$ with the missing $Node_1 \rightarrow Node_2$ neighbor relation. In accordance with some aspects, the network entity can also update the neighbor list of $Node_2$ with the missing $Node_2 \rightarrow Node_1$ neighbor relation for symmetry purposes. If there is a missing $Node_1 \rightarrow Node_2$ neighbor relation in $Node_1$, it can indicate that there is a missing $Node_2 \rightarrow Node_1$ neighbor relation in $Node_2$.

[0075] In accordance with the aspects where the missing neighbor relationship is between cells that utilize different radio access technologies, the network entity is informed of the missing $Node_1 \rightarrow Node_{int}$ inter-RAT neighbor relationship. The network entity can update the neighbor list of $Node_1$ with the missing $Node_1 \rightarrow Node_{int}$ inter-RAT neighbor relationship. In accordance with some aspects, the network entity

can also update the neighbor list of $Node_{int}$ with the $Node_{int} \rightarrow Node_1$ inter-RAT neighbor relationship for symmetry purposes.

[0076] With reference now to **Fig. 9**, illustrated is a system 900 that facilitates self-configuration of missing neighbor relations in a wireless communications network in accordance with one or more of the disclosed aspects. System 900 can reside in a user device. System 900 comprises a receiver 902 that can receive a signal from, for example, a receiver antenna. The receiver 902 can perform typical actions thereon, such as filtering, amplifying, downconverting, *etc.* the received signal. The receiver 902 can also digitize the conditioned signal to obtain samples. A demodulator 904 can obtain received symbols for each symbol period, as well as provide received symbols to a processor 906.

[0077] Processor 906 can be a processor dedicated to analyzing information received by receiver component 902 and/or generating information for transmission by a transmitter 908. In addition or alternatively, processor 906 can control one or more components of user device 900, analyze information received by receiver 902, generate information for transmission by transmitter 908, and/or control one or more components of user device 900. Processor 906 may include a controller component capable of coordinating communications with additional user devices.

[0078] User device 900 can additionally comprise memory 908 operatively coupled to processor 906 and that can store information related to coordinating communications and any other suitable information. Memory 910 can additionally store protocols associated with self-configuring neighbor lists. User device 900 can further comprise a symbol modulator 912 and a transmitter 908 that transmits the modulated signal.

[0079] Receiver 902 is further operatively coupled to a timer 914 that is configured to track intervals associated with the time taken to reestablish a radio link after a radio link failure. The timer 914 can track different time intervals depending on whether the radio link failure is between access nodes that utilize the same radio access technology or between access nodes that utilize a different radio access technology. Information associated with a missing $Node_1 \rightarrow Node_2$ neighbor relation and/or a missing $Node_1$ to $Node_{int}$ inter-RAT neighbor relationship can be retained in memory 910. Based on the condition of the timer(s), the $Node_1 \rightarrow Node_2$ neighbor relation

and/or the missing $Node_1$ to $Node_{int}$ inter-RAT neighbor relationship can be conveyed to an access node by transmitter 908.

[0080] **Fig. 10** illustrations a system 1000 that facilitates basing neighbor list updates on a radio link failures in accordance with various aspects presented herein. System 1000 comprises a base station or access point 1002. As illustrated, base station 1002 receives signal(s) from one or more communication devices 1004 (*e.g.,* user device) by a receive antenna 1006, and transmits to the one or more communication devices 1004 through a transmit antenna 1008.

[0081] Base station 1002 comprises a receiver 1010 that receives information from receive antenna 1006 and is operatively associated with a demodulator 1012 that demodulates received information. Demodulated symbols are analyzed by a processor 1014 that is coupled to a memory 1016 that stores information related to dynamically updating neighbor lists in neighboring cells that have a missing neighbor relationship. A modulator 1018 can multiplex the signal for transmission by a transmitter 1020 through transmit antenna 1008 to communication devices 1004.

[0082] Receiver 1010 can obtain information from a user device that indicates a missing $Node_1 \rightarrow Node_2$ neighbor relation and/or a missing $Node_1$ to $Node_{int}$ inter-RAT neighbor relationship. Transmitter 1020 can convey this information to a network entity. The network entity can selectively update a neighbor list 1022 of base station 1002 as a function of the missing neighbor relationship information.

[0083] **Fig. 11** illustrates an exemplary wireless communication system 1100, according to various aspects. Wireless communication system 1100 depicts one base station and one terminal for sake of brevity. However, it is to be appreciated that system 1100 can include more than one base station or access point and/or more than one terminal or user device, wherein additional base stations and/or terminals can be substantially similar or different from the exemplary base station and terminal described below. In addition, it is to be appreciated that the base station and/or the terminal can employ the systems and/or methods described herein to facilitate wireless communication there between.

[0084] Referring now to **Fig. 11**, on a downlink, at access point 1105, a transmit (TX) data processor 1110 receives, formats, codes, interleaves, and modulates (or symbol maps) traffic data and provides modulation symbols ("data symbols"). A

symbol modulator 1115 receives and processes the data symbols and pilot symbols and provides a stream of symbols. A symbol modulator 1115 multiplexes data and pilot symbols and obtains a set of N transmit symbols. Each transmit symbol may be a data symbol, a pilot symbol, or a signal value of zero. The pilot symbols may be sent continuously in each symbol period. The pilot symbols can be frequency division multiplexed (FDM), orthogonal frequency division multiplexed (OFDM), time division multiplexed (TDM), frequency division multiplexed (FDM), or code division multiplexed (CDM).

[0085] A transmitter unit (TMTR) 1120 receives and converts the stream of symbols into one or more analog signals and further conditions (*e.g.*, amplifies, filters, and frequency upconverts) the analog signals to generate a downlink signal suitable for transmission over the wireless channel. The downlink signal is then transmitted through an antenna 1125 to the terminals. At terminal 1130, an antenna 1135 receives the downlink signal and provides a received signal to a receiver unit (RCVR) 1140. Receiver unit 1140 conditions (*e.g.*, filters, amplifies, and frequency downconverts) the received signal and digitizes the conditioned signal to obtain samples. A symbol demodulator 1145 obtains N received symbols and provides received pilot symbols to a processor 1150 for channel estimation. Symbol demodulator 1145 further receives a frequency response estimate for the downlink from processor 1150, performs data demodulation on the received data symbols to obtain data symbol estimates (which are estimates of the transmitted data symbols), and provides the data symbol estimates to an RX data processor 1155, which demodulates (*i.e.*, symbol demaps), deinterleaves, and decodes the data symbol estimates to recover the transmitted traffic data. The processing by symbol demodulator 1145 and RX data processor 1155 is complementary to the processing by symbol modulator 1115 and TX data processor 1110, respectively, at access point 1105.

[0086] On the uplink, a TX data processor 1160 processes traffic data and provides data symbols. A symbol modulator 1165 receives and multiplexes the data symbols with pilot symbols, performs modulation, and provides a stream of symbols. A transmitter unit 1170 then receives and processes the stream of symbols to generate an uplink signal, which is transmitted by the antenna 1135 to the access point 1105.

[0087] At access point 1105, the uplink signal from terminal 1130 is received by the antenna 1125 and processed by a receiver unit 1175 to obtain samples. A symbol demodulator 1180 then processes the samples and provides received pilot symbols and data symbol estimates for the uplink. An RX data processor 1185 processes the data symbol estimates to recover the traffic data transmitted by terminal 1130. A processor 1190 performs channel estimation for each active terminal transmitting on the uplink.

[0088] Processors 1190 and 1150 direct (*e.g.*, control, coordinate, manage, ...) operation at access point 1105 and terminal 1130, respectively. Respective processors 1190 and 1150 can be associated with memory units (not shown) that store program codes and data. Processors 1190 and 1150 can also perform computations to derive frequency and impulse response estimates for the uplink and downlink, respectively.

[0089] For a multiple-access system (*e.g.*, FDMA, OFDMA, CDMA, TDMA, and the like), multiple terminals can transmit concurrently on the uplink. For such a system, the pilot subbands may be shared among different terminals. The channel estimation techniques may be used in cases where the pilot subbands for each terminal span the entire operating band (possibly except for the band edges). Such a pilot subband structure would be desirable to obtain frequency diversity for each terminal. The techniques described herein may be implemented by various means. For example, these techniques may be implemented in hardware, software, or a combination thereof. For a hardware implementation, the processing units used for channel estimation may be implemented within one or more application specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), processors, controllers, micro-controllers, microprocessors, other electronic units designed to perform the functions described herein, or a combination thereof. With software, implementation can be through modules (*e.g.*, procedures, functions, and so on) that perform the functions described herein. The software codes may be stored in memory unit and executed by the processors 1190 and 1150.

[0090] With reference to **Fig. 12**, illustrated is an example system 1200 that facilitates a neighbor list update on an access node based on a radio link failure in accordance with an aspect. System 1200 can reside at least partially within a mobile device. It is to be appreciated that system 1200 is represented as including functional

blocks, which may be functional blocks that represent functions implemented by a processor, software, or combination thereof (*e.g.,* firmware).

[0091] System 1200 includes a logical grouping 1202 of electrical components that can act separately or in conjunction. Logical grouping 1202 includes an electrical component 1204 for detecting a radio link failure with a first access node. The radio link failure indicates a missing neighbor relation.

[0092] Also included in logical grouping 1202 is and electrical component 1206 for activating a timer and an electrical component 1208 for establishing a second link with a second access node before expiration of the timer. Further, logical grouping 1202 includes an electrical component 1210 for notifying the second access node of the missing neighbor relation.

[0093] In accordance with some aspects, the timer is a $T_{valid\_infra\_relat}$ timer and the missing neighbor relation is between the first access node and the second access node. In this aspect, the first access node and the second access node utilize similar radio link technology.

[0094] According to some aspects, the timer is a T_{miss_relat} timer and logical grouping 1202 includes an electrical component for starting a $T_{valid\_inter\_relat}$ timer after detection of the radio link failure. Logical grouping 1202 can also include an electrical component for establishing a communication link with an intermediary access node before expiration of the $T_{valid\_inter\_relat}$ timer. The first access node and the intermediary access node utilize different radio link technology. Further, logical grouping 1202 can include an electrical component for starting the T_{miss_relat} timer, wherein the missing neighbor relation is between the first access node and the intermediary access node and the first access node and second access node utilize similar radio link technology.

[0095] Additionally or alternatively, logical grouping 1202 can include an electrical component for detecting expiration of the $T_{valid\_inter\_relat}$ timer and an electrical component for discarding information related to the radio link failure. According to an aspect, logical grouping 1202 can include an electrical component for detecting expiration of the T_{miss_relat} timer and an electrical component for discarding information related to the radio link failure.

[0096] Additionally or alternatively, logical grouping 1202 can include an electrical component for detecting expiration of the timer and an electrical component

for discarding information related to the radio link failure. In an aspect, logical grouping 1202 can include an electrical component for storing an identification of the first access node before detection of the radio link failure.

[0097] System 1200 can include a memory 1212 that retains instructions for executing functions associated with electrical components 1204, 1206, 1208, and 1210 or other components. While shown as being external to memory 1212, it is to be understood that one or more of electrical components 1204, 1206, 1208, and 1210 can exist within memory 1212.

[0098] **Fig. 13** illustrates an example system 1300 that facilitates updates to access node neighbor lists, according to an aspect. System 1300 can reside at least partially within a base station. System 1300 is represented as including functional blocks, which may be functional blocks that represent functions implemented by a processor, software, or combination thereof (*e.g.,* firmware).

[0099] System 1300 includes a logical grouping 1302 of electrical components that can act separately or in conjunction. Included in logical grouping 1302 is an electrical component 1304 for establishing a radio link with an end node. Also included in logical grouping 1302 is an electrical component 1306 for receiving from the end node missing neighbor relationship information that is a function of a radio link failure between the end node and a first access node. Further, logical grouping 1302 includes an electrical component 1308 for reporting to a network entity the radio link failure information.

[00100] In accordance with some aspects, logical grouping 1302 can include an electrical component for receiving from the network entity an update to a neighbor list. The missing neighbor relationship is between a first access node and the access node that established the radio link with the end node. Additionally or alternatively, the received missing neighbor relationship is between a first access node and an intermediary access node that utilize different radio access technology.

[00101] System 1300 also includes a memory 1310 that retains instructions for executing functions associated with electrical components 1304, 1306, and 1308 or other components. While shown as being external to memory 1310, it is to be understood that one or more of electrical components 1304, 1306, and 1308 can exist within memory 1310.

[00102] It is to be understood that the aspects described herein may be implemented by hardware, software, firmware or any combination thereof. When implemented in software, the functions may be stored on or transmitted over as one or more instructions or code on a computer-readable medium. Computer-readable media includes both computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A storage media may be any available media that can be accessed by a general purpose or special purpose computer. By way of example, and not limitation, such computer-readable media can comprise RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium that can be used to carry or store desired program code means in the form of instructions or data structures and that can be accessed by a general-purpose or special-purpose computer, or a general-purpose or special-purpose processor. Also, any connection is properly termed a computer-readable medium. For example, if the software is transmitted from a website, server, or other remote source using a coaxial cable, fiber optic cable, twisted pair, digital subscriber line (DSL), or wireless technologies such as infrared, radio, and microwave, then the coaxial cable, fiber optic cable, twisted pair, DSL, or wireless technologies such as infrared, radio, and microwave are included in the definition of medium. Disk and disc, as used herein, includes compact disc (CD), laser disc, optical disc, digital versatile disc (DVD), floppy disk and blu-ray disc where *disks* usually reproduce data magnetically, while *discs* reproduce data optically with lasers. Combinations of the above should also be included within the scope of computer-readable media.

[00103] The various illustrative logics, logical blocks, modules, and circuits described in connection with the aspects disclosed herein may be implemented or performed with a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general-purpose processor may be a microprocessor, but, in the alternative, the processor may be any conventional processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing

devices, *e.g.*, a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration. Additionally, at least one processor may comprise one or more modules operable to perform one or more of the steps and/or actions described above.

[00104] For a software implementation, the techniques described herein may be implemented with modules (*e.g.*, procedures, functions, and so on) that perform the functions described herein. The software codes may be stored in memory units and executed by processors. The memory unit may be implemented within the processor or external to the processor, in which case it can be communicatively coupled to the processor through various means as is known in the art. Further, at least one processor may include one or more modules operable to perform the functions described herein.

[00105] The techniques described herein may be used for various wireless communication systems such as CDMA, TDMA, FDMA, OFDMA, SC-FDMA and other systems. The terms "system" and "network" are often used interchangeably. A CDMA system may implement a radio technology such as Universal Terrestrial Radio Access (UTRA), CDMA2000, *etc*. UTRA includes Wideband-CDMA (W-CDMA) and other variants of CDMA. Further, CDMA2000covers IS-2000, IS-95 and IS-856 standards. A TDMA system may implement a radio technology such as Global System for Mobile Communications (GSM). An OFDMA system may implement a radio technology such as Evolved UTRA (E-UTRA), Ultra Mobile Broadband (UMB), IEEE 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20, Flash-OFDM®, *etc*. UTRA and E-UTRA are part of Universal Mobile Telecommunication System (UMTS). 3GPP Long Term Evolution (LTE) is a release of UMTS that uses E-UTRA, which employs OFDMA on the downlink and SC-FDMA on the uplink. UTRA, E-UTRA, UMTS, LTE and GSM are described in documents from an organization named "3rd Generation Partnership Project" (3GPP). Additionally, CDMA2000and UMB are described in documents from an organization named "3rd Generation Partnership Project 2" (3GPP2). Further, such wireless communication systems may additionally include peer-to-peer (*e.g.*, mobile-to-mobile) *ad hoc* network systems often using unpaired unlicensed spectrums, 802.xx wireless LAN, BLUETOOTH and any other short- or long- range, wireless communication techniques.

[00106] Moreover, various aspects or features described herein may be implemented as a method, apparatus, or article of manufacture using standard programming and/or engineering techniques. The term "article of manufacture" as used herein is intended to encompass a computer program accessible from any computer-readable device, carrier, or media. For example, computer-readable media can include but are not limited to magnetic storage devices (*e.g.*, hard disk, floppy disk, magnetic strips, *etc.*), optical disks (*e.g.*, compact disk (CD), digital versatile disk (DVD), *etc.*), smart cards, and flash memory devices (*e.g.*, EPROM, card, stick, key drive, *etc.*). Additionally, various storage media described herein can represent one or more devices and/or other machine-readable media for storing information. The term "machine-readable medium" can include, without being limited to, wireless channels and various other media capable of storing, containing, and/or carrying instruction(s) and/or data. Additionally, a computer program product may include a computer readable medium having one or more instructions or codes operable to cause a computer to perform the functions described herein.

[00107] Further, the steps and/or actions of a method or algorithm described in connection with the aspects disclosed herein may be embodied directly in hardware, in a software module executed by a processor, or in a combination of the two. A software module may reside in RAM memory, flash memory, ROM memory, EPROM memory, EEPROM memory, registers, a hard disk, a removable disk, a CD-ROM, or any other form of storage medium known in the art. An exemplary storage medium may be coupled to the processor, such that the processor can read information from, and write information to, the storage medium. In the alternative, the storage medium may be integral to the processor. Further, in some aspects, the processor and the storage medium may reside in an ASIC. Additionally, the ASIC may reside in a user terminal. In the alternative, the processor and the storage medium may reside as discrete components in a user terminal. Additionally, in some aspects, the steps and/or actions of a method or algorithm may reside as one or any combination or set of codes and/or instructions on a machine-readable medium and/or computer readable medium, which may be incorporated into a computer program product.

[00108] While the foregoing disclosure discusses illustrative aspects and/or aspects, it should be noted that various changes and modifications could be made herein

without departing from the scope of the described aspects and/or aspects as defined by the appended claims. Accordingly, the described aspects are intended to embrace all such alterations, modifications and variations that fall within scope of the appended claims. Furthermore, although elements of the described aspects and/or aspects may be described or claimed in the singular, the plural is contemplated unless limitation to the singular is explicitly stated. Additionally, all or a portion of any aspect and/or aspect may be utilized with all or a portion of any other aspect and/or aspect, unless stated otherwise.

[00109] To the extent that the term "includes" is used in either the detailed description or the claims, such term is intended to be inclusive in a manner similar to the term "comprising" as "comprising" is interpreted when employed as a transitional word in a claim. Furthermore, the term "or" as used in either the detailed description or the claims is intended to mean an inclusive "or" rather than an exclusive "or". That is, unless specified otherwise, or clear from the context, the phrase "X employs A or B" is intended to mean any of the natural inclusive permutations. That is, the phrase "X employs A or B" is satisfied by any of the following instances: X employs A; X employs B; or X employs both A and B. In addition, the articles "a" and "an" as used in this application and the appended claims should generally be construed to mean "one or more" unless specified otherwise or clear from the context to be directed to a singular form.

CLAIMS

What is claimed is:

1. A method for facilitating a neighbor list update on an access node based on a radio link failure, comprising:

detecting a radio link failure with a first access node, wherein the radio link failure indicates a missing neighbor relation;

starting a timer;

establishing a second link with a second access node before expiration of the timer; and

notifying the second access node of the missing neighbor relation.

2. The method of claim 1, wherein the timer is a $T_{valid\_infra\_relat}$ timer and the missing neighbor relation is between the first access node and the second access node.

3. The method of claim 2, wherein the first access node and the second access node utilize similar radio link technology.

4. The method of claim 1, further comprising:

detecting expiration of the timer; and

discarding information related to the radio link failure.

5. The method of claim 1, wherein the timer is a T_{miss_relat} timer, the method further comprising:

starting a $T_{valid\_inter\_relat}$ timer after detection of the radio link failure;

establishing a communication link with an intermediary access node before expiration of the $T_{valid\_inter\_relat}$ timer; and

starting the T_{miss_relat} timer, wherein the missing neighbor relation is between the first access node and the intermediary access node and the first access node and second access node utilize similar radio link technology.

6. The method of claim 5, wherein the first access node and the intermediary access node utilize different radio link technology.

7. The method of claim 5, further comprising:
detecting expiration of the $T_{valid\_inter\_relat}$ timer; and
discarding information related to the radio link failure

8. The method of claim 5, further comprising:
detecting expiration of the T_{miss_relat} timer; and
discarding information related to the radio link failure.

9. The method of claim 1, further comprises storing an identification of the first access node before detection of the radio link failure.

10. A wireless communications apparatus, comprising:

a memory that retains instructions related to detecting a radio link failure with a first access node, starting a timer, establishing a second link with a second access node before expiration of the timer, and notifying the second access node of the missing neighbor relation, wherein the radio link failure indicates a missing neighbor relation; and

a processor, coupled to the memory, configured to execute the instructions retained in the memory.

11. The wireless communication apparatus of claim 10, wherein the first access node and the second access node utilize similar radio link technology, the timer is a $T_{valid\_infra\_relat}$ timer, and the missing neighbor relation is between the first access node and the second access node.

12. The wireless communication apparatus of claim 10, the memory further retains instructions related to detecting expiration of the timer and discarding information related to the radio link failure.

13. The wireless communication apparatus of claim 10, wherein the timer is a T_{miss_relat} timer, the memory further retains instructions related to starting a $T_{valid\_inter\_relat}$ timer after detection of the radio link failure, establishing a communication link with an intermediary access node before expiration of the $T_{valid\_inter\_relat}$ timer, and starting the T_{miss_relat} timer, wherein the missing neighbor relation is between the first access node and the intermediary access node and the first access node and second access node utilize similar radio link technology.

14. The wireless communication apparatus of claim 10, the memory further retains instructions related to detecting expiration of $T_{valid\_inter\_relat}$ timer or the T_{miss_relat} timer and discarding information related to the radio link failure.

15. A wireless communications apparatus that enables a neighbor list update on an access node as a function of a radio link failure, comprising:

means for detecting a radio link failure with a first access node, wherein the radio link failure indicates a missing neighbor relation;

means for starting a timer;

means for establishing a second link with a second access node before expiration of the timer; and

means for notifying the second access node of the missing neighbor relation.

16. The wireless communications apparatus of claim 15, wherein the timer is a $T_{valid\_infra\_relat}$ timer and the missing neighbor relation is between the first access node and the second access node that utilize similar radio link technology.

17. The wireless communications apparatus of claim 15, wherein the timer is a T_{miss_relat} timer, the apparatus further comprising:

means for starting a $T_{valid\_inter\_relat}$ timer after detection of the radio link failure;

means for establishing a communication link with an intermediary access node before expiration of the $T_{valid\_inter\_relat}$ timer; and

means for starting the T_{miss_relat} timer, wherein the missing neighbor relation is between the first access node and the intermediary access node and the first access node and second access node utilize similar radio link technology.

18. A computer program product, comprising:

a computer-readable medium comprising:

a first set of codes for causing a computer to detect a radio link failure with a first access node, wherein the radio link failure indicates a missing neighbor relation;

a second set of codes for causing the computer to activate a timer;

a third set of codes for causing the computer to establish a second link with a second access node before expiration of the timer; and

a fourth set of codes for causing the computer to notify the second access node of the missing neighbor relation.

19. The computer program product of claim 18, wherein the timer is a $T_{valid\_infra\_relat}$ timer and the missing neighbor relation is between the first access node and the second access node that utilize similar radio link technology.

20. The computer program product of claim 18, wherein the timer is a T_{miss_relat} timer, the computer-readable medium further comprising:

a fifth set of codes for causing the computer to activate a $T_{valid\_inter\_relat}$ timer after detection of the radio link failure;

a sixth set of codes for causing the computer to establish a communication link with an intermediary access node before expiration of the $T_{valid\_inter\_relat}$ timer; and

a seventh set of codes for causing the computer to activate the T_{miss_relat} timer, wherein the missing neighbor relation is between the first access node and the intermediary access node and the first access node and second access node utilize similar radio link technology.

21. At least one processor configured to enable updates to an access node neighbor list based on radio link failures, comprising:

a first module for detecting a radio link failure with a first access node, wherein the radio link failure indicates a missing neighbor relation;

a second module for starting a timer;

a third module for establishing a second link with a second access node before expiration of the timer; and

a fourth module for notifying the second access node of the missing neighbor relation.

22. The processor of claim 21, wherein the timer is a $T_{valid\_infra\_relat}$ timer and the missing neighbor relation is between the first access node and the second access node that utilize similar radio link technology.

23. The processor of claim 21, wherein the timer is a T_{miss_relat} timer, the method further comprising:

a fifth module for starting a $T_{valid\_inter\_relat}$ timer after detection of the radio link failure;

a sixth module for establishing a communication link with an intermediary access node before expiration of the $T_{valid\_inter\_relat}$ timer; and

a seventh module for starting the T_{miss_relat} timer, wherein the missing neighbor relation is between the first access node and the intermediary access node and the first access node and second access node utilize similar radio link technology.

24. A method for facilitating updates to neighbor lists in an access node as a function of a radio link failure, comprising:

establishing a radio link with an end node;

receiving from the end node missing neighbor relationship information that is a function of a radio link failure between the end node and a first access node; and

reporting to a network entity the radio link failure information.

25. The method of claim 24, further comprises receiving from the network entity an update to a neighbor list, wherein the missing neighbor relationship is between a first access node and the access node that established the radio link with the end node.

26. The method of claim 24, wherein the received missing neighbor relationship is between a first access node and an intermediary access node that utilize different radio access technology.

27. A wireless communications apparatus, comprising:

a memory that retains instructions related to establishing a radio link with an end node, receiving from the end node missing neighbor relationship information that is a function of a radio link failure between the end node and a first access node, and reporting to a network entity the radio link failure information; and

a processor, coupled to the memory, configured to execute the instructions retained in the memory.

28. The wireless communications apparatus of claim 27, the memory further retains instructions related to receiving from the network entity an update to a neighbor list, wherein the missing neighbor relationship is between a first access node and the access node that established the radio link with the end node.

29. The wireless communications apparatus of claim 27, wherein the received missing neighbor relationship is between a first access node and an intermediary access node.

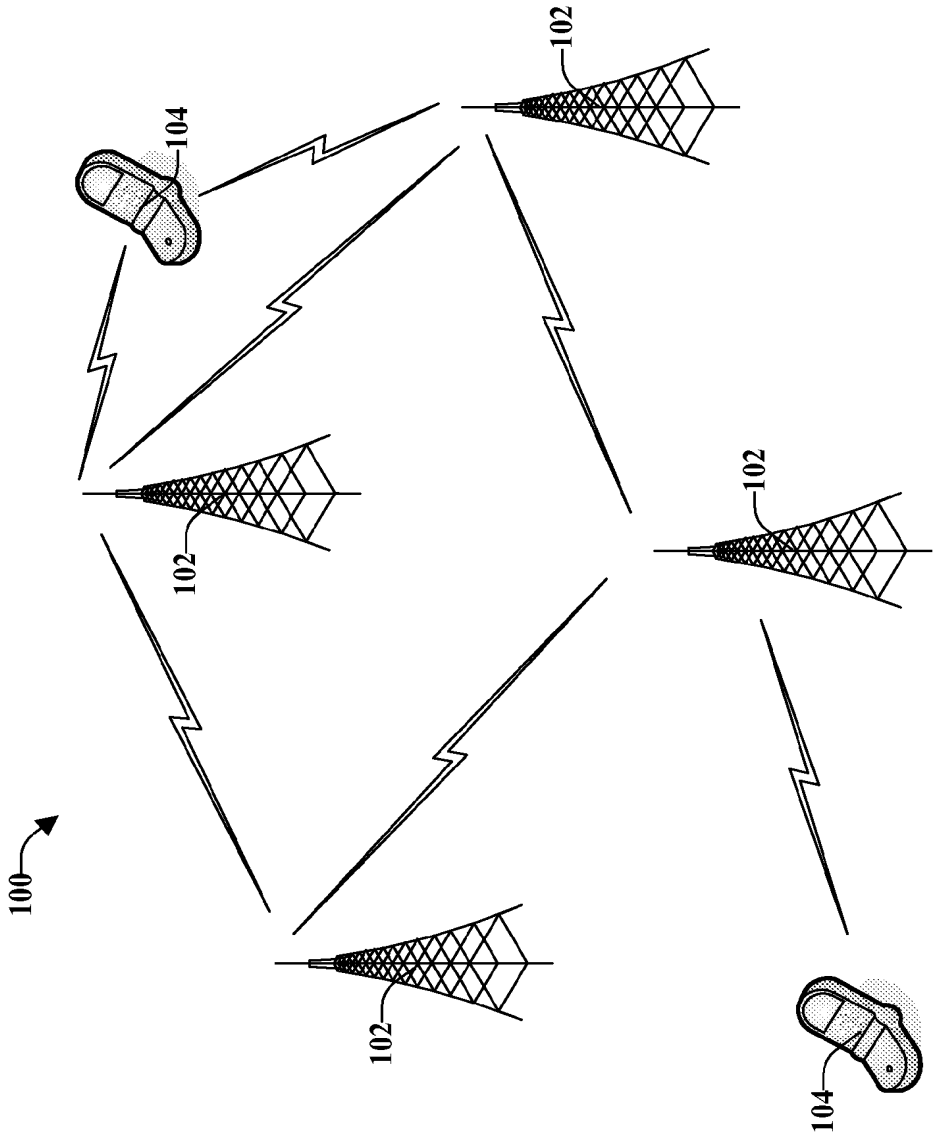


FIG. 1

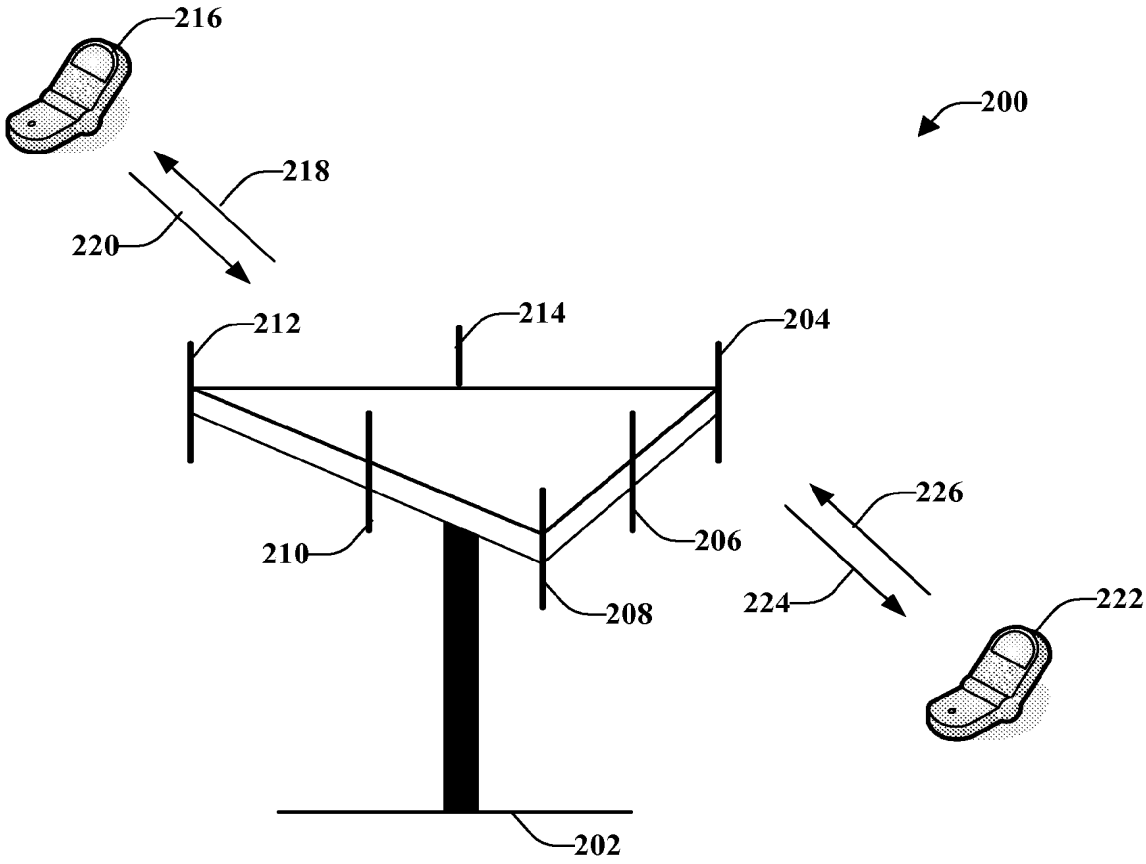


FIG. 2

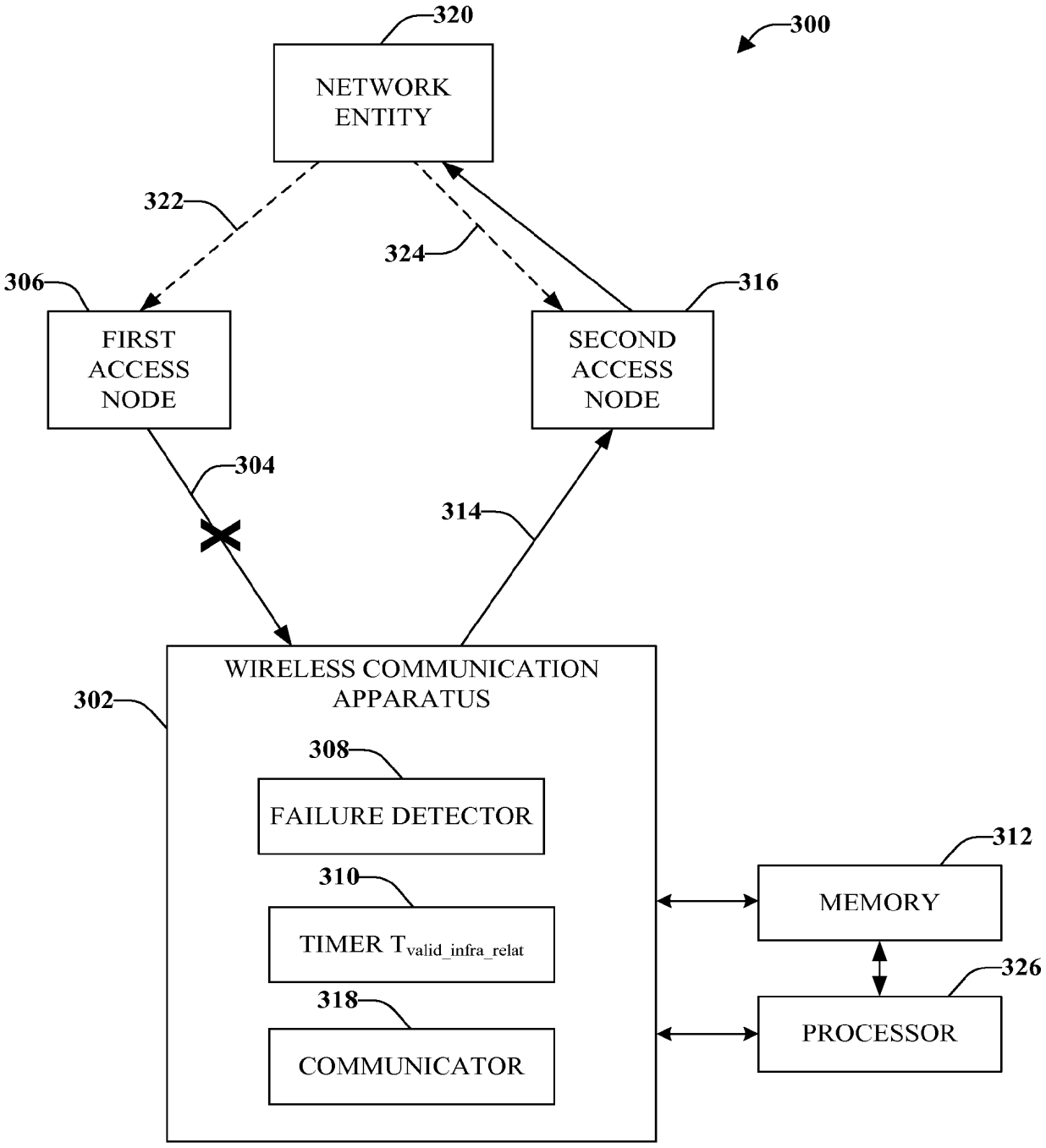

320
300
NETWORK ENTITY
322
324
306
316
FIRST ACCESS NODE
SECOND ACCESS NODE
304
314
WIRELESS COMMUNICATION APPARATUS
302
308
FAILURE DETECTOR
310
TIMER $T_{valid\_infra\_relat}$
318
COMMUNICATOR
312
MEMORY
326
PROCESSOR

FIG. 3

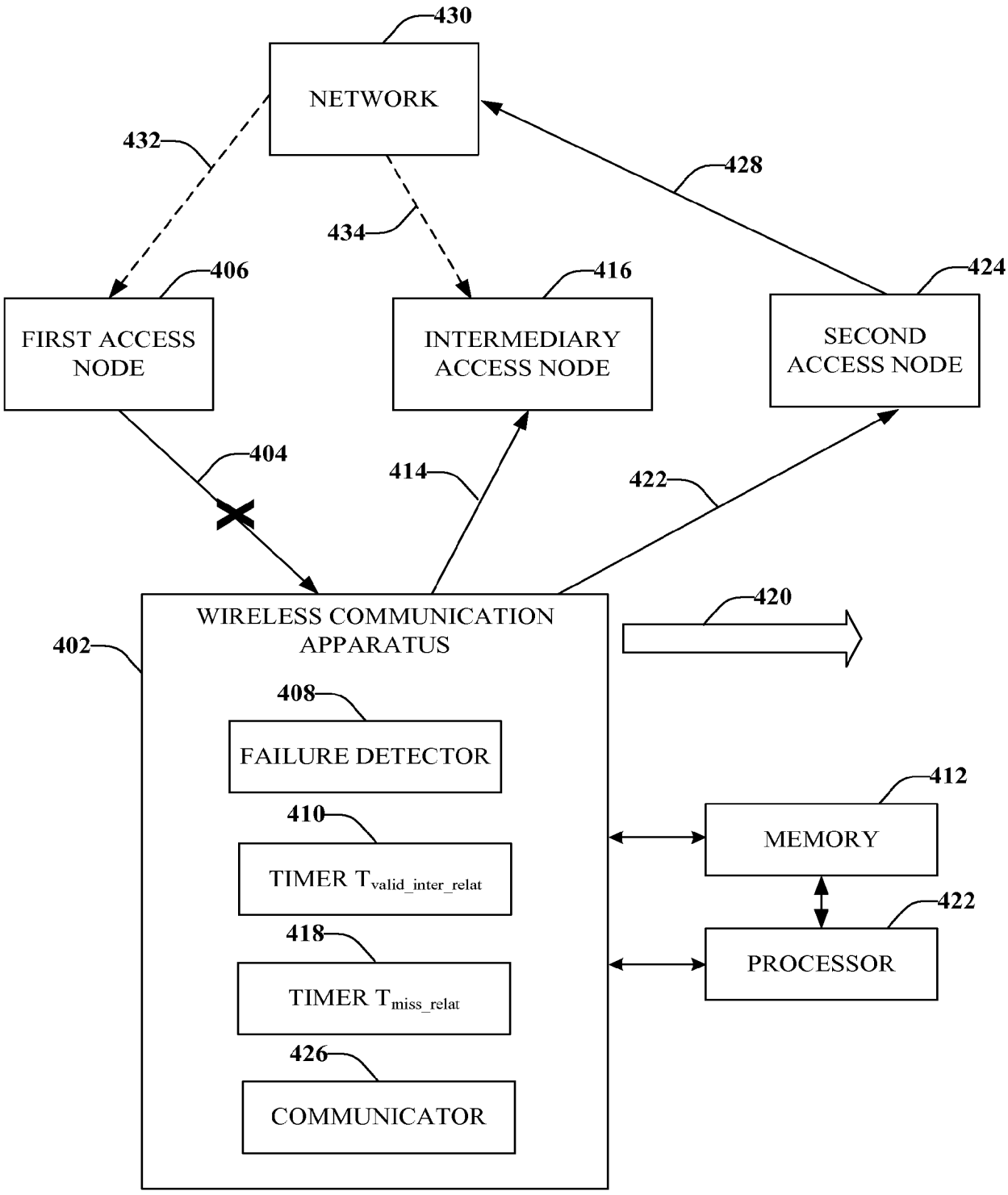

430
NETWORK
432
428
434
406
416
424
FIRST ACCESS NODE
INTERMEDIARY ACCESS NODE
SECOND ACCESS NODE
404
414
422
420
402
WIRELESS COMMUNICATION APPARATUS
408
FAILURE DETECTOR
412
410
TIMER $T_{valid\_inter\_relat}$
MEMORY
418
422
TIMER T_{miss_relat}
PROCESSOR
426
COMMUNICATOR

FIG. 4

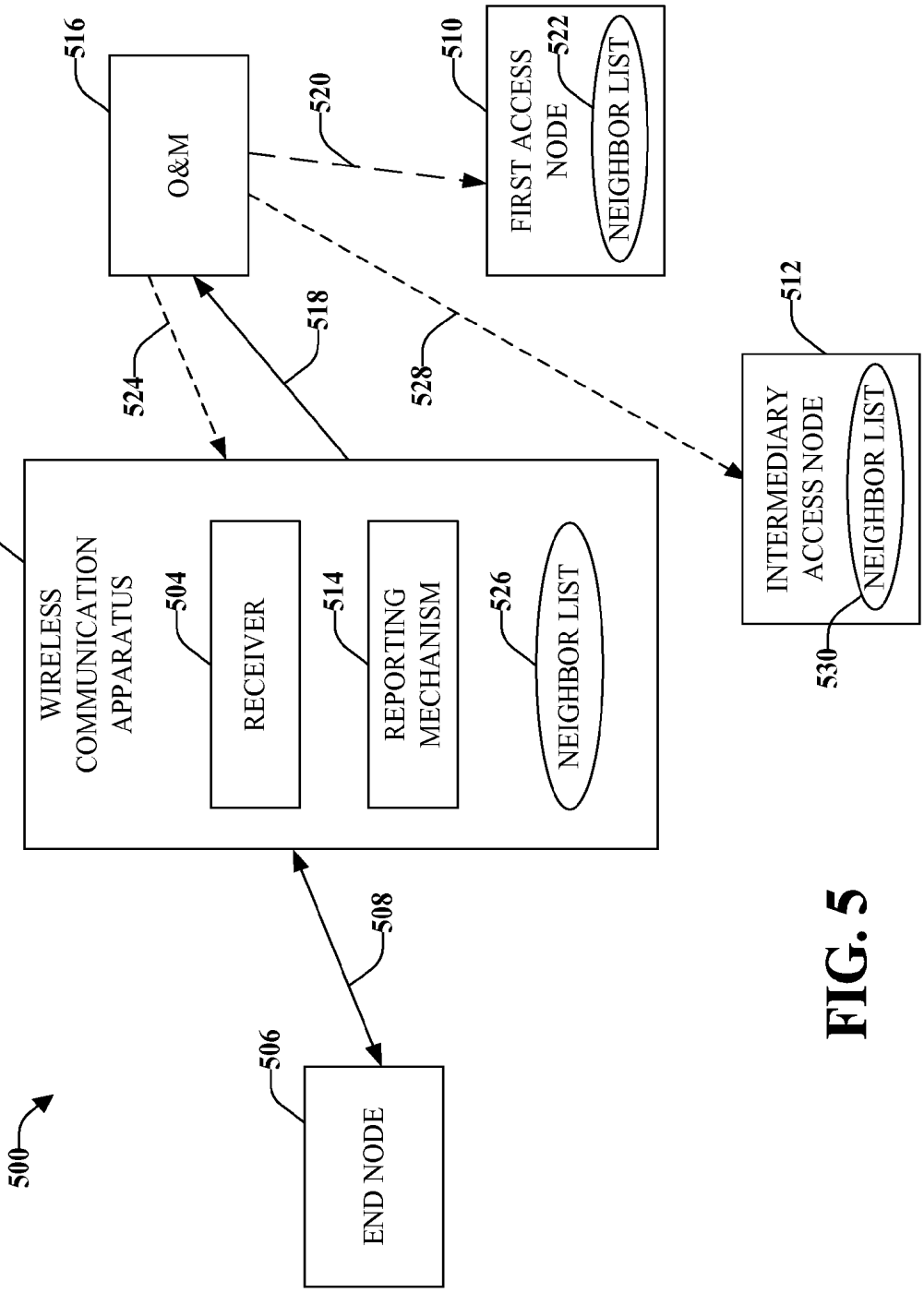

500
502
WIRELESS COMMUNICATION APPARATUS
504
RECEIVER
514
REPORTING MECHANISM
526
NEIGHBOR LIST
506
END NODE
508
516
O&M
520
510
FIRST ACCESS NODE
522
NEIGHBOR LIST
512
INTERMEDIARY ACCESS NODE
NEIGHBOR LIST
530
518
524
528

FIG. 5

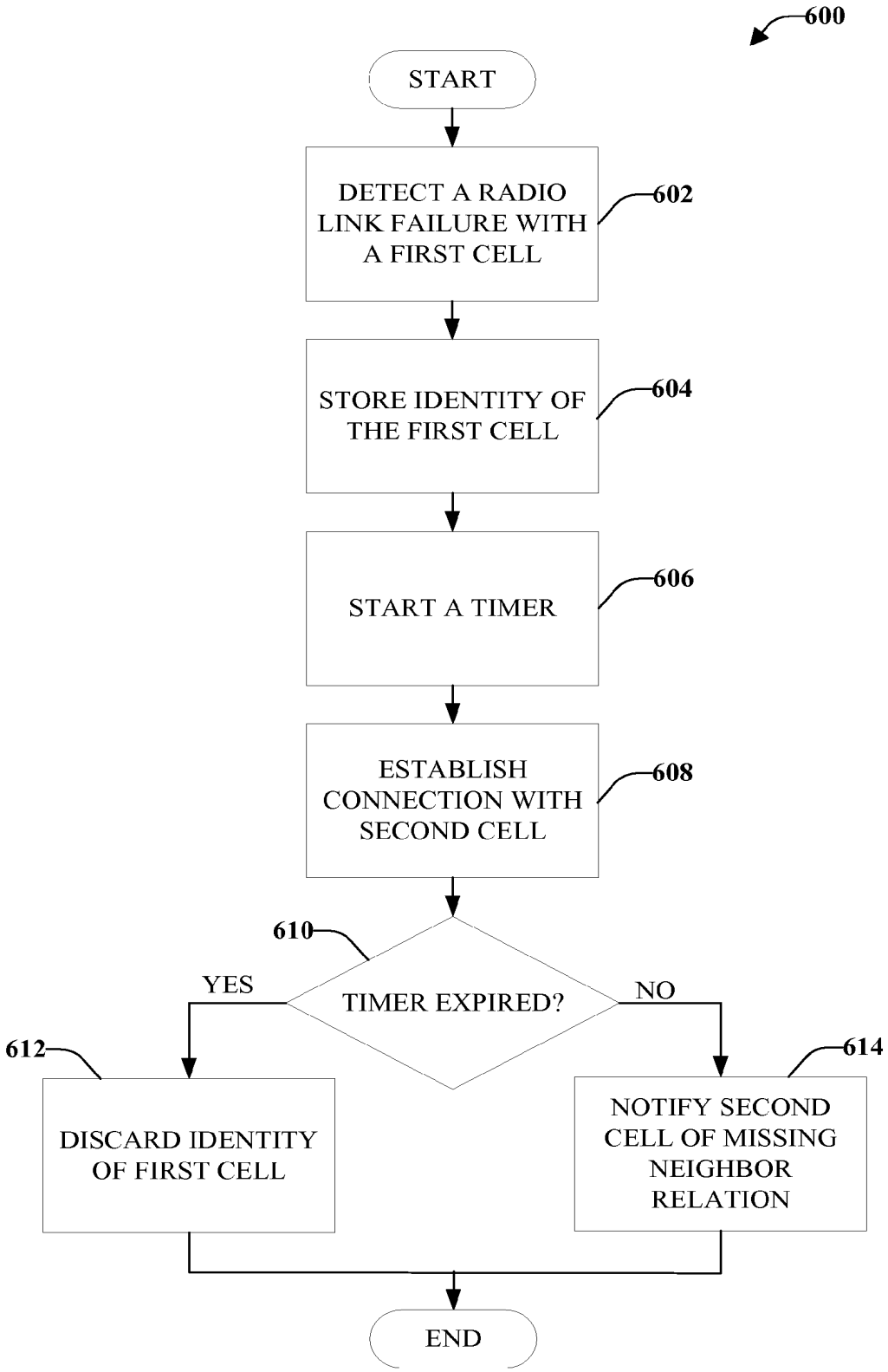

600
START
DETECT A RADIO LINK FAILURE WITH A FIRST CELL
602
STORE IDENTITY OF THE FIRST CELL
604
START A TIMER
606
ESTABLISH CONNECTION WITH SECOND CELL
608
610
TIMER EXPIRED?
YES
NO
612
DISCARD IDENTITY OF FIRST CELL
614
NOTIFY SECOND CELL OF MISSING NEIGHBOR RELATION
END

FIG. 6

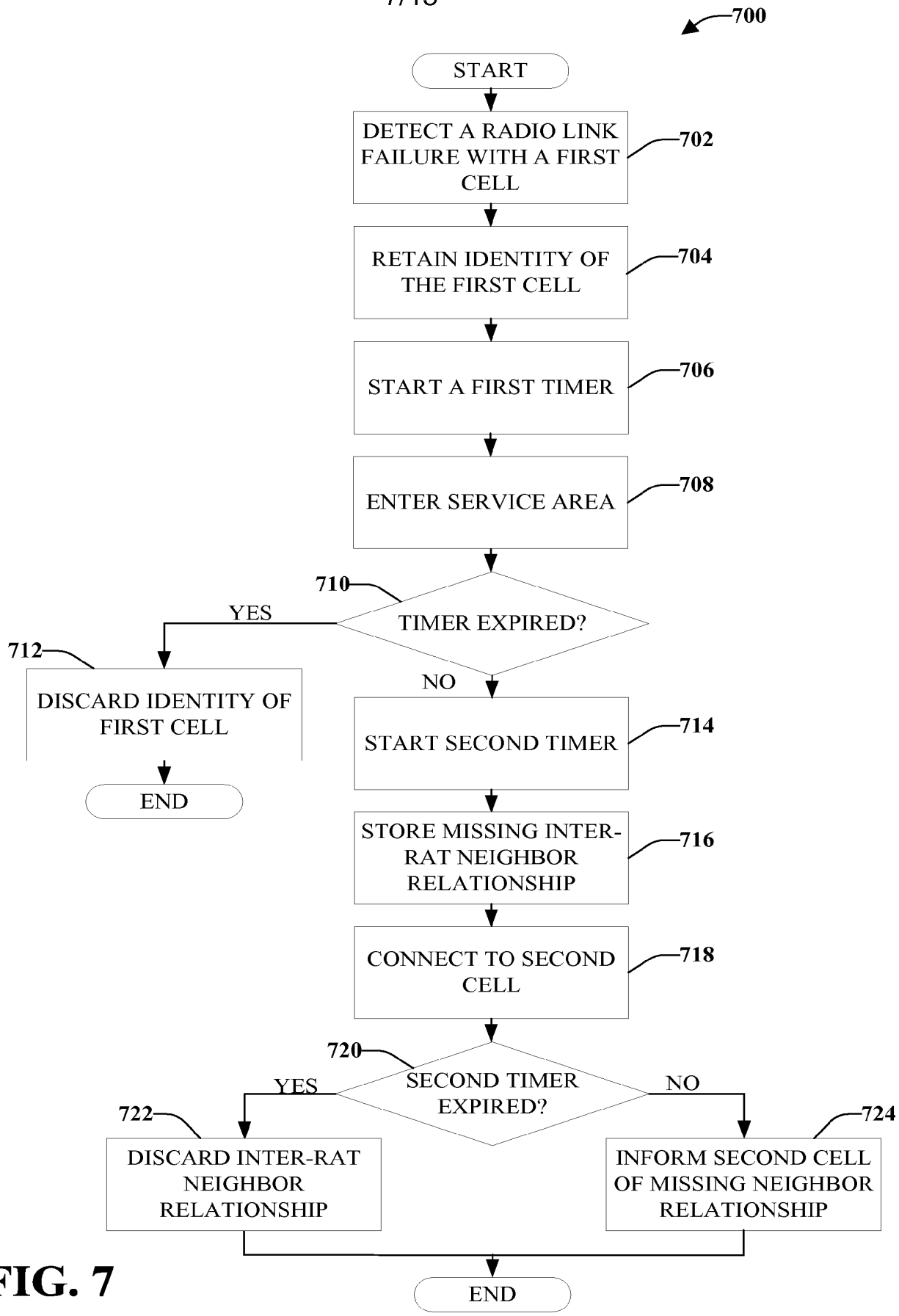

700
START
DETECT A RADIO LINK FAILURE WITH A FIRST CELL
702
RETAIN IDENTITY OF THE FIRST CELL
704
START A FIRST TIMER
706
ENTER SERVICE AREA
708
710
TIMER EXPIRED?
YES
712
DISCARD IDENTITY OF FIRST CELL
END
NO
START SECOND TIMER
714
STORE MISSING INTER-RAT NEIGHBOR RELATIONSHIP
716
CONNECT TO SECOND CELL
718
720
SECOND TIMER EXPIRED?
YES
NO
722
DISCARD INTER-RAT NEIGHBOR RELATIONSHIP
724
INFORM SECOND CELL OF MISSING NEIGHBOR RELATIONSHIP
END

FIG. 7

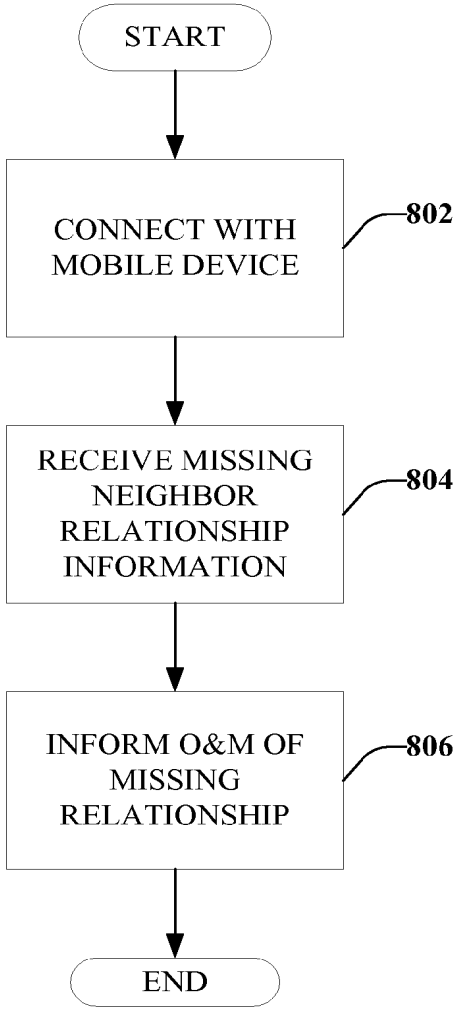

START
CONNECT WITH MOBILE DEVICE
802
RECEIVE MISSING NEIGHBOR RELATIONSHIP INFORMATION
804
INFORM O&M OF MISSING RELATIONSHIP
806
END

FIG. 8

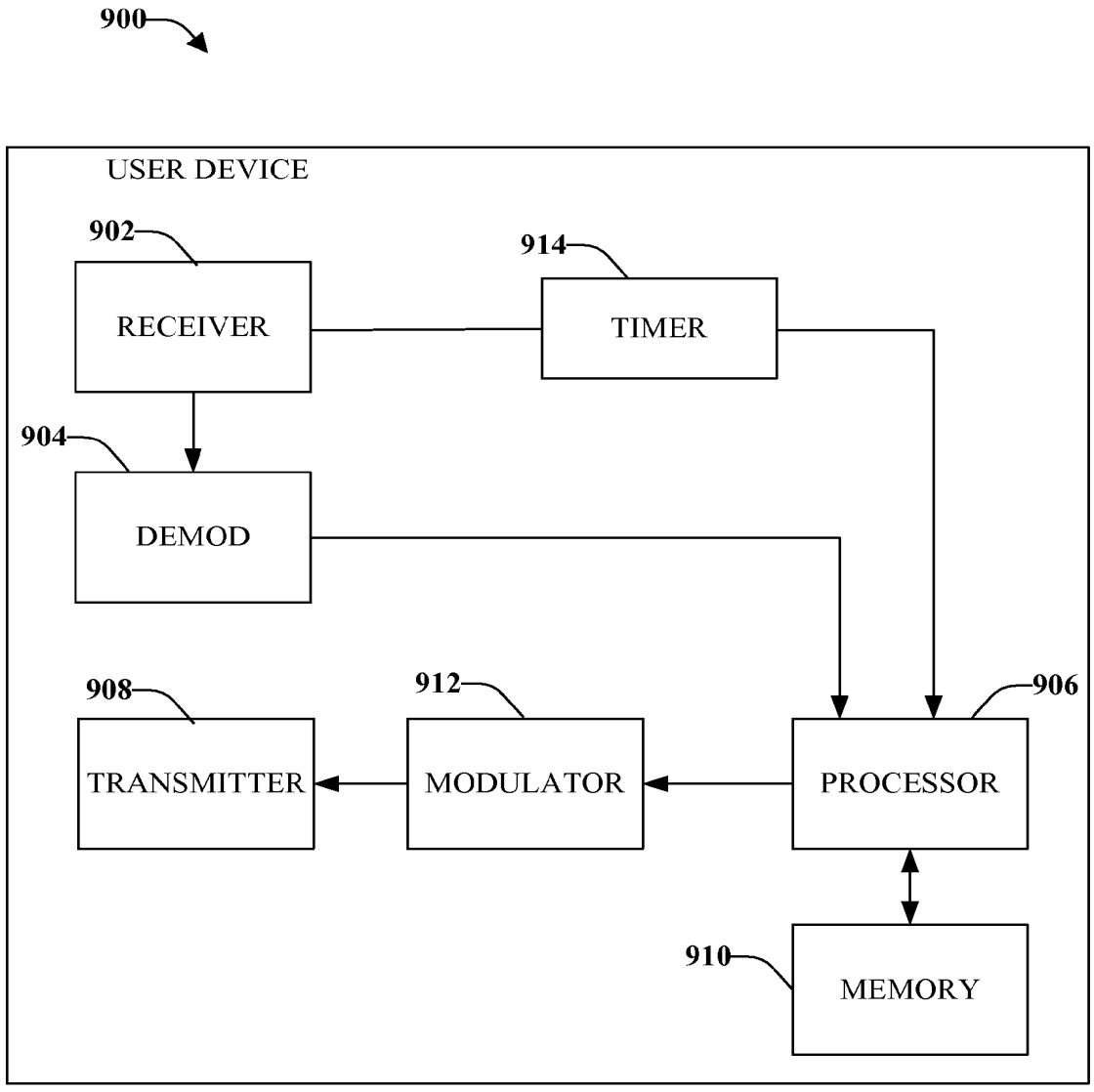

900
USER DEVICE
902
RECEIVER
914
TIMER
904
DEMOD
908
TRANSMITTER
912
MODULATOR
906
PROCESSOR
910
MEMORY

FIG. 9

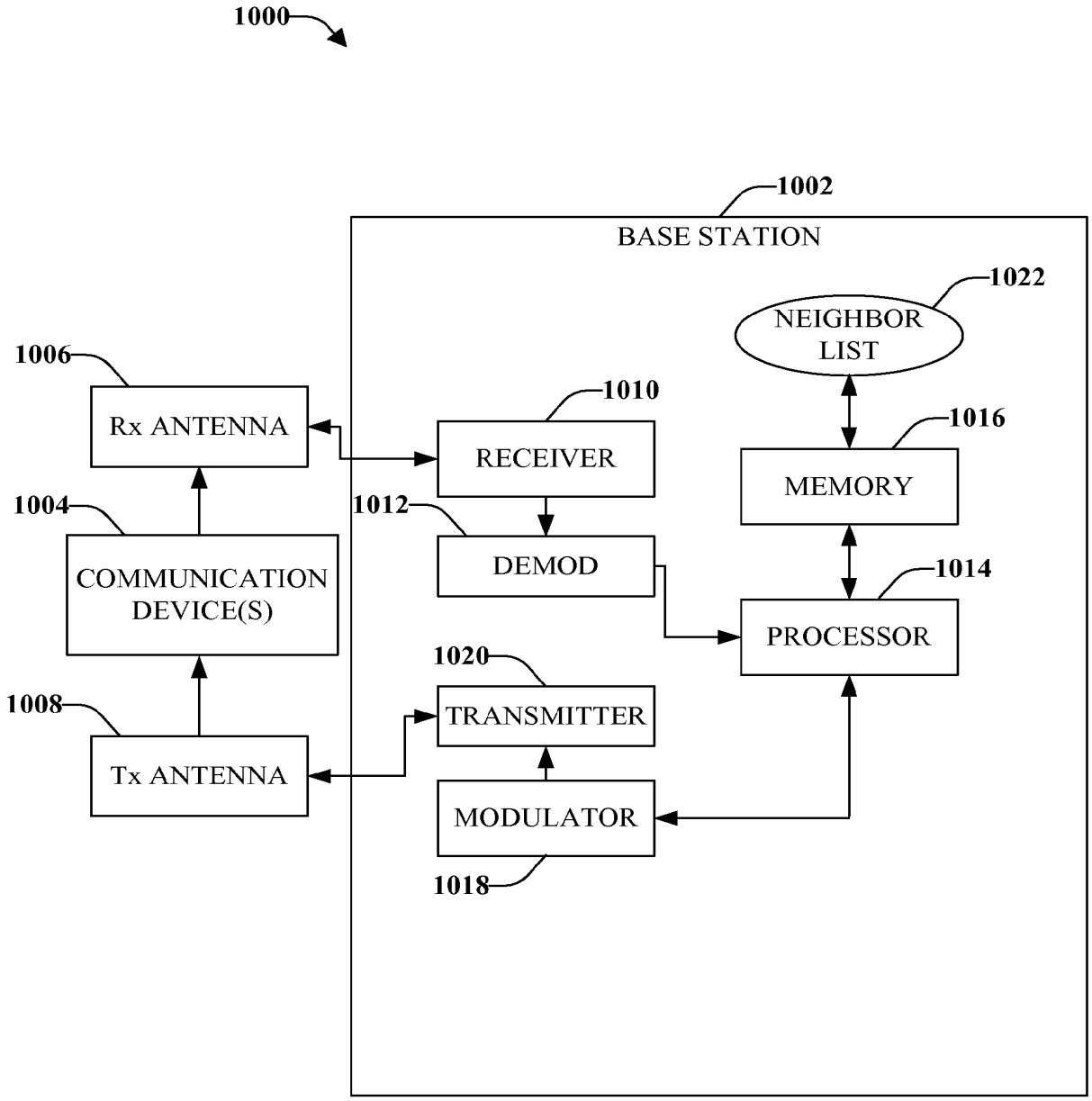

1000
1002
BASE STATION
1022
NEIGHBOR LIST
1006
Rx ANTENNA
1010
RECEIVER
1016
MEMORY
1004
COMMUNICATION DEVICE(S)
1012
DEMOD
1014
PROCESSOR
1020
TRANSMITTER
1008
Tx ANTENNA
MODULATOR
1018

FIG. 10

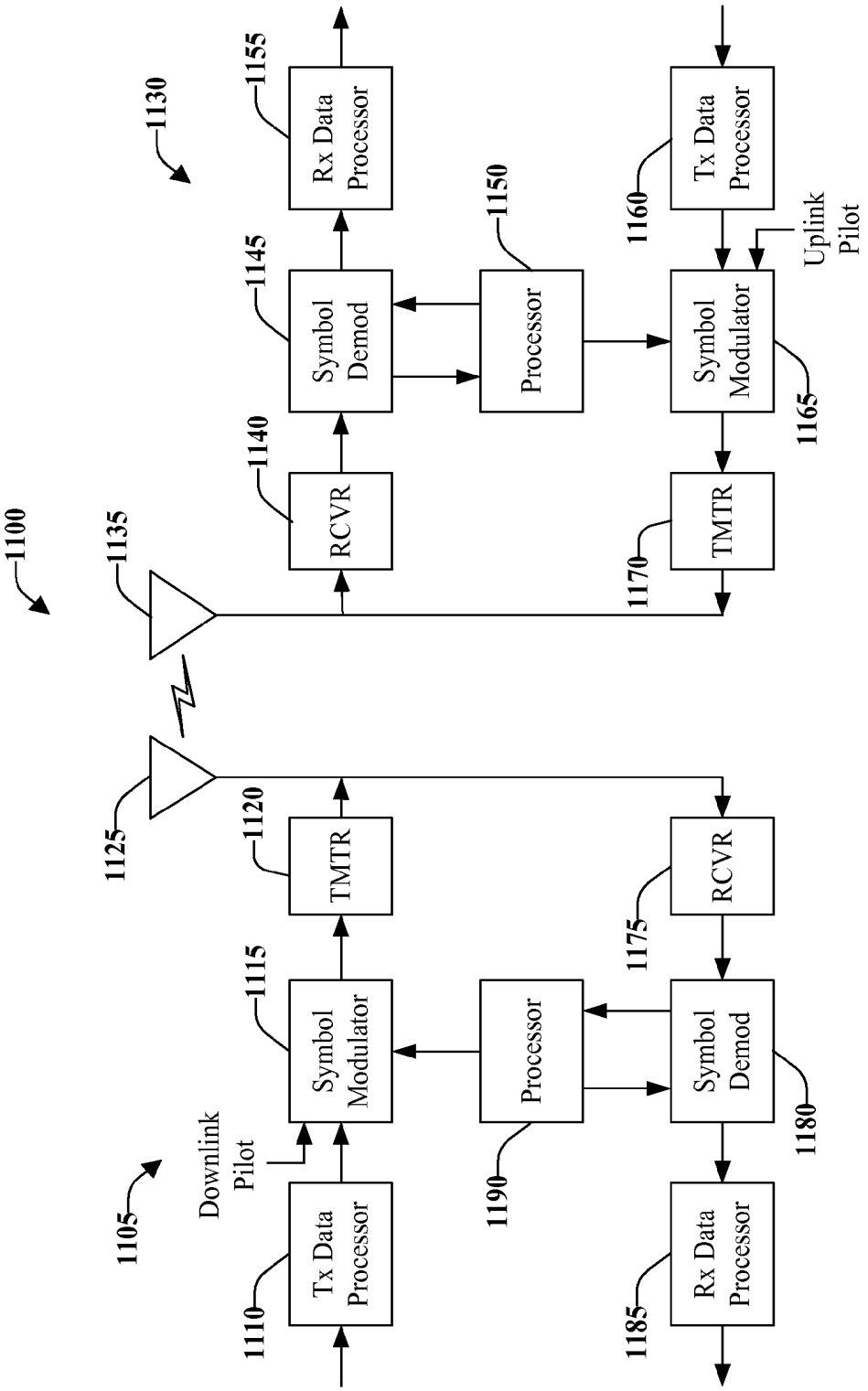

1100
1105
1110
Tx Data Processor
Downlink Pilot
1115
Symbol Modulator
1120
TMTR
1125
1130
1135
1140
RCVR
1145
Symbol Demod
1150
Processor
1155
Rx Data Processor
1160
Tx Data Processor
Uplink Pilot
1165
Symbol Modulator
1170
TMTR
1175
RCVR
1180
Symbol Demod
1185
Rx Data Processor
1190
Processor

FIG. 11

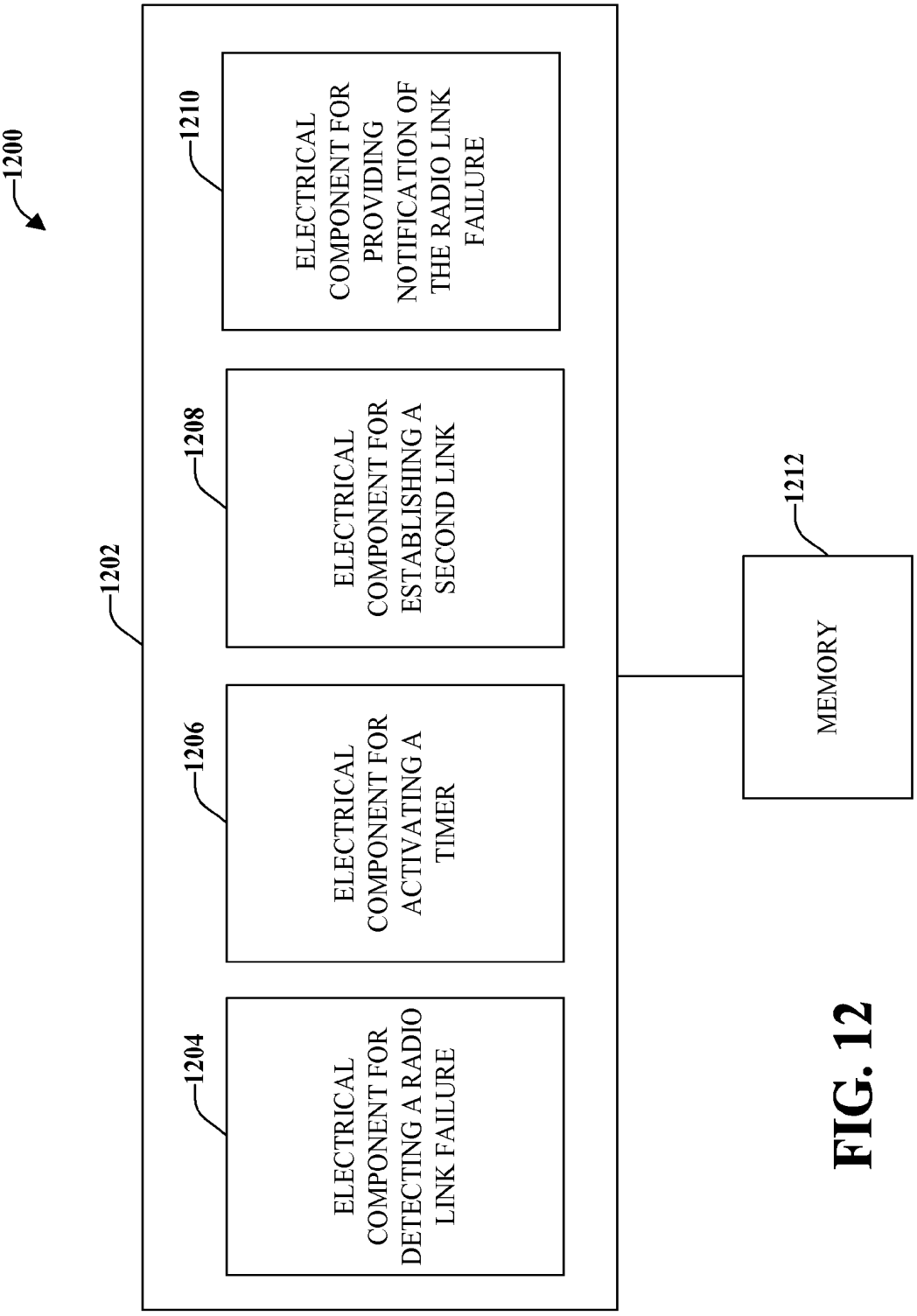

1200
1202
1204
ELECTRICAL COMPONENT FOR DETECTING A RADIO LINK FAILURE
1206
ELECTRICAL COMPONENT FOR ACTIVATING A TIMER
1208
ELECTRICAL COMPONENT FOR ESTABLISHING A SECOND LINK
1210
ELECTRICAL COMPONENT FOR PROVIDING NOTIFICATION OF THE RADIO LINK FAILURE
1212
MEMORY

FIG. 12

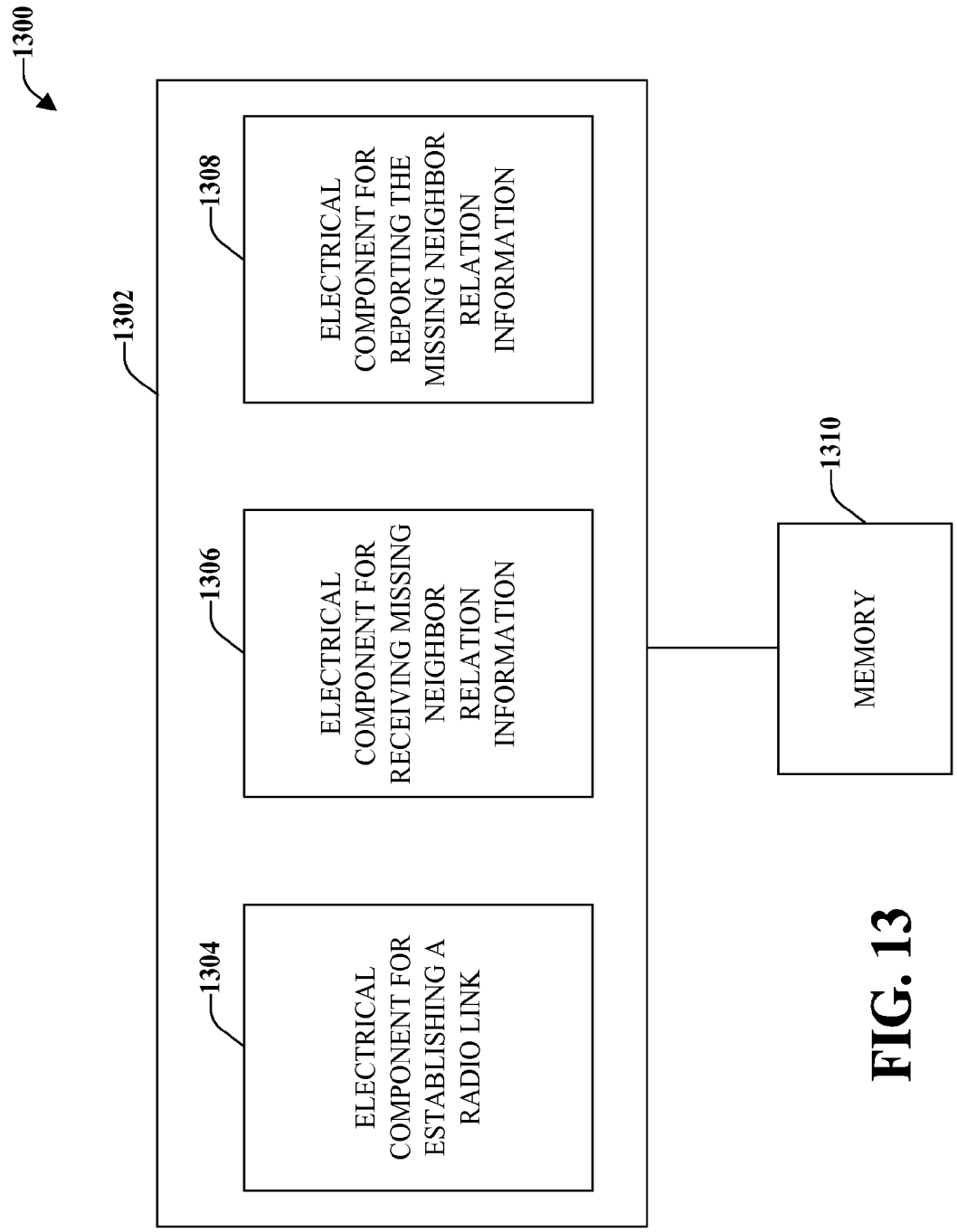

1300
1302
1304
ELECTRICAL COMPONENT FOR ESTABLISHING A RADIO LINK
1306
ELECTRICAL COMPONENT FOR RECEIVING MISSING NEIGHBOR RELATION INFORMATION
1308
ELECTRICAL COMPONENT FOR REPORTING THE MISSING NEIGHBOR RELATION INFORMATION
1310
MEMORY

FIG. 13

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/083108

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W40/24

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/179742 A1 (OGIER RICHARD G [US] ET AL) 25 September 2003 (2003-09-25) abstract figure 1 paragraph [0014] paragraph [0058] - paragraph [0168] paragraph [0213] - paragraph [0255]	1-29
A	WO 01/49061 A (QUALCOMM INC [US]) 5 July 2001 (2001-07-05) abstract page 2, line 10 - page 9, line 5	1-29
P,A	US 2008/146232 A1 (KNISELY DOUGLAS NORMAN [US]) 19 June 2008 (2008-06-19) abstract paragraph [0002] - paragraph [0012] paragraph [0018] - paragraph [0044]	1-29

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

☒ See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 January 2009	06/02/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Plata-Andres, Isabel

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2008/083108

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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WO 0149061 A	05-07-2001	AT 345654 T	15-12-2006
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US 2008146232 A1	19-06-2008	WO 2008077008 A1	26-06-2008

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(54) Title: NEIGHBOUR CELL LISTS

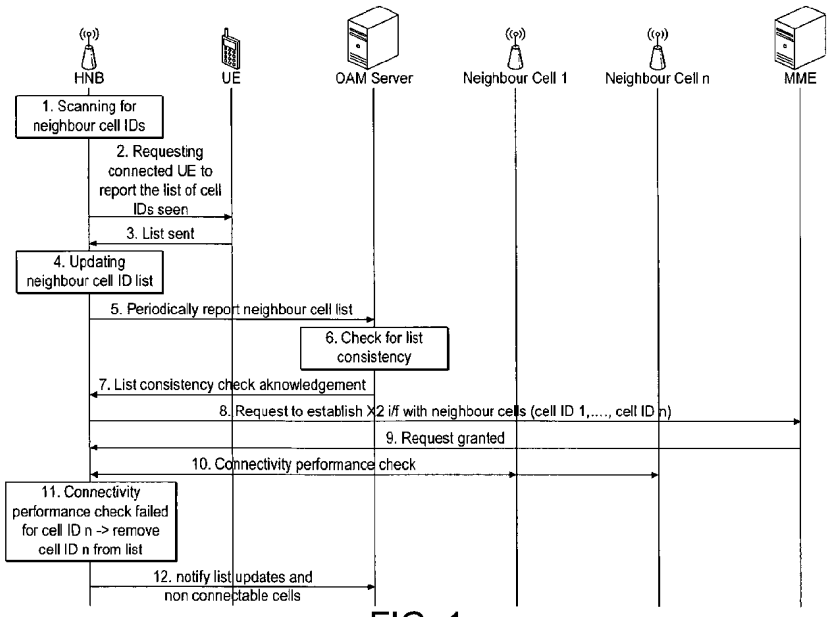


FIG. 1

(57) Abstract: Apparatus, comprising means for providing connectivity information for at least one neighbour cell in a neighbour cell list, said information being dependent on the result of a connectivity check carried out to measure the performance of a route between the apparatus and a respective base station associated with the at least one neighbour cell.

WO 2009/019319 A2

NEIGHBOUR CELL LISTS

The present invention relates to a neighbour cell list. In particular, the present invention relates to providing connectivity information for at least one neighbour cell in a neighbour cell list.

In the third generation partnership project (3GPP) long term evolution (LTE) standardisation work there is ongoing study of the use in LTE networks of so called Home Node Bs (HNBs). A HNB is meant to provide indoor coverage to e.g. a household via LTE radio technology and network architecture support. The user is the owner of the home base station and the connection between the HNB and the operator's network is intended to be achieved via internet connections commonly available to private users, e.g. x digital subscriber line (xDSL).

One of the main issues when deploying HNBs is how to guarantee service continuity and efficient handover to neighbour cells, or to overlapping macro cells. A "neighbour cell" is a cell which is adjacent or proximate to the cell with which the home base station is associated. A "macro cell" comprises a large cell that is optimized to provide coverage rather than capacity, the coverage of which overlaps small cells, such as micro cells, pico cells and femto cells. A solution for such a problem implies the availability of a neighbour cell list as well as appropriate interfaces between the HNB and the neighbour base stations (such interface being called X2) that will allow performance of e.g. handover procedures, data forwarding, measurements exchange etc.

Use of a neighbour cell list at the HNB is intended to facilitate hand over procedures from HNB to macro cell and between HNBs, i.e. in the corporate scenario.

In 3GPP it is desirable to support seamless mobility between HNBs and overlapping macro or between neighbour HNBs.

If a cell is listed in the neighbour cell list it means that handover is possible from the cell owning the list to the cell listed. However, handover procedures strongly benefit from the presence of an X2 interface between the serving and target cell, such interface mainly being used for data forwarding during handovers.

Cells with poor connectivity are automatically included in the neighbour cell list of the HNB and X2 interfaces with such cells will eventually be established. However, due to the poor performance of the end to end connection between the X2 interface end-points, data forwarding, seamless handovers or fast measurements exchanges are not possible (i.e. will not be timely or reliably performed), nullifying the advantages of establishing the X2 interface or keeping the cell in the neighbour cell list. Eventually the UE will be guided to hand over to target cells with poor connectivity with the HNB serving cell, resulting in service interruption due to consequent break before make handovers.

Due to the way HNBs are going to be connected to the operator's network, i.e. via relatively cheap and low performance backhaul, establishment of X2 interfaces will not always be subject to the QoS an X2 would need. One example of degraded QoS is that where the end to end connectivity between the serving and target base stations allows for delays in excess of the maximum limit allowed for data forwarding. The latter nullifies the benefits of establishing an X2 interface and it prompts deletion of the respective cell from the neighbour cell list.

This invention is aimed at providing a method according to which such process of neighbour cell list creation/maintenance is defined, and it aims to reduce or eliminate one or more of the above problems.

A particular problem addressed by this invention is that of allowing neighbour cell list creation and maintenance depending on whether X2 interfaces can be enabled between the node owning the list and the nodes on the list.

At its most general, the present invention provides connectivity information for an entity on a list in dependence on a measurement of the characteristics of a route between the entity on the list and another entity.

According to a first aspect, the present invention may provide an apparatus, comprising means for providing connectivity information for at least one neighbour cell in a neighbour cell list, said information being dependent on the result of a connectivity check carried out to measure the performance of a route between the apparatus and a respective base station associated with the at least one neighbour cell.

The connectivity check may comprise a check to determine whether an interface is capable of establishment over the route. The interface may be for the performance of at least one of a handover procedure, data forwarding, and measurements exchange between the apparatus and the base station. The neighbour cell list may be at the apparatus.

The means for providing connectivity information may comprise means for creating the neighbour cell list. The means for providing connectivity information may comprise means for updating the neighbour cell list. The apparatus may further comprise means for receiving a list of one or more neighbour cell identities. The apparatus may comprise means for requesting the list of one or more neighbour cell identities. The means for providing connectivity information may be arranged to provide the connectivity information in dependence on the list of one or more neighbour cell identities received.

The apparatus may comprise means for reporting the neighbour cell list to a server, such as an operation and maintenance (OAM) server. The server could then perform a coherence check with other neighbour cell lists received from neighbour nodes and prompt for a rescan if it detects an inconsistency between the lists. The apparatus may further comprise means, such as a receiver or transceiver, for receiving from a server a prompt to rescan for one or more neighbour cell identities.

The apparatus may include means for requesting permission from an entity, such as a mobility management entity (MME), for the apparatus to establish the interface with the respective base station in the at least one neighbour cell. The permission request may be for permission to establish an interface with a base station of one cell, or with a base station of each of a plurality or all of the cells on the list. The connectivity check may be carried out once the entity grants permission for the apparatus to establish the interface or interfaces.

The apparatus preferably includes means for performing the connectivity check. The connectivity check may include calculating at least one of round trip delay, packet loss, and sustainable throughput on the route between the apparatus and the respective base station.

The apparatus may include means for removing a neighbour cell from the neighbour cell list in dependence on results of the connectivity check. The apparatus may comprise

means for notifying a server, such as an OAM server, that a neighbour cell, or plural neighbour cells, has been removed from the neighbour cell list.

The apparatus may include means for establishing an interface with the respective base station in the at least one neighbour cell included in the list. Such establishment may be carried out in dependence on the result of the connectivity check.

The apparatus may comprise a base station, such as a home base station. The apparatus may comprise a component part of a base station, and may comprise an electronic chip e.g. within a base station. The apparatus may include means for broadcasting the neighbour cell list within a cell associated with the apparatus/base station.

The at least one neighbour cell may include at least one of a neighbour cell (such as a HNB or an eHNB) and an overlapping macro cell.

According to a second aspect, the present invention may provide a method, comprising providing connectivity information for at least one neighbour cell in a neighbour cell list, said information being dependent on the result of a connectivity check carried out to measure the performance of a route between the apparatus and a respective base station associated with the at least one neighbour cell.

According to a third aspect, the present invention may provide a computer program embodied on a computer readable medium, said computer program configured to control a processor to perform providing connectivity information for at least one neighbour cell in a neighbour cell list, said information being dependent on the result of a connectivity check carried out to measure the performance of a route between the apparatus and a respective base station associated with the at least one neighbour cell.

According to a fourth aspect, the present invention may provide an apparatus, comprising circuitry arranged to provide connectivity information for at least one neighbour cell in a neighbour cell list, said information being dependent on the result of a connectivity check carried out to measure the performance of a route between the apparatus and a respective base station associated with the at least one neighbour cell.

According to a fifth aspect, the present invention may provide an apparatus,

comprising means for receiving a first neighbour cell list including at least one neighbour cell from a home base station; and means for detecting an inconsistency between the neighbour cell list received from the home base station and at least one neighbour cell list received from at least one respective base station, which respective base station neighbours the home base station.

The apparatus of the fifth aspect of the present invention may include means for prompting the home base station to rescan for an element (or elements) of the first neighbour cell list which generates the inconsistency or plural inconsistencies. Moreover, the apparatus of the fifth aspect may further comprise means for receiving a notification from the home base station that a neighbour cell (or plural cells) has been removed from the first neighbour cell list.

The apparatus of the fifth aspect of the present invention may comprise a server, such as an OAM server, or part of a server. For example, the apparatus of the fifth aspect may comprise an electronic chip e.g. within a server.

According to a sixth aspect, the present invention may provide a method, comprising receiving a first neighbour cell list including at least one neighbour cell from a home base station; and detecting an inconsistency between the neighbour cell list received from the home base station and at least one neighbour cell list received from at least one respective base station, which respective base station neighbours the home base station.

According to a seventh aspect, the present invention may provide a computer program embodied on a computer readable medium, said computer program configured to control a processor to perform receiving a first neighbour cell list including at least one neighbour cell from a home base station; and detecting an inconsistency between the neighbour cell list received from the home base station and at least one neighbour cell list received from at least one respective base station, which respective base station neighbours the home base station.

According to an eighth aspect, the present invention may provide an apparatus, comprising a receiver arranged to receive a first neighbour cell list including at least one neighbour cell from a home base station; and a detector arranged to detect an inconsistency between the neighbour cell list received from the home base station and at least one

neighbour cell list received from at least one respective base station, which respective base station neighbours the home base station.

The present invention is not applicable only to whether X2 interfaces are capable of establishment, but is applicable to other interfaces, such as other interfaces between base stations, which preferably allow the performance of e.g. handover procedures, data forwarding, and measurements exchange.

Embodiments of this invention relate to a method to create and maintain neighbour cell lists at the HNB and also relate to a way of checking whether X2 interfaces with neighbour base stations can be established or not.

Embodiments of the invention are not concerned with defining how to create a neighbour cell list from the information received from neighbour or overlapping cells via broadcast radio channels, such as primary broadcast channel (P-BCH).

As the scenario of HNB deployment is relatively new, the problem of neighbour cell list creation/maintenance has always undergone procedures taking into account network, planning and fairly static deployment scenarios. Some solutions have been proposed for the HNB scenario, where the HNB can detect (by acting as a receiver) the P-BCH channel of neighbour cells and derive their cell ID information. However, this way of creating/maintaining the cell ID list does not take into account the backhaul connectivity factors between the HNB and the operator's network or between the HNB and its neighbour base stations.

Ideally it is desirable to ensure that the eNode Bs (eNBs), or HNBs reported in the neighbour cell list of a HNB are also connected to the HNB via a X2 interface. This improves handover to the cells listed in the neighbour cell list. However, due to the backhaul connectivity of HNBs and to the performance it may be subject to, it is foreseen that establishing X2 interfaces with all possible neighbour cells may not be feasible.

Embodiments of the present invention provide criteria as to how X2 interfaces can be setup depending on the entries in the neighbour cell list and/or how the neighbour cell list is maintained depending on X2 interface establishment.

An example of the present invention will now be described with reference to the accompanying drawing, in which:

Figure 1 shows a graphical representation (message sequence chart) of the procedures for neighbour cell list creation and maintenance according to one embodiment of the present invention; and

Figure 2 shows a representation of an apparatus according to one embodiment of the present invention.

It is to be noted that the order of the steps illustrated in the example embodiment of Fig. 1 is not intended to limit the scope of the invention to a series of steps carried out in that particular order. In some embodiments some of the illustrated steps may be carried out in a different order, combined, or even omitted, and yet the other embodiments will be examples of the invention.

At cell setup, home base station (in this embodiment a home node B, or HNB), or rather a scanner of the home base station, scans for received Cell IDs and forms a first list of neighbour cells. The list may include one or more neighbour cells, or rather the list may include information identifying one or more neighbouring cells. The HNB periodically requests that user equipments (UEs) connected to the HNB provide a list of received cell IDs in order to update its neighbour cell list. Such updating may be carried out by circuitry in the home base station. In other embodiments, the request for cell identities may be sent to an entity other than a UE, and an entity other than a UE may provide the list of IDs to the HNB. In this embodiment, the HNB periodically reports the neighbour cell list formed to an operation and maintenance (OAM) server. Having received the list, the OAM server then performs a coherence check with other neighbour cell list received from neighbour nodes. If an inconsistency between the neighbour cell lists submitted to the OAM server by neighbour eNBs/HNBs is detected, the OAM server prompts a rescan for the elements of the neighbour cell lists generating the inconsistency.

Once a stable neighbour cell list has been achieved, as shown in Fig. 1 the HNB requests that the network, i.e. a mobility management entity (MME) grants permission for the HNB to establish an X2 interface with the eNBs/HNBs populating the neighbour cell list. Once permission to establish an X2 interface with such nodes is granted the HNB performs a connectivity check with each of the nodes with which an X2 needs to be established. Such a test may consist of calculating e.g. the round trip delay, packet loss,

sustainable throughput on the end to end route between the HNB and the node with which an X2 needs to be established.

As one of the main purposes of the X2 is to allow data forwarding in handover procedures, an excessive end to end delay along the X2 would impair any type of data forwarding and may neutralise the benefits of such interface. If such a situation is registered the HNB does not attempt to establish an X2 interface with such a node and it eliminates the respective cell ID from its neighbour cell list. Such an event is notified to the OAM server with the appropriate event description, so that the OAM can efficiently detect true anomalies in an HNB's neighbour.

HNBs deployed without undergoing any network planning procedures will not have a preconfigured neighbour cell list. Further, HNBs need to re-create a neighbour cell list in case they are moved from their usual location. If mobility between HNBs and overlapping macro or home neighbour cells has to be provided it is essential in one embodiment of the invention that the HNB broadcasts a neighbour cell list within its cell. If seamless mobility needs to be guaranteed (this being the working assumption at least for the HNB <-> overlapping macro cell scenario) the base stations associated with the cells in the HNB neighbour cell list also preferably need to establish a X2 interface with the HNB owning the list.

Figure 2 shows an embodiment of the apparatus of the present invention. Figure 2 shows a home base station (100) comprising circuitry (102), memory (104), a transmitter (106), a receiver (108) and further circuitry (110) for establishing an X2 interface with another base station. In other embodiments, the further circuitry (110) may be incorporated into the circuitry (102). In other embodiments the transmitter (106) and receiver (108) may be combined as a transceiver, rather than being separate. Indeed, in other embodiments of the invention any of the individual blocks shown in Figure 2 may be combined with others of the individual blocks.

The circuitry (102) carries out the above-mentioned scanning for cell IDs which have been received via the receiver (108) from user equipment. The circuitry (102) forms a neighbour cell list and holds it in the memory (104). In other embodiments, the neighbour cell list (114) is provided to the home base station (100). In any event the circuitry (102) provides connectivity information for at least one neighbour cell on the neighbour cell list

(114).

Connectivity checking circuitry (112) in the circuitry (102) carries out the above-mentioned connectivity check. In other embodiments, the connectivity checking circuitry (112) is an element in the base station (100) separate from the circuitry (102). In further embodiments still, the home base station (100) receives the result of a connectivity check carried out at entity separate from the home base station (100) via the receiver (108).

The transmitter (106) is used for sending requests for the list of cell identities, reporting the neighbour cell list to the OAM server, requesting permission from the MME for permission to establish the X2 interface with the base stations in the neighbouring cells listed in the neighbour cell list, for notifying the OAM when a neighbour cell is removed from the neighbour cell list, and for broadcasting the neighbour cell list. In other embodiments, some or all of these processes are carried out by different elements of the home base station (100), rather than all being carried out by the transmitter (106).

The receiver (108) is used for receiving the list of neighbour cell identities from user equipment and for receiving the prompt from the OAM. In other embodiments these processes are carried out by separate or different elements of the home base station (100).

An advantage of the present invention is that X2 interfaces are established by taking into account the performance of the connectivity route between the two end nodes of the X2 interface. Such performance is not guaranteed in the HNB scenario because the HNB is connected to the IP world by means of cheap and highly available broadband connections such as xDSL. Efficient neighbour cell list creation and maintenance for HNBs is thus preferred for supporting effective mobility.

The disadvantages of not using the present invention include the fact that cells with poor connectivity are automatically included in the neighbour cell list of the HNB and X2 interfaces with such cells will eventually be established. However, due to the poor performance of the end to end connection between the X2 interface end-points, data forwarding, seamless handovers or fast measurements exchanges are not possible (i.e. will not be timely or reliably performed), nullifying the advantages of establishing the X2 interface or keeping the cell in the neighbour cell list. Eventually the UE will be guided to hand over to target cells with poor connectivity with the HNB serving cell, resulting in

service interruption due to consequent break before make handovers.

This invention may also be used in other technologies such as GPRS GUN or more generally in cases where a home base station is deployed with no particular network planning or connectivity performance checks and where interfaces need to be established between such base station and other elements in the network.

In general, the various embodiments of the invention may be implemented in hardware or special purpose circuits, software, logic or any combination thereof. For example, some aspects may be implemented in hardware, while other aspects may be implemented in firmware or software which may be executed by a controller, microprocessor or other computing device, although the invention is not limited thereto.

While various aspects of the invention may be illustrated and described as block diagrams, flow charts, or using some other pictorial representation, it is well understood that these blocks, apparatus, systems, techniques or methods described herein may be implemented in, as non-limiting examples, hardware, software, firmware, special purpose circuits or logic, general purpose hardware or controller or other computing devices, or some combination thereof.

The embodiments of this invention may be implemented by computer software executable by a data processor of the mobile device, such as in the processor entity, or by hardware, or by a combination of software and hardware. Further in this regard it should be noted that any blocks of the logic flow as in the Figures may represent program steps, or interconnected logic circuits, blocks and functions, or a combination of program steps and logic circuits, blocks and functions.

The memory may be of any type suitable to the local technical environment and may be implemented using any suitable data storage technology, such as semiconductor-based memory devices, magnetic memory devices and systems, optical memory devices and systems, fixed memory and removable memory. The data processors may be of any type suitable to the local technical environment, and may include one or more of general purpose computers, special purpose computers, microprocessors, digital signal processors (DSPs) and processors based on multi-core processor architecture, as non-limiting examples.

Embodiments of the inventions may be practiced in various components such as integrated circuit modules. The design of integrated circuits is by and large a highly automated process. Complex and powerful software tools are available for converting a logic level design into a semiconductor circuit design ready to be etched and formed on a semiconductor substrate.

The foregoing description has provided by way of exemplary and non-limiting examples a full and informative description of the exemplary embodiment of this invention. However, various modifications and adaptations may become apparent to those skilled in the relevant arts in view of the foregoing description, when read in conjunction with the accompanying drawings and the appended claims.

Claims:

1. Apparatus, comprising:

means for providing connectivity information for at least one neighbour cell in a neighbour cell list,

said information being dependent on the result of a connectivity check carried out to measure the performance of a route between the apparatus and a respective base station associated with the at least one neighbour cell.

2. Apparatus as claimed in claim 1, wherein the connectivity check comprises a check to determine whether an interface is capable of establishment over the route.

3. Apparatus as claimed in claim 2, wherein the interface is for the performance of at least one of a handover procedure, data forwarding, and measurements exchange between the apparatus and the base station.

4. Apparatus as claimed in any one of claims1 to 3, wherein the neighbour cell list is at the apparatus.

5. Apparatus as claimed in any one of claims 1 to 4, wherein the means for providing connectivity information comprises means for creating the neighbour cell list.

6. Apparatus as claimed in any one of claims 1 to 5, wherein the means for providing connectivity information comprises means for updating the neighbour cell list.

7. Apparatus as claimed in any one of claims 1 to 6, further comprising means for receiving a list of one or more neighbour cell identities.

8. Apparatus as claimed in claim 7, further comprising means for requesting the list of one or more neighbour cell identities.

9. Apparatus as claimed in claim 7 or claim 8, wherein the means for providing connectivity information is arranged to provide the connectivity information in dependence on the list of one or more neighbour cell identities received.

10. Apparatus as claimed in any one of claims 1 to 9, further comprising means for reporting the neighbour cell list to a server.

11. Apparatus as claimed in claim 10, further comprising means for receiving from the server a prompt to rescan for one or more neighbour cell identities.

12. Apparatus as claimed in any one of claims 1 to 11, further comprising means for requesting from an entity permission for the apparatus to establish the interface with the respective base station in the at least one neighbour cell.

13. Apparatus as claimed in any one of claims 1 to 12, further comprising means for performing the connectivity check.

14. Apparatus as claimed in any one of claims 1 to 13, wherein the connectivity check includes calculating at least one of round trip delay, packet loss, and sustainable throughput on the route between the apparatus and the respective base station.

15. Apparatus as claimed in any one of claims 1 to 14, wherein the means for providing connectivity information comprises means for removing a neighbour cell from the neighbour cell list in dependence on results of the connectivity check.

16. Apparatus as claimed in any one of claims 1 to 15, further comprising means for notifying a server that a neighbour cell has been removed from the neighbour cell list.

17. Apparatus as claimed in any one of claims 2 to 16, further comprising means for establishing the interface with the respective base station in the at least one neighbour cell included in the list.

18. Apparatus as claimed in any one of claims 1 to 17, wherein the at least one neighbour cell includes at least one of a neighbour cell and an overlapping macro cell.

19. Method, comprising:

providing connectivity information for at least one neighbour cell in a neighbour cell list,

said information being dependent on the result of a connectivity check carried out to

measure the performance of a route between the apparatus and a respective base station associated with the at least one neighbour cell.

20. Method as claimed in claim 19, wherein the connectivity check comprises a check to determine whether an interface is capable of establishment over the route.

21. Method as claimed in claim 20, wherein the interface is for the performance of at least one of a handover procedure, data forwarding, and measurements exchange between the apparatus and the base station.

22. Method as claimed in any one of claims 19 to 21, wherein the neighbour cell list is at the apparatus.

23. Method as claimed in any one of claims 19 to 22, wherein the providing connectivity information comprises creating the neighbour cell list.

24. Method as claimed in any one of claims 19 to 23, wherein the providing connectivity information comprises updating the neighbour cell list.

25. Method as claimed in any one of claims 19 to 24, further comprising performing the connectivity check.

26. Method as claimed in any one of claims 19 to 25, wherein the connectivity check includes calculating at least one of round trip delay, packet loss, and sustainable throughput on the route between the apparatus and the respective base station.

27. Method as claimed in any one of claims 19 to 26, wherein the providing connectivity information comprises removing a neighbour cell from the neighbour cell list in dependence on results of the connectivity check.

28. Method as claimed in any one of claims 20 to 27, further comprising establishing the interface with the respective base station in the at least one neighbour cell included in the list.

29. Method as claimed in any one of claims 19 to 28, wherein the at least one neighbour

cell includes at least one of a neighbour cell and an overlapping macro cell.

30. A computer program embodied on a computer readable medium, said computer program configured to control a processor to perform:

providing connectivity information for at least one neighbour cell in a neighbour cell list,

said information being dependent on the result of a connectivity check carried out to measure the performance of a route between the apparatus and a respective base station associated with the at least one neighbour cell.

31. Apparatus, comprising:

circuitry arranged to provide connectivity information for at least one neighbour cell in a neighbour cell list,

said information being dependent on the result of a connectivity check carried out to measure the performance of a route between the apparatus and a respective base station associated with the at least one neighbour cell.

32. Apparatus, comprising:

means for receiving a first neighbour cell list including at least one neighbour cell from a home base station; and

means for detecting an inconsistency between the neighbour cell list received from the home base station and at least one neighbour cell list received from at least one respective base station, which respective base station neighbours the home base station.

33. Apparatus as claimed in claim 32, further comprising means for prompting the home base station to rescan for the an element of the first neighbour cell list which generates the inconsistency.

34. Apparatus as claimed in claim 32 or claim 33, further comprising means for receiving a notification from the home base station that a neighbour cell has been removed from the first neighbour cell list.

35. Apparatus as claimed in any one of claims 32 to 34, wherein the apparatus comprises a server.

36. Apparatus as claimed in claim 35, wherein the apparatus comprises an operation and maintenance server.

37. Method, comprising:

receiving a first neighbour cell list including at least one neighbour cell from a home base station; and

detecting an inconsistency between the neighbour cell list received from the home base station and at least one neighbour cell list received from at least one respective base station, which respective base station neighbours the home base station.

38. Method as claimed in claim 37, further comprising prompting the home base station to rescan for the an element of the first neighbour cell list which generates the inconsistency.

39. Method as claimed in claim 37 or claim 38, further comprising receiving a notification from the home base station that a neighbour cell has been removed from the first neighbour cell list.

40. A computer program embodied on a computer readable medium, said computer program configured to control a processor to perform:

receiving a first neighbour cell list including at least one neighbour cell from a home base station; and

detecting an inconsistency between the neighbour cell list received from the home base station and at least one neighbour cell list received from at least one respective base station, which respective base station neighbours the home base station.

41. Apparatus, comprising:

a receiver arranged to receive a first neighbour cell list including at least one neighbour cell from a home base station; and

a detector arranged to detect an inconsistency between the neighbour cell list received from the home base station and at least one neighbour cell list received from at least one respective base station, which respective base station neighbours the home base station.

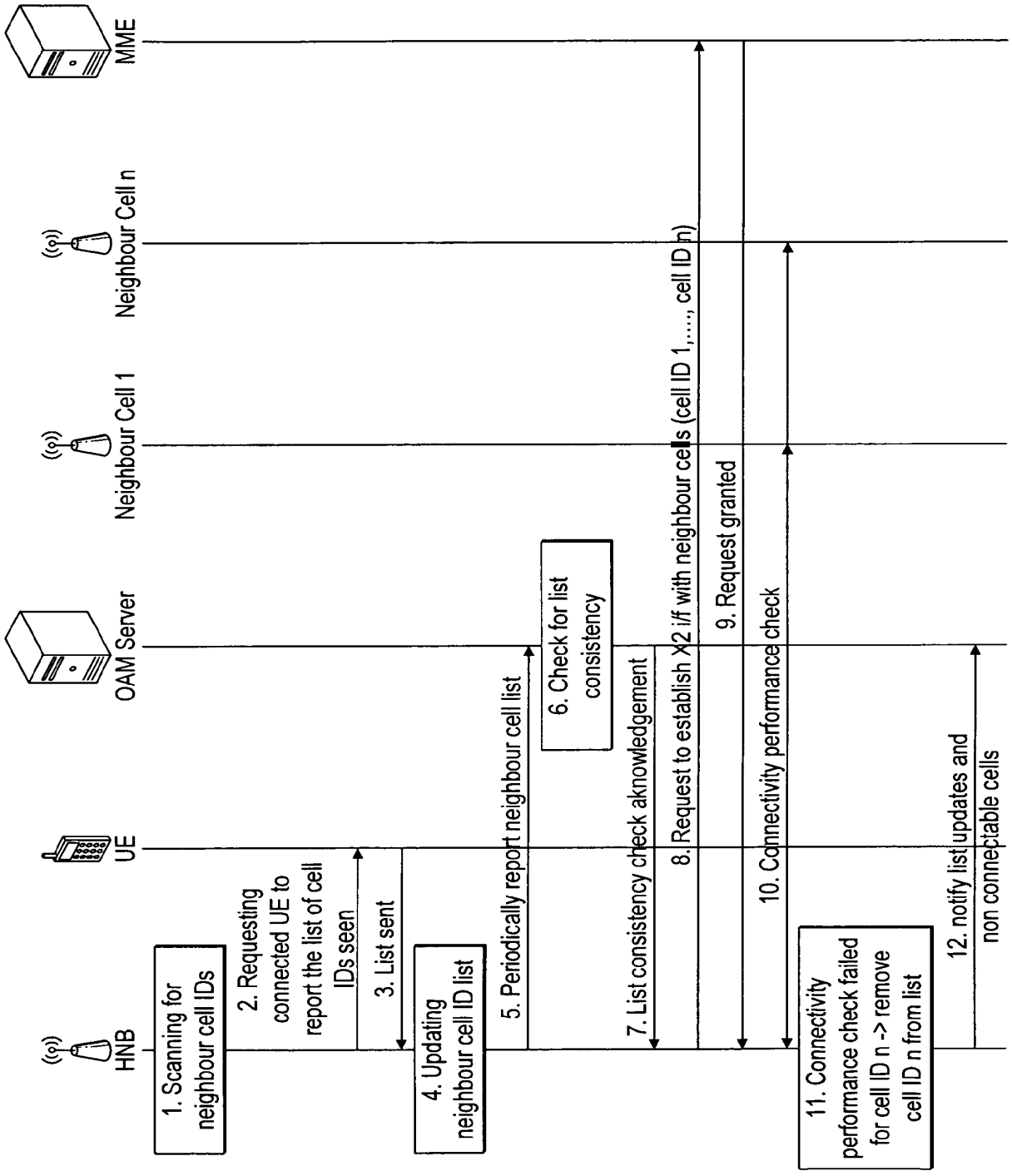

HNB
UE
OAM Server
Neighbour Cell 1
Neighbour Cell n
MME
1. Scanning for neighbour cell IDs
2. Requesting connected UE to report the list of cell IDs seen
3. List sent
4. Updating neighbour cell ID list
5. Periodically report neighbour cell list
6. Check for list consistency
7. List consistency check aknowledgement
8. Request to establish X2 i/f with neighbour cells (cell ID 1,...., cell ID n)
9. Request granted
10. Connectivity performance check
11. Connectivity performance check failed for cell ID n -> remove cell ID n from list
12. notify list updates and non connectable cells

FIG. 1

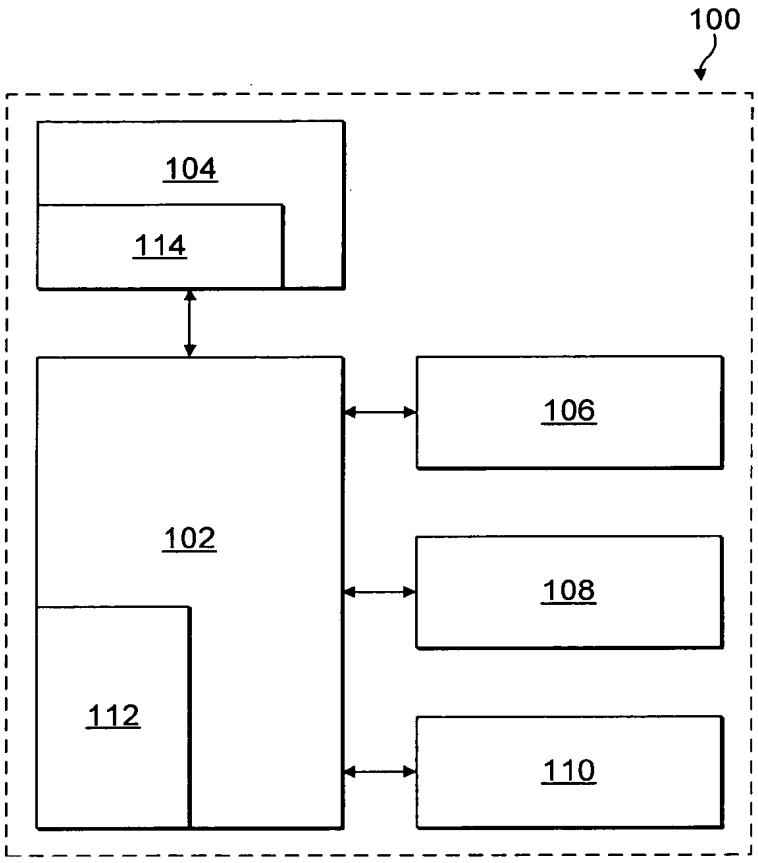


FIG. 2

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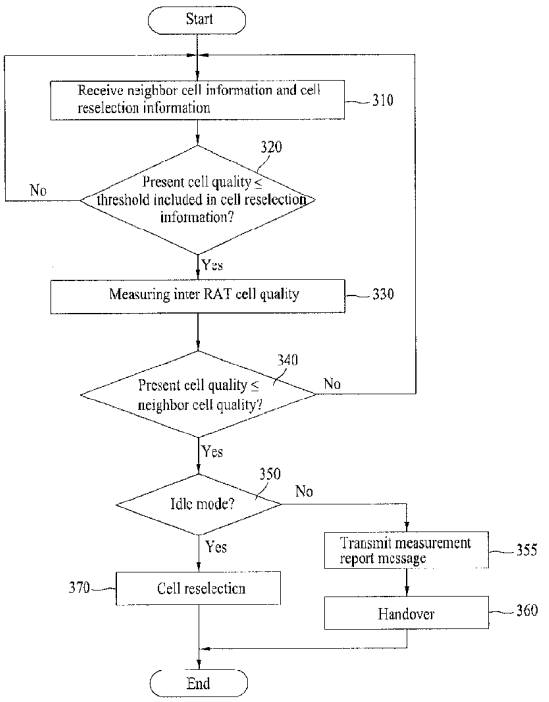
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(54) Title: METHOD FOR SUPPORTING MOBILITY OF MOBILE TERMINAL, AND MOBILE TERMINAL THEREOF

FIG. 3



(57) Abstract: A method for supporting mobility of a mobile station and the mobile station which supports the mobility are disclosed. The method of supporting the mobility of the mobile station includes receiving cell reselection information and neighbor cell information from a base station (BS) of a present cell, wherein the cell reselection information includes thresholds for determining whether the quality of the other RAT cell shall be measured or not, wherein the neighbor cell information includes a frame duration code and a frame number of a downlink frame in the other RAT cell, wherein the frame duration code indicates the start preamble of the downlink frame; determining whether a mobile station (MS) shall measure the quality of the other RAT cell or not using the thresholds; and measuring the quality of the other RAT cell and reselecting a cell or transmitting the measured result to the BS through a measurement report message according to the measured result, if it is determined that the MS would measure the quality of the other RAT cell. Accordingly, since the mobility of the mobile station between the E- UTRAN network and the other RAT cell is supported, the mobile station can continuously receive a service while maintaining current service quality although a user moves to the other RAT cell.

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【DESCRIPTION】

【Invention Title】

METHOD FOR SUPPORTING MOBILITY OF MOBILE TERMINAL, AND MOBILE TERMINAL THEREOF

【Technical Field】

The present invention relates to a inter radio access technology (RAT), and more particularly, to a method for supporting mobility of a mobile station between an evolved UMTS terrestrial radio access (E-UTRAN) network which is provided in the 3rd Generation Partnership Project (3GPP) and the other RAT cell.

【Background Art】

The inter RAT indicates a technology of allowing a mobile station to continuously receive a service, which is currently being used, even when a mobile station is moved from a network, in which the mobile station is registered, to the other RAT cell so as to improve the convenience of a user.

In the 3GPP network, as shown in FIGs. 1A and 1B, system information is transmitted. The system information may be transmitted using a system information block as

shown in FIG. 1A or may be transmitted using a measurement control message as shown in FIG. 1B. A base station periodically transmits the system information block to a mobile station such that the mobile station knows information about a cell in which the mobile station is registered and a neighbor cell, for example, radio bearer information, physical channel information, and an attribute such as cell quality, and provides useful information such that the mobile station continuously receives a service from a present cell or the mobile station is moved to a cell having high quality.

In the technology of the 3GPP network, 15, 16 or 18 pieces of system information are respectively defined and used in a Global System for Mobile communication (GSM), a General Packet Radio Service (GPRS) and a Universal Mobile Telecommunication System (UMTS). Table 1 shows system information block types 4 using cell selection and reselection in a system information block used in the UMTS network. As shown in Table 1, the system information includes information elements including an individual parameter and various parameters, for example, cell selection and reselection information.

Table 1

Information Element/Group name	Need	Type and reference
UTRAN mobility information elements		
Cell identity	Mandatory	Cell identity
Cell selection and re-selection info	Mandatory	Cell selection and re-selection info for SIB3/4
Cell Access Restriction	Mandatory	Cell Access Restriction

In the 3GPP network, cell measurement is performed as follows. The mobile station periodically measures the quality of a present cell or a neighbor cell, for example, an intra neighbor cell or an inter RAT neighbor cell, includes a measurement value in a measurement report message, and transmits the measurement report message to the base station. The base station which receives the measurement report message from the mobile station checks the value included in the message, compares the quality of the cell managed by the base station with the quality of the neighbor cell, and determines whether the mobile station shall stay in the present cell or shall be moved to the neighbor cell having the quality higher than that of the present cell. The measurement report message transmitted from the mobile station to the base station may be transmitted to the base station by a periodic method or an event-trigger method.

Currently, in the 3GPP inter-RAT, a technology of supporting mobility between other RAT cells in the same standard, for example, a technology of supporting mobility from a UMTS network defined in the 3GPP to a GSM network

was developed.

However, a technology of supporting mobility between other RAT cells in different standards, for example, a technology of supporting mobility between an E-UTRAN network which is provided in the 3GPP and a World Interoperability for Microwave Access (WiMAX) network which is provided in the IEEE has not been developed.

【Disclosure】

【Technical Problem】

An object of the present invention devised to solve the problem lies on a method for supporting mobility of a mobile station between an E-UTRAN network and the other RAT cell.

Another object of the present invention devised to solve the problem lies on a mobile station to which a method of supporting mobility of the mobile station is applied.

【Technical Solution】

The object of the present invention can be achieved by providing a method of supporting mobility between E-UTRAN network and the other RAT cell includes receiving

cell reselection information and neighbor cell information from a base station (BS) of a present cell, wherein the cell reselection information includes thresholds, wherein the neighbor cell information includes downlink frame information of the other RAT cell; determining whether a mobile station (MS) shall measure the quality of the other RAT cell or not using the thresholds; and measuring the quality of the other RAT cell and reselecting a cell or transmitting the measured result to the BS through a measurement report message according to the measured result, if it is determined that the MS would measure the quality of the other RAT cell.

Preferably, the frame information included in the neighbor cell information may include a frame duration code indicating a downlink frame start preamble of the other RAT cell and a frame number of a downlink frame of the other RAT cell.

Preferably, the determining may include determining that the MS would measure the quality of the other RAT cell if the signal quality of a present cell is equal to or lower than a signal quality threshold or the Rx power strength of the present cell is equal to or lower than an Rx power strength threshold.

Preferably, the transmitting through the measurement

report message may include adjusting, by the MS, the transmission frequency of the measurement report message using at least one of a hysteresis parameter or time-to-trigger parameter.

Preferably, the neighbor cell information may be used when any one of cell reselection or handover is performed with respect to the mobile station.

In another aspect of the present invention, provided herein is a method of supporting mobility between E-UTRAN network and the other RAT cell, the method including transmitting cell reselection information and neighbor cell information from a base station (BS) to a mobile station (MS) periodically, wherein the cell reselection information includes thresholds for determining whether the quality of the other RAT cell shall be measured or not, wherein the neighbor cell information includes a frame duration code and a frame number of a downlink frame in the other RAT cell, wherein the frame duration code indicates the start preamble of the downlink frame; at the MS, receiving a measurement report message which includes the result of measuring the quality of the other RAT cell according to the thresholds; and transmitting a command which indicates a handover of the MS according to the measured result.

Preferably, the neighbor cell information and the

cell reselection information may be transmitted in a way that information elements are added to a system information block transmitted from the BS to the MS periodically.

Preferably, the cell reselection information and the neighbor cell information may be transmitted in a way that system information is added to a measurement control message transmitted from the BS to the MS periodically, and the system information includes the cell reselection information and the neighbor cell information.

Preferably, the neighbor cell information may further include at least one of bandwidth information and a preamble index. The bandwidth information indicates cell bandwidth size of the other RAT cell and the preamble index indicates a specific preamble of a physical layer in the other RAT cell.

In a further aspect of the present invention, provided herein is a mobile station supporting mobility between E-UTRAN network and other RAT, the mobile station including: system information receiving portion to receive cell reselection information and neighbor cell information from a base station (BS) of a present cell periodically, wherein the cell reselection information includes thresholds for determining whether the quality of the other RAT cell shall be measured or not, wherein the neighbor

cell information includes a frame duration code and a frame number of a downlink frame in the other RAT cell, wherein the frame duration code indicates the start preamble of the downlink frame; quality measurement portion to measure the quality of other RAT cell if it is determined that the quality of the other RAT cell would be measured according to the thresholds; and measurement report portion to transmit a result of measuring the quality of the other RAT cell to the BS through a measurement report message.

Preferably, the quality measurement portion may measure the quality of the other RAT cell according to duration scheduled in a measurement gap registered in the MS and the BS if the mobile station is in an active mode.

Preferably, the mobile station may be a dual receiver which is able to receive signals of the E-UTRAN and the other RAT cell simultaneously.

【Advantageous Effects】

According to an embodiment of the present invention, since the mobility of the mobile station between the E-UTRAN network and the other RAT cell is supported, the mobile station can continuously receive a service while maintaining current service quality although a user moves to the other RAT cell.

【Description of Drawings】

The accompanying drawings, which are included to provide a further understanding of the invention, illustrate embodiments of the invention and together with the description serve to explain the principle of the invention.

In the drawings:

FIGs. 1A and 1B are views showing a conventional scheme of transmitting system information from a base station to a mobile station.

FIG. 2 is a view showing a base station and a mobile station in an E-UTRAN network according to an embodiment of the present invention.

FIG. 3 is a flowchart illustrating a method for supporting mobility of a mobile station according to an embodiment of the present invention.

FIG. 4A is a view showing an example in which a mobile station receives a system information block and triggers a measurement report message, according to an embodiment of the present invention.

FIG. 4B is a view showing an example in which a mobile station receives a measurement control message and triggers the measurement control message, according to an

embodiment of the present invention.

FIG. 5A is a view showing a method for checking a code "series to modulate" according to preamble indexes.

FIG. 5B is a view showing a method for reading a preamble corresponding to a preamble index.

FIG. 5C is a view showing an example of the structure of a WiMAX frame associated with FIG. 5B.

FIG. 6 is a view showing an example of the structure of a system information block according to the present invention.

FIG. 7 is a graph showing a method for adjusting the amount of measurement report message in consideration of a hysteresis margin according to an embodiment of the present invention.

FIG. 8 is a graph showing a method for adjusting the amount of measurement report message in consideration of a time-to-trigger parameter according to an embodiment of the present invention.

【Mode for Invention】

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. The detailed description set forth below in connection with the appended

drawings is intended as a description of exemplary embodiments and is not intended to represent the only embodiments in which the concepts explained in these embodiments can be practiced.

FIG. 2 is a view showing a base station 220 and a mobile station 210 in an E-UTRAN network according to an embodiment of the present invention.

The mobile station 210 of FIG. 2 includes a system information receiving portion 211, a quality measurement portion 212, a measurement report portion 213 and a cell reselection unit 214.

The system information receiving portion 211 receives neighbor cell information and cell reselection information from the base station 220 of a present cell. The neighbor cell information includes downlink frame information of the other RAT cell and the cell reselection information includes thresholds for determining whether or not the quality of the other RAT cell shall be measured. The neighbor cell information transmitted from the base station 220 to the mobile station may include bandwidth information indicating a cell bandwidth size of the other RAT cell and a preamble index indicating a specific preamble of a physical layer in the other RAT cell.

The quality measurement portion 212 measures the

quality of the other RAT cell while the signal of the other RAT cell is received, if it is determined that the quality of the other RAT cell is measured according to the thresholds. At this time, if the mobile station 210 is a single receiver, the quality measurement portion 212 may be configured to measure the quality of the other RAT cell according to a measurement gap. In contrast, if the mobile station 210 is a dual receiver, the quality measurement portion 212 may be configured to measure the quality of the other RAT cell if the quality of the present cell measured by the mobile station 210 is equal to or lower than the threshold of the cell selection information.

The measurement report portion 213 transmits the result measured by the quality measurement portion 212 to the base station through a measurement report message periodically or an event-trigger method, if the mobile station 210 is in an active mode.

The cell reselection unit 214 performs a cell reselection procedure of the mobile station 210 according to the measured result or performs handover according to a command received from a measurement report checking unit 222, that is, a handover command message. In more detail, the cell reselection unit 214 performs the cell reselection procedure if the mobile station 210 is in an idle mode and

performs the handover procedure if the mobile station 210 is in the active mode.

The base station 220 includes a system information transmission unit 221 and the measurement report checking unit 222.

The system information transmission unit 221 periodically transmits neighbor cell information and cell reselection information to the mobile station 210. The system information including the neighbor cell information and the cell reselection information is transmitted to the mobile station through the system information block or the measurement control message.

The measurement report checking unit 222 receives the measurement report message including the result of measuring the quality of the other RAT cell from the mobile station 210. The measurement report checking unit 222 transmits the command indicating that the mobile station 210 should perform the handover, that is, the handover command message, to the mobile station 210, if the handover of the mobile station 210 is necessary according to the measured result included in the measurement report message.

FIG. 3 is a flowchart illustrating a method for supporting mobility of a mobile station according to an embodiment of the present invention.

The mobile station receives neighbor cell information and cell reselection information from a base station of a present cell (step 310). The neighbor cell information includes downlink frame information of the other RAT cell and the cell reselection information includes thresholds for determining whether or not the quality of the other RAT cell shall be measured.

Next, it is determined whether or not the mobile station shall measure the quality of the other RAT cell using the thresholds of the cell reselection information (step 320). That is, if the quality of the present cell checked by the mobile station is equal to or lower than the threshold of the cell selection information, it is determined that the quality of the other RAT cell would be measured and, if the quality of the present cell measured by the mobile station exceeds the threshold of the cell selection information, the step (step 310) of, at the mobile station, receiving the neighbor cell information and the cell reselection information from the base station of the present cell is repeated.

If it is determined that the mobile station would measure the quality of the other RAT cell, the mobile station measures the quality of the other RAT cell while the signal of the other RAT cell is received (step 330).

Next, it is determined whether cell reselection or a quality measurement report shall be performed according to the quality information of the neighbor cell measured by the mobile station (step 335). That is, if the quality of the present cell checked by the mobile station exceeds the quality of the neighbor cell measured by the mobile station, the step (step 310) of, at the mobile station, receiving the neighbor cell information and the cell reselection information from the base station of the present cell is repeated. In contrast, if the quality of the present cell checked by the mobile station is equal to or lower than the quality of the neighbor cell measured by the mobile station, the method progresses to a next step (step 350) of reporting the cell reselection or the quality measurement.

Next, it is checked whether the mobile station is in an idle mode (step 350). If the mobile station is in an active mode, the result measured by the mobile station is included in a measurement report message and the measurement report message is transmitted to the base station (step 355). The base station receives the measurement report message from the mobile station and determines whether the handover shall be performed with respect to the mobile station according to the measured result included in the measurement report message. If the

base station transmits the command indicating that the handover should be performed, that is, the handover command message, to the mobile station, the mobile station performs handover into the neighbor cell (step 360). In this step (step 360), the mobile station may use the neighbor cell information which is previously received from the base station.

In contrast, if the mobile station is in the idle mode, the cell reselection using the neighbor cell information is performed (step 370). Even in this step (step 370), the mobile station may use the neighbor cell information which is previously received from the base station.

Hereinafter, a WiMAX network will be, for example, described as the other RAT cell.

The neighbor cell information and the cell reselection information are transmitted in a state of being included in the system information block or the measurement control message transmitted in the E-UTRAN network as information elements.

FIG. 4A is a view showing an example in which a mobile station receives a system information block transmitted by the E-UTRAN base station and triggers a measurement report message.

The E-UTRAN base station 220 transmits the system information block including the present cell information and the neighbor cell information to the mobile station 210 (405).

In the E-UTRAN, the base station may provide WiMAX system information to the mobile station. In order to allow the mobile station to be moved from the E-UTRAN network to the WiMAX network, necessary information of the WiMAX cell should be previously received through the system information in the E-UTRAN network. The necessary information may be received through two types of system information as follows.

The system information block (SIB) is a message which is periodically transmitted from the E-UTRAN base station to the mobile station and includes the WiMAX neighbor cell necessary for allowing the mobile station to be moved from the cell managed by the E-UTRAN base station to the cell managed by the WiMAX base station. The system information as the neighbor cell information may include the base station identifier (BS ID) or information necessary for synchronization, which is performed in order to receive downlink information of the WiMAX neighbor cell, as shown in Table 2. The contents included in the system information block are shown in Table 2.

Table 2

Name	Description
WiMAX RAT Identifier	This field contains the identifier of WiMAX RAT among the RAT IDs (e.g. GSM, CDMA 20001X, etc).
NAP ID	NAP (Network Access Provider) is a business entity that provides WiMAX radio access infrastructure to one or more WiMAX Network Service Providers (NSPs).
NSP ID	NSP (Network Service Provider) is a business entity that provides IP connectivity and WiMAX services to WIMAX subscribers compliant with the Service Level agreement it establishes with WiMAX subscribers.
BS ID	BS (Base Station) ID is a global unique identifier for a WiMAX base station.
MAC Version	MAC Version specifies the version of IEEE 802.16 to which BS or MS.
System Version	This indicates the Mobile WiMAX release as specified by the WiMAX Forum Mobile Air Interface System Profile.
QoS Levels Supported	QoS level which is supported in WiMAX cell (e.g. Real time service or Non-Real time service etc).
DL center carrier frequency of WiMAX neighbouring cells	Identifies the DL center carrier frequency of WiMAX neighboring cells. DL center carrier frequency shall be a multiple of 250 kHz.
Bandwidth	Identifies the size of cell bandwidth (the difference between the highest and lowest frequencies available for network signals. It is also used to describe the amount of data that can be transmitted in a fixed amount of time).
FFT size	Indicates the FFT sizes supported by the MS.
Preamble index	Identifies the PHY-specific Preamble for the WiMAX neighboring BS.
Frame Duration Code	This field indicates the periodicity of the DL frame start preamble.
Frame Number	Indicates the current DL Frame Number and incremented by 1 MOD 2^{24} each frame.
Other parameter	In addition, other parameter similar to those used in intra-3GPP inter-RAT idle mode mobility can also be sent on the E-UTRAN broadcast channel.

The system information block (SIB) may include information necessary for determining whether or not the mobile station which is in the idle mode (LTE_IDLE) needs to be moved from the cell managed by the E-UTRAN base

station to the cell managed by the WiMAX base station. Such information is a message which is periodically transmitted from the E-UTRAN base station to the mobile station. The contents included in the system information block are shown in Table 3.

Table 3

Name	Description
WiMAX RAT Identifier	This field contains the identifier of WiMAX RAT among the RAT IDs (e.g. GSM, CDMA 20001X, etc).
WiMAX Start Measuring E-UTRAN Signal Quality Threshold	This field contains the threshold of the signal quality of the current cell to trigger WiMAX measurements
WiMAX Start Measuring E-UTRAN Rx Power Strength Threshold	This field contains the threshold of the Rx Power Strength of the current cell to trigger WiMAX measurements

The mobile station 210 which receives the system information block from the base station 220 checks whether the quality of the present cell in the contents of the system information block satisfies the following condition (420).

The thresholds for determining whether or not the condition is satisfied include a WiMAX start measuring E-UTRAN signal quality threshold (hereinafter, referred to as a first threshold) and a WiMAX start measuring E-UTRAN receiver (Rx) power strength threshold (hereinafter, referred to as a second threshold).

That is, if the measured signal quality of the present cell (serving cell) is equal to or lower than the first threshold or if the measured Rx power strength of the

serving cell is equal to or lower than the second threshold, the measurement of the WiMAX cell is started.

The mobile station 210 collects the WiMAX neighbor cell information, includes the WiMAX neighbor cell information in the measurement report message, and transmits the measurement report message to the base station 220 (430).

The WiMAX neighbor cell information may be added to the measurement control message transmitted from the E-UTRAN base station to the mobile station such that the mobile station performs the measurement by another method for transmitting the system information including the WiMAX neighbor cell information.

FIG. 4B is a view showing an example in which a mobile station receives a measurement control message transmitted by the E-UTRAN base station and triggers the measurement control message.

The E-UTRAN base station 220 includes information, which is desired to be reported by the mobile station 210, in the measurement control message and transmits the measurement control message to the mobile station (410).

The mobile station 210 checks the measurement control message received from the base station 220 and determines whether or not the attribute of the WiMAX neighbor cell

shall be measured (420). Similarly, the determination whether or not the attribute of the WiMAX neighbor cell shall be measured uses the first threshold and the second threshold as described above.

The mobile station measures the signal quality and the Rx power strength from the signal transmitted by the E-UTRAN base station managed by the cell in which the mobile station is registered. The mobile station compares the measured value and the thresholds in the system information block received from the E-UTRAN base station, that is, the first threshold and the second threshold, and determines whether the information (e.g., the signal quality and the Rx power strength) of the WiMAX neighbor cell shall be measured or only the present cell information shall be continuously measured.

The mobile station 210 measures the attribute of the WiMAX neighbor cell according to the contents of the measurement control message, includes the attribute in the measurement report message, and transmits the measurement report message to the E-UTRAN base station (430).

If the quality (e.g., the signal quality and the Rx power strength) of the present E-UTRAN cell is equal to or lower than the threshold included in the system information block, the mobile station measures the WiMAX neighbor cell

information and reports the WiMAX neighbor cell information to the base station. The base station checks the measured result reported from the mobile station and performs handover of the mobile station into the WiMAX neighbor cell if the quality of the WiMAX neighbor cell is higher than that of the base station of the present cell.

In particular, in the embodiment of the present invention, the base station provides parameters such as a bandwidth, a preamble index, a frame duration code, a frame number and an FFT size to the mobile station.

The mobile station may acquire information used for a process of reading a preamble of a WiMAX frame through preamble index information. The mobile terminal may acquire a receive signal strength indicator (RSSI) and a carrier-to-interference-and-noise ratio (CINR) of the WiMAX cell after decoding the preamble, and read DL-MAP information of FIG. 5C necessary for DL synchronization. For example, if the mobile station acquires the preamble index, the mobile station can know a code "series to modulate" of FIG. 5A. The mobile station analyzes the code so as to recognize a cell ID and a segment, that is, a sector. In FIG. 5B, if the preamble index is 0, the mobile station reads only the preamble corresponding to a segment 1 of a cell 1. FIG. 5C is a view showing an example of the

structure of a WiMAX frame including the preamble and the DL-MAP which is the information for downlink synchronization. The mobile station may readily perform synchronization for receiving the downlink information of the WiMAX network through the DL-MAP information after decoding the preamble.

The mobile station can recognize DL carrier allocation information. The DL carrier allocation information facilitates the reception of the DL information. The mobile station can know the following DL carrier allocation through the FFT size. That is, the mobile station can know the number of DC subcarriers, the number of guard subcarriers, the number of all subcarriers within a symbol, pilots, the number of data subcarriers, the number of data subcarriers per subchannel, the number of subchannels through the FFT size.

FIG. 6 is a view showing an example of the structure of a system information block (SIB) in the case where the neighbor cell information and the cell reselection information are added to the system information block (SIB).

The transmission of the system information for the cell selection and cell reselection from the E-UTARN network to the WiMAX network uses a method for adding information elements to the system information block (SIB)

used in the E-UTRAN, and the system information may be transmitted to the mobile station through an SIB3 message. The transmission of the system information including the WiMAX neighbor cell uses a method for adding the information elements to the system information used in the E-UTRAN, and the system information may be transmitted to the mobile station through a SIB5 message.

Meanwhile, if the neighbor cell information and the cell reselection information are included in the measurement control message, the procedure of collecting the parameters of the measurement control message by the mobile station is changed. The meanings of the parameters of the measurement control message are shown in Table 4.

Table 4

Name	Description
Measurement Identity	Identifier to discriminate the measurement report message.
Measurement Command	Indicates the purpose of measurement report message (e.g. Setup, Modify, Delete)
Measurement Type	Indicates the measurement type. (e.g. Intra frequency measurement, Inter frequency measurement, Inter RAT Measurement)
Report Criteria	Indicates the Event (e.g. Event3a, Event3b, Event3c, Event3d).
Other Information	Cell list, Physical channel information elements, etc.

Hereinafter, a process of measuring the quality of the neighbor RAT cell and reporting the measured result will be described in detail.

In order to allow the mobile station to be moved from the E-UTRAN network to the WiMAX network, the mobile

station should measure the attribute (e.g., the signal quality and the Rx power strength) of the WiMAX cell. This measurement can be performed in the idle (LTE_IDLE) mode and the active (LTE_ACTIVE) mode. The idle (LTE_IDLE) mode and the active (LTE_ACTIVE) mode described herein are as follows.

The idle (LTE_IDLE) mode indicates the mode in which the mobile station has only minimum information in order to perform the communication between the mobile station and the E-UTRAN base station. In order to transmit a message of an upper layer between the mobile station and the base station, the mode should transition to the active (LTE_ACTIVE) mode. The supporting of the mobility in the idle (LTE_IDLE) mode is performed by the cell reselection.

The active (LTE_ACTIVE) mode indicates the mode in which the mobile station has all information necessary for performing the communication between the mobile station and the E-UTRAN base station, that is, the mode in which the message of the upper layer can be transmitted between the mobile station and the base station. The supporting of the mobility in the active (LTE_ACTIVE) mode is performed by handover.

The mobile station which is in the idle (LTE_IDLE) mode in the E-UTRAN network may measure a specific

attribute of the E-UTRAN cell and the WiMAX cell in order to perform the cell reselection, and schedule a DRX duration such that a receiver is turned off (DRX off duration) in a predetermined period so as to reduce power consumption. It is determined whether or not the mobile station shall measure the attribute of the WiMAX neighbor cell, by at least one of the first threshold or the second threshold.

An example of the rule of measuring and stopping the attribute of the WiMAX neighbor cell by the mobile station is as follows.

First, if the measured signal quality of the serving cell is equal to or lower than the first threshold or if the measured Rx power strength of the serving cell is equal to or lower than the second threshold, the measurement of the WiMAX cell is started.

During the measurement of the WiMAX cell, if the measured signal quality of the serving cell is higher than the first threshold or if the measured Rx power strength of the serving cell is higher than the second threshold, the measurement of the WiMAX cell is stopped.

Even in the mobile station which is registered in the E-UTRAN network is currently in the active (LTE_ACTIVE) mode, the same rule is applied similar to the mobile

station which is in the idle (LTE_idle) mode, and the necessary information of the WiMAX cell is measured.

When the mobile station which is in the active (LTE_ACTIVE) mode measures the WiMAX cell information, a measurement gap is required. The measurement gap indicates information for scheduling duration which can measure the information about the serving base station or another network for a predetermined period of time while the mobile station communicates with the serving base station. The mobile station which is registered in the E-UTRAN network can measure the WiMAX cell information according to the duration scheduled in the measurement gap. The measuring method of the mobile station in the active (LTE_ACTIV) mode may be changed according to the capability (UE capability) of the mobile station. For example, if the mobile station is a single receiver, that is, if the mobile station cannot simultaneously receive signals of two networks, the measurement gap is required. If the mobile station is a dual receiver, that is, if the mobile station can simultaneously receive the signals of the two networks, the signal of the other RAT cell except the network in which the mobile station is currently registered can be received or measured without the measurement gap.

The mobile station which is in the active

(LTE_ACTIVE) mode measures the RSSI and the CINR of the WiMAX neighbor cell. The mobile station may classify the WiMAX neighbor cell using a WiMAX neighbor cell list included in the measurement control message and the system information received from the base station. The mobile station may transmit the measured RSSI or CINR to the WiMAX neighbor cell through the measurement report message, and may transmit the measurement report only when the measured RSSI or CINR exceeds a specific threshold. In addition, the transmission of the measurement report message may use both a method for periodically transmitting the message from the mobile station to the base station and a method for reporting the message when a specific event is generated. The event which can trigger the inter RAT measurement report will now be described.

That is, the event includes a case where the estimated quality of the serving system is equal to or lower than a specific threshold and the estimated quality of the target system is higher than the specific threshold (event 3a), a case where the estimated quality of the target system is equal to or lower than the specific threshold (event 3b), a case where the estimated quality of the target system is higher than the specific threshold (event 3c), and a case where a best cell is changed in the

target system (event 3d).

The mobile station may control the transmission amount of the measurement report message using a hysteresis parameter and a time-to-trigger parameter.

As shown in FIG. 7, only when the signal strength of the neighbor cell 1 is higher than a hysteresis margin although higher than the threshold, the event 3a is triggered and the measurement report message is transmitted, thereby adjusting the amount of message.

FIG. 8 is a graph showing a method for adjusting the transmission of measurement report message in consideration of a time-to-trigger parameter according to an embodiment of the present invention. As shown in FIG. 8, when the signal strength of the neighbor cell 1 is higher than the threshold for a period of time corresponding to the time-to-trigger parameter although being higher than the threshold, the event 3a is triggered and the measurement report message is transmitted, thereby adjusting the amount of message.

As described above, the mobile station receives the neighbor cell information and the cell reselection information from the base station before being moved to the WiMAX cell and previously acquires the WiMAX neighbor cell such that the mobile station is readily moved from the E-

UTRAN network to the WiMAX network and a time consumed for the movement of the mobile station is reduced.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

【Industrial Applicability】

The present invention is applicable to an inter radio access technology (RAT), and more particularly, to an access algorithm of an E-UTRAN network which is provided in the 3GPP and apparatuses associated therewith, such as a mobile station and a base station.

【CLAIMS】

【Claim 1】 A method of supporting mobility between E-UTRAN network and the other RAT cell, the method comprising:

receiving cell reselection information and neighbor cell information from a base station (BS) of a present cell, wherein the cell reselection information includes thresholds for determining whether the quality of the other RAT cell shall be measured or not, wherein the neighbor cell information includes a frame duration code and a frame number of a downlink frame in the other RAT cell, wherein the frame duration code indicates the start preamble of the downlink frame;

determining whether a mobile station (MS) shall measure the quality of the other RAT cell or not using the thresholds; and

measuring the quality of the other RAT cell and reselecting a cell or transmitting the measured result to the BS through a measurement report message according to the measured result, if it is determined that the MS would measure the quality of the other RAT cell.

【Claim 2】 The method of claim 1, wherein the neighbor cell information includes at least one of bandwidth

information, a preamble index or FFT size, wherein the bandwidth information indicates a cell bandwidth size of the other RAT cell, wherein the preamble index indicates a specific preamble of a physical layer in the other RAT cell.

【Claim 3】 The method of claim 1, wherein the determining comprises determining that the MS would measure the quality of the other RAT cell if the signal quality of the present cell is equal to or lower than a signal quality threshold or the Rx power strength of the present cell is equal to or lower than an Rx power strength threshold.

【Claim 4】 The method of claim 1, wherein the transmitting through the measurement report message comprises adjusting, by the MS, the transmission frequency of the measurement report message using at least one of a hysteresis parameter or time-to-trigger parameter.

【Claim 5】 The method of claim 1, further comprising receiving a handover command message from the BS and performing handover into the other RAT cell.

【Claim 6】 The method of claim 1, wherein the other RAT

cell is a WiMAX cell.

【Claim 7】 A method of supporting mobility between E-UTRAN network and the other RAT cell, the method comprising:

transmitting cell reselection information and neighbor cell information from a base station (BS) to a mobile station (MS) periodically, wherein the cell reselection information includes thresholds for determining whether the quality of the other RAT cell shall be measured or not, wherein the neighbor cell information includes a frame duration code and a frame number of a downlink frame in the other RAT cell, wherein the frame duration code indicates the start preamble of the downlink frame;

at the MS, receiving a measurement report message which includes the result of measuring the quality of the other RAT cell according to the thresholds; and

transmitting a command which indicates a handover of the MS according to the measured result.

【Claim 8】 The method of claim 7, wherein the neighbor cell information and the cell reselection information are transmitted in a way that information elements are added to a system information block transmitted from the BS to the MS periodically.

【Claim 9】 The method of claim 7, wherein the cell reselection information and the neighbor cell information are transmitted in a way that system information is added to a measurement control message transmitted from the BS to the MS periodically, and the system information includes the cell reselection information and the neighbor cell information.

【Claim 10】 The method of claim 7, wherein the neighbor cell information includes at least one of bandwidth information, a preamble index or FFT size, wherein the bandwidth information indicates cell bandwidth size of the other RAT cell, wherein the preamble index indicates a specific preamble of a physical layer in the other RAT cell.

【Claim 11】 The method of claim 7, wherein the other RAT cell is a WiMAX cell.

【Claim 12】 A mobile station supporting mobility between E-UTRAN network and other RAT, the mobile station comprising:

system information receiving portion to receive cell reselection information and neighbor cell information from a base station (BS) of a present cell periodically, wherein the cell reselection information includes thresholds for determining whether the quality of the other RAT cell shall be measured or not, wherein the neighbor cell information includes a frame duration code and a frame number of a downlink frame in the other RAT cell, wherein the frame duration code indicates the start preamble of the downlink frame;

quality measurement portion to measure the quality of other RAT cell if it is determined that the quality of the other RAT cell would be measured according to the thresholds; and

measurement report portion to transmit a result of measuring the quality of the other RAT cell to the BS through a measurement report message.

【Claim 13】 The mobile station of claim 12, wherein the quality measurement portion measures the quality of the other RAT cell according to duration scheduled in a measurement gap registered in the mobile station and the BS if the mobile station is in an active mode.

【Claim 14】 The mobile station of claim 12, wherein the mobile station is a dual receiver which is able to receive signals of the E-UTRAN and the other RAT cell simultaneously.

FIG. 1A

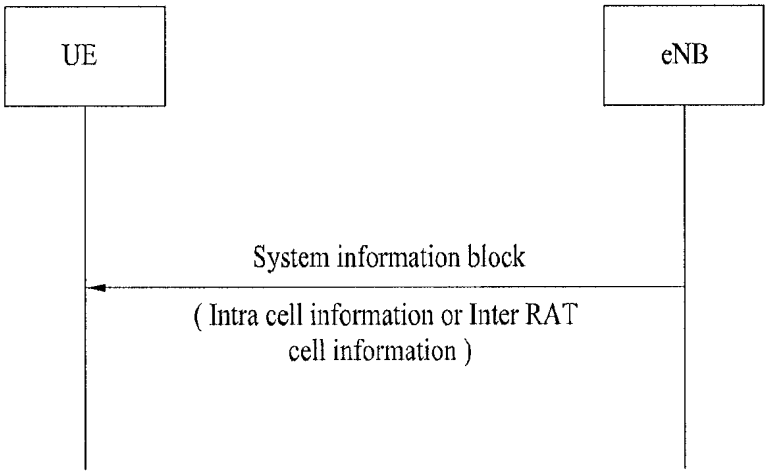

UE
eNB
System information block
(Intra cell information or Inter RAT cell information)

FIG. 1B

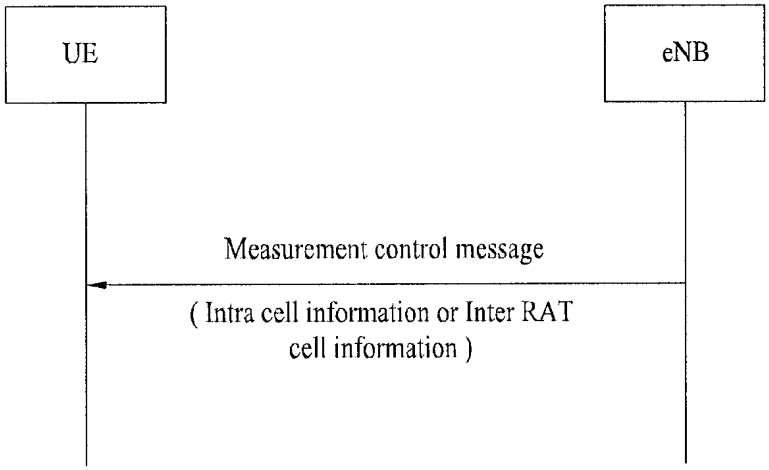

UE
eNB
Measurement control message
(Intra cell information or Inter RAT cell information)

FIG. 2

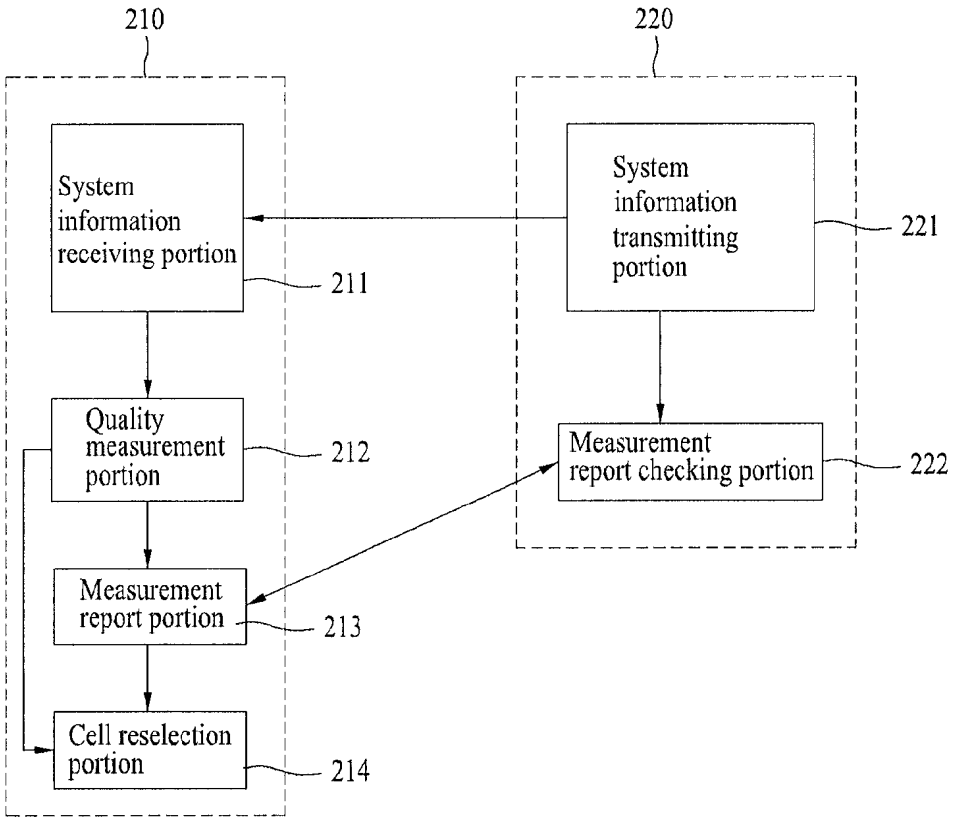

210
220
System information receiving portion
211
System information transmitting portion
221
Quality measurement portion
212
Measurement report checking portion
222
Measurement report portion
213
Cell reselection portion
214

FIG. 3

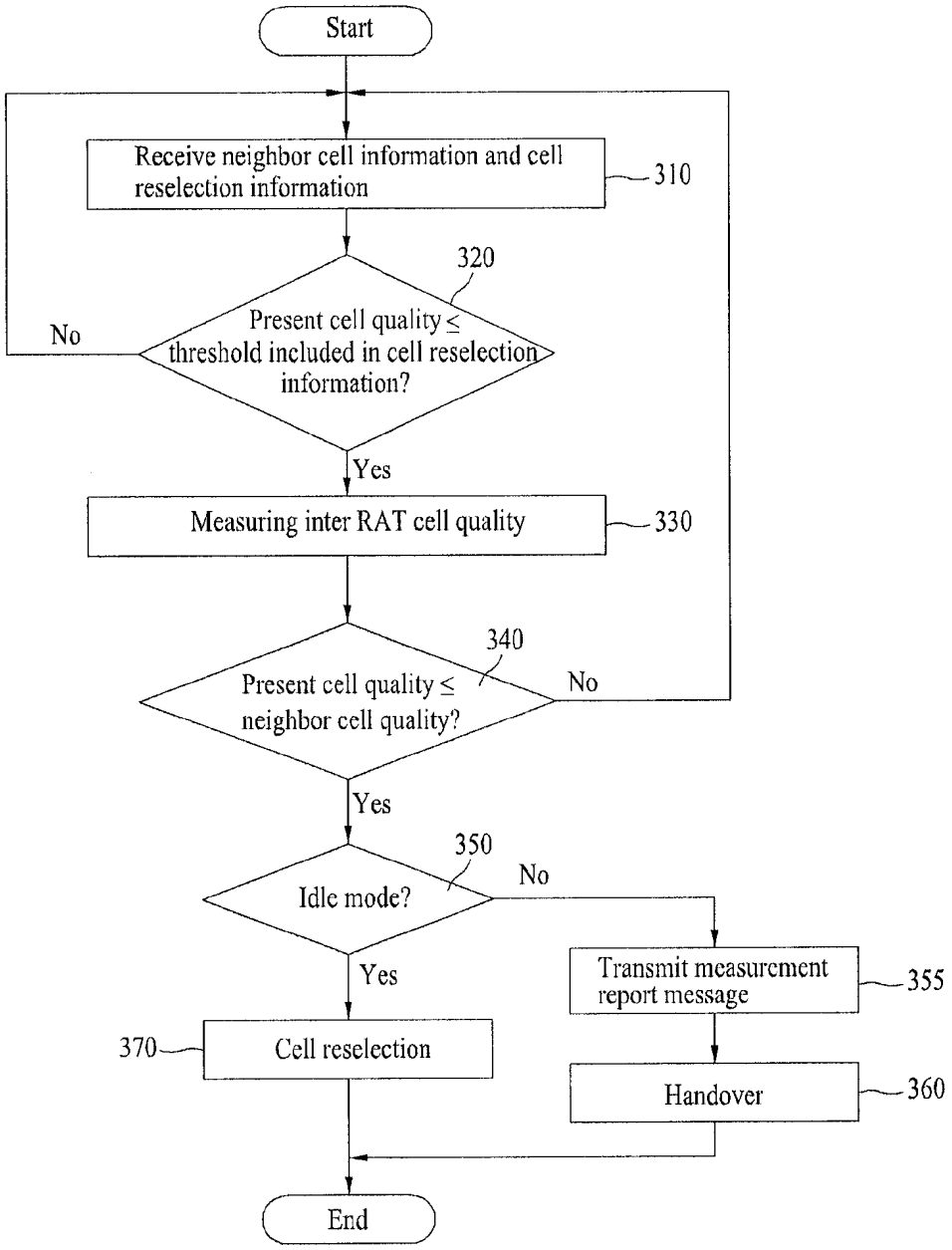

Start
Receive neighbor cell information and cell reselection information
310
320
Present cell quality ≤ threshold included in cell reselection information?
No
Yes
Measuring inter RAT cell quality
330
340
Present cell quality ≤ neighbor cell quality?
No
Yes
350
Idle mode?
No
Yes
Transmit measurement report message
355
370
Cell reselection
Handover
360
End

FIG. 4A

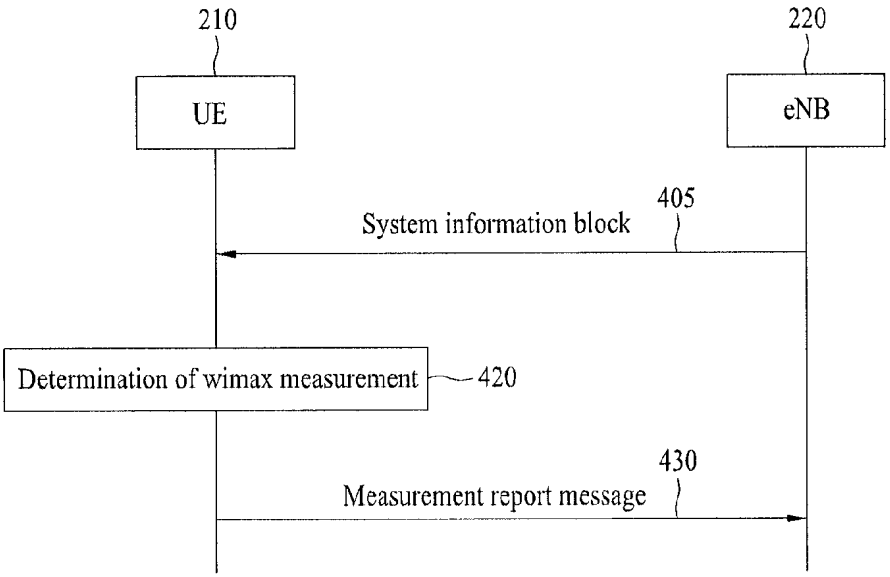

210
220
UE
eNB
405
System information block
Determination of wimax measurement
420
430
Measurement report message

FIG. 4B

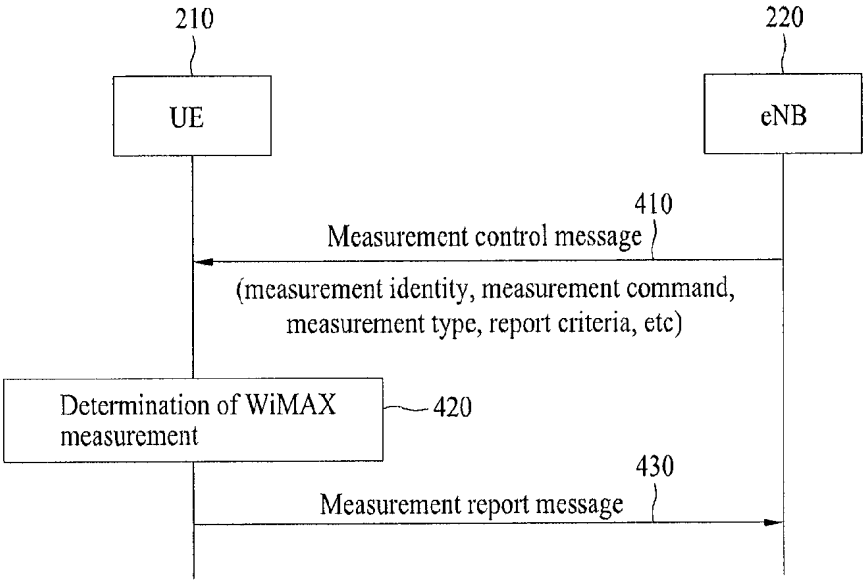

210
220
UE
eNB
410
Measurement control message
(measurement identity, measurement command, measurement type, report criteria, etc)
Determination of WiMAX measurement
420
430
Measurement report message

FIG. 5A

Preamble Index	Cell ID	segment	Series to modulate
0	1	1	0xA6F294537B285E1844677D1 33E4D53CCB1F182DE00489E5 3E6B6E

FIG. 5B

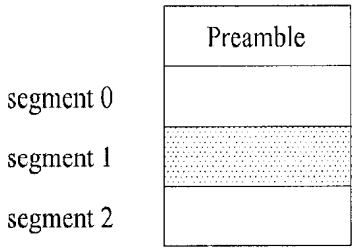


FIG. 5C

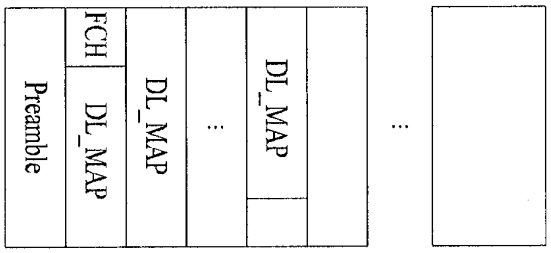


FIG. 6

System Information Block 3	System Information Block 5

Information Elements
{
Cell reselection information
}
	Information Elements
	{
	Neighbor cell information
	}

Other information	Other information

FIG. 7

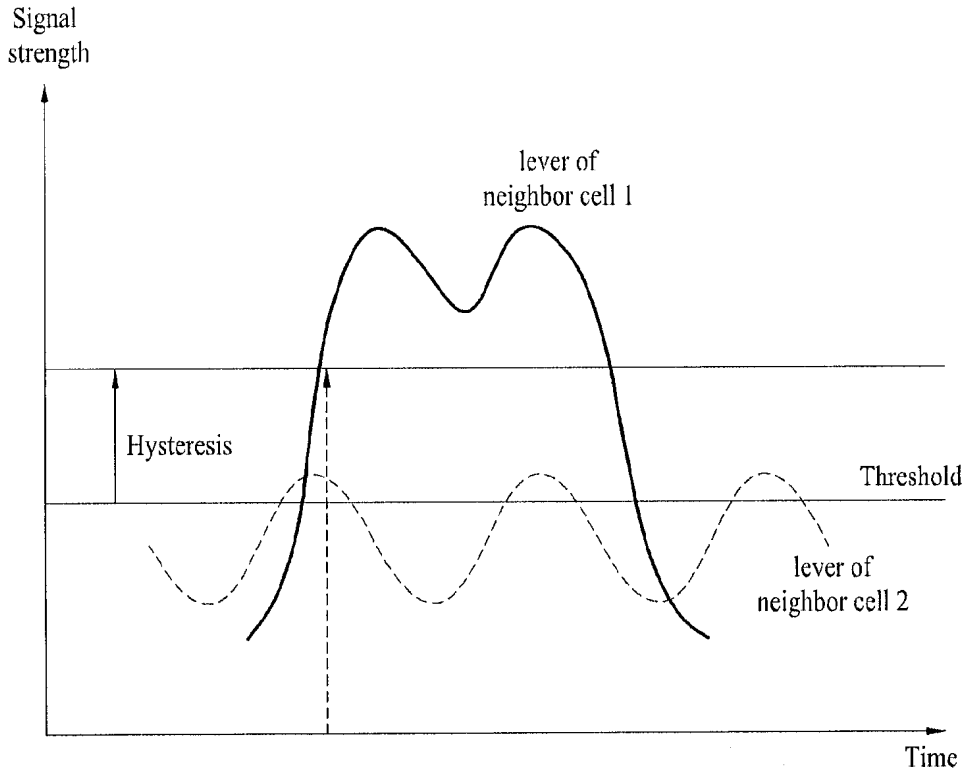
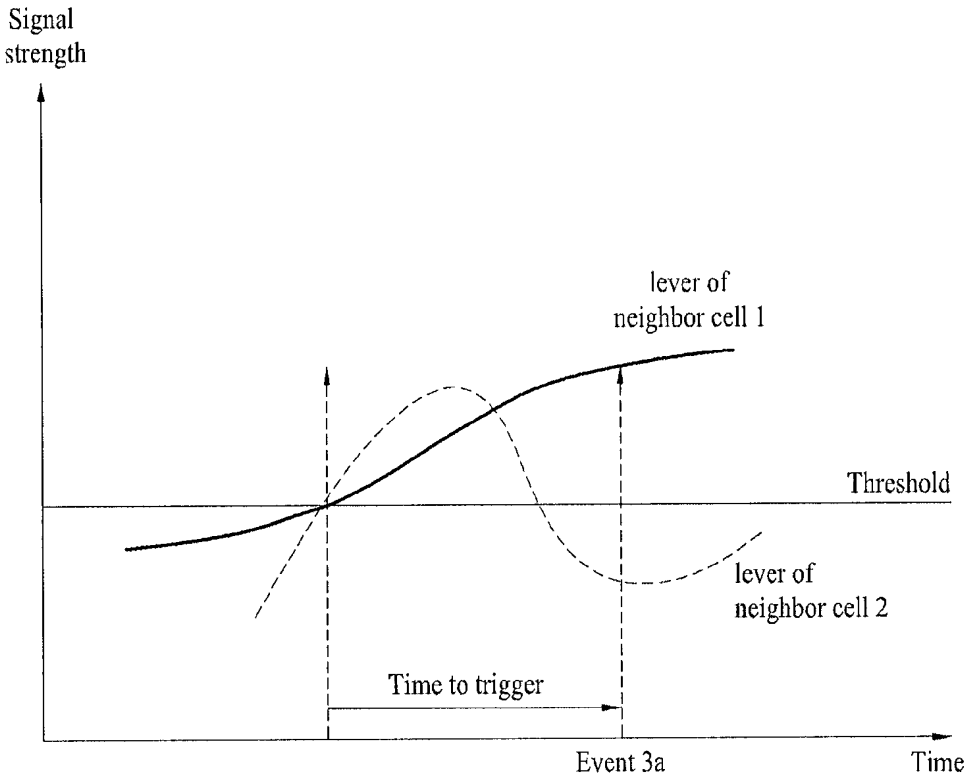

Signal strength
lever of neighbor cell 1
Hysteresis
Threshold
lever of neighbor cell 2
Time

FIG. 8


Signal strength
lever of neighbor cell 1
Threshold
lever of neighbor cell 2
Time to trigger
Event 3a
Time

Optimisation of neighbourcells

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
Wuyts, Koenraad Maria
Royal KPN N.V.
P.O. Box 95321
2509 CH The Hague
PAYS-BAS

PCT

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

(PCT Rule 44.1)

Applicant's or agent's file reference 403446WO	Date of mailing *(day/month/year)* 24 January 2011 (24-01-2011)
	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/EP2010/064823	International filing date *(day/month/year)* 5 October 2010 (05-10-2010)

Applicant

KONINKLIJKE KPN N.V.

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

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Fascimile No.: (41-22) 338.82.70

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

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

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

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

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

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

For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	REICHERT, Jacques Tel: +49 (0)89 2399-5951

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
403446WO		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/EP2010/064823	05/10/2010	07/10/2009
Applicant		
KONINKLIJKE KPN N.V.		

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

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

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

1. **Basis of the report**

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

[X] the international application in the language in which it was filed

[ ] a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

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

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

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

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

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

[ ] the text is approved as submitted by the applicant

[X] the text has been established by this Authority to read as follows:

SYSTEM FOR UPDATING A NEIGHBOR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

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

[X] the text is approved as submitted by the applicant

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

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

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

[ ] as suggested by the applicant

[ ] as selected by this Authority, because the applicant failed to suggest a figure

[X] as selected by this Authority, because this figure better characterizes the invention

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

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/064823

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W36/02 H04W24/10
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 2009/119699 A2 (NEC CORP [JP]; SERRAVALLE FRANCESCA [GB]) 1 October 2009 (2009-10-01) page 7, line 28 - page 9, paragraph 15 page 12, paragraph 13 - page 13, paragraph 24 claims 1,75,76 figures 3,5,8,9,10	1,9,13 2-8, 10-12,14
Y	WO 2009/064716 A1 (QUALCOMM INC [US]; FLORE ORONZO [US]; GRILLI FRANCESCO [US]; CHAPONNIE) 22 May 2009 (2009-05-22) paragraph [0052] - paragraph [0056] paragraph [0062] - paragraph [0065]	2-8, 10-12,14

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 January 2011	24/01/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Patras, Paula Larisa

3

Form PCT/ISA/210 (second sheet) (April 2005)

International application No
PCT/EP2010/064823

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2009/019319 A2 (NOKIA SIEMENS NETWORKS OY [FI]; CENTONZA ANGELO [GB]) 12 February 2009 (2009-02-12) * abstract page 7, line 15 - page 8, line 3 page 8, line 22 - page 9, line 20	1-14
A	WO 2009/045070 A2 (LG ELECTRONICS INC [KR]; PARK GI WON [KR]; KIM YONG HO [KR]; LEE JIN [) 9 April 2009 (2009-04-09) the whole document	1-14

3

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2009119699 A2	01-10-2009	EP 2255573 A2	01-12-2010
		GB 2458886 A	07-10-2009
WO 2009064716 A1	22-05-2009	CA 2703812 A1	22-05-2009
		CN 101855927 A	06-10-2010
		EP 2220894 A1	25-08-2010
		KR 20100093087 A	24-08-2010
		US 2009137265 A1	28-05-2009
WO 2009019319 A2	12-02-2009	CN 101822077 A	01-09-2010
		EP 2179597 A2	28-04-2010
		US 2010208693 A1	19-08-2010
WO 2009045070 A2	09-04-2009	KR 20090034261 A	07-04-2009
		US 2010216474 A1	26-08-2010

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2010/064823	05.10.2010	07.10.2009

International Patent Classification (IPC) or both national classification and IPC
INV. H04W36/02 H04W24/10

Applicant
KONINKLIJKE KPN N.V.

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

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

2. **FURTHER ACTION**

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

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

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

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:

European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0
Fax: +49 89 2399 - 4465

Date of completion of this opinion
see form PCT/ISA/210

Authorized Officer
Patras, Paula Larisa
Telephone No. +49 89 2399-4081

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

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

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

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

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

1. Statement

Novelty (N)	Yes:	Claims	2-8, 10-12, 14
	No:	Claims	1, 9, 13
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-14
Industrial applicability (IA)	Yes:	Claims	1-14
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

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

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Reference is made to the following documents; the numbering will be adhered to in the rest of the procedure:

D1 WO 2009/119699 A2 (NEC CORP [JP]; SERRAVALLE FRANCESCA [GB]) 1 October 2009 (2009-10-01)

D2 WO 2009/064716 A1 (QUALCOMM INC [US]; FLORE ORONZO [US]; GRILLI FRANCESCO [US]; CHAPONNIE) 22 May 2009 (2009-05-22)

Concerning Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability

1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claim 1** is not new in the sense of Article 33(2) PCT.

Document **D1** discloses, according to the features of **claim 1** (the text in brackets refers to **D1**), **a system** (page 6, lines 3 and 4:"mobile(cellular) telecommunication system"; claim 1) **for updating a neighbour cell list in a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined** (page 8 line 27 to page 9 line 1:"The first base station 310 then updates its Inter-Radio Access Technology (Inter-RAT) neighbour relation list"), **the system comprising:**

- a detector configured for detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network (figure 8:"35"; page 12, lines 26-27:"handover module 35 for generating and transmitting handover requests");

- a selector configured for selecting a part of the user terminals (figure 8: "33"- Identifier management module");

- a request generator configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes (figure 8:"33"; page 12, lines 22 to 24:"the identifier management module 33 is operable for requesting information relating to identifiers of target gateway and basestation components") **of at least one of the first wireless access network and the second wireless access network** (figure 3; page 8, lines 6 to 13:"a first base station 310 in an LTE network may use the process to determine whether there are other neighbouring base stations in the area, for example base stations that are part of other types of networks. The base station 310 sends a Report Neighbour Request message 316 to a user device (UE) 314 that is connected to the base station 310, requesting that the UE 314 reports the presence of any neighbouring base stations to the first base station 310);

- a receiver configured for receiving the cell information from the one or more of the selected user terminals (figure 8:"21"; page 12, lines15 to 17:"transceiver circuit 21 which is operable to transmit signals to and to receive signals from the mobile telephones"); **and**

- updating means configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information (page 8 line 27 to page 9 line 1:"first base station 310 then updates its Inter-Radio Access Technology (Inter-RAT) neighbour relation list").

As a consequence **claim 1** is not new (see Article 33(2) PCT).

2 The same considerations as made in paragraph 1 of this section regarding **claim 1** are also valid for independent **claims 9 and 13**, said **claim 9** comprising the same feature combination of **claim 1** in terms of a method claim, and **claim 13** being the implementation of the method in **claim 9** in a computer program.

Therefore independent **claims 9 and 13** are not new (see Article 33(2) PCT).

3 The subject-matter of **claim 14** does not involve an inventive step within the meaning of Article 33(1) and (3) PCT.

Document **D1** discloses, according to the features of **claim 14** (the text in brackets refers to **D1**), **a mobile user terminal** (figure 9), **the terminal comprising:**

- a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network (figure 9:"71");

- scanning means for detecting the cell information from the wireless access nodes (figure 9:"89"; page 13, line 10:"identifier request module"), **at least one of the wireless access nodes scanned by the terminal being absent in the neighbour cell list ,**

- a transmitter for transmitting the detected cell information (figure 9:"71"; page 13, line 2:"transceiver circuit"),

The difference between the mobile user terminal of **claim 14** and the one disclosed in document **D1** consists of the following features:

[1] the terminal contains a neighbour cell list of the first wireless access node;

[2] at least one of the wireless access nodes scanned by the terminal being absent in the neighbour cell list;

[3] the mobile user terminal is arranged for temporarily storing the detected cell information and transmitting the detected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

Feature **[1]** is not implicitly disclosed in document **D1**. Nevertheless, it is noted that storing a neighbor cell list provided by a serving cell in a mobile terminal is a well known capability of user terminals performing cell reselection and handover (see for example 3GPP TS 36.300 v8.9.0, chapter 10.2.1).

Regarding feature **[2]**, it is obvious that a mobile terminal having a stored neighbor cell list will, when moving through the network, scan cells absent from the stored cell list.

The technical problem solved by feature **[3]** is "how to adapt a mobile terminal to efficiently update a neighbor cell list of a network node after being handed over to that node". Document **D2** discloses, in the context of neighbor list up-

dating techniques in a communication system, the fact that a mobile terminal can be adapted for notifying a newly selected cell about a missing neighbor list information (see D2: paragraphs [0052] and [0053]).

The skilled person would, without use of inventive skill, apply the teaching of document **D2** in order to solve the above formulated technical problem.

As a consequence, the subject-matter of **claim 14** is not inventive (see Article 33(3) PCT).

4 Furthermore, dependent **claims 2 to 8** along with dependent **claims 10 to 12** do not contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to novelty or inventive step (Articles 33(1) PCT), for the reason that the subject-matter of said claims is either directly derivable from the disclosure of documents **D1** and **D2** (**D2** paragraphs [0052]-[0058] for claims 2, 3, 4, 5, 6, 10, 11 and 12), or represents simple details which are generally known to the person skilled in the field of neighbor cell list updating techniques (claims 7, 8).

Therefore said claims are also considered not inventive (Article 33(3) PCT).

Concerning Item VIII

Certain observations on the international application

1 In addition, the applicant's attention is drawn to the following clarity objections (Article 6 PCT):

1.1 **Claim 1**, despite being directed to an apparatus (i.e. a system in a telecommunication architecture) defines part of the system components in terms of the operations they carry out. This latter manner of claiming is proper to a claim setting out a method or a procedure whereas a claim to an apparatus should be phrased in terms of the structural features which allow said operations to be actually performed. Since the claim contains a mixture of method and apparatus features, its category is not clear, which, in turn, results in the scope of protection conferred by the claim being also unclear (Article 6 PCT).

Similar objections equally apply to **claims 2-9**.

1.2 **Claim 15** refers to a "mobile user terminal configured for use in the method according to one or more of the claims 10-12". The usage of the mobile in the specified method is not limiting the scope of the said claim (see Guidelines III-12.4.16), for the reason that any standard mobile would respond to a neighbor cell information report request.

Concerning Item VII

Certain defects in the international application

1 Furthermore, the applicant's attention is drawn to the following formal comments and/or objections:

1.1 Independent claims are not in the two-part form in accordance with Rule 6.3 (b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document **D1**) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

1.2 All features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

1.3 According to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the prior art documents cited above is not mentioned in the description, nor are these documents identified therein.

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

General information	For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities.
Amending claims under Art. 19 PCT	Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220.
Filing a demand for international preliminary examination	In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT). If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).
Filing informal comments	After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box.
End of the international phase	At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPER (international preliminary examination report).
Relevant PCT Rules and more information	Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003

3NSDOCID: <XS_ _ _ 20070401OCK_I_>

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: OOSTVEEN, Job Cornelis et al.	Examiner: Unknown
Serial No.: Unknown	Group Art Unit: Unknown
Filed: Concurrently herewith	Docket No.: US17827
Customer No.: 90057	Confirmation No.: Unknown
Title: SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE	

MAIL STOP: PCT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Dear Sir:

Prior to taking up this application for examination, please enter the following amendments:

Amendments to the Specification begin on page 2;

Amendments to the Claims begin on page 3;

Remarks begin on page 9.

IN THE SPECIFICATION

Please amend the Specification as follows:

Please insert the following paragraph on page 1, line 2, as follows:

PRIORITY CLAIM TO RELATED APPLICATIONS

This application is a national stage application under 35 U.S.C. § 371 of PCT/EP2010/064823, filed October 5, 2010, published as WO 2011/042433 A1 on April 14, 2011, and claiming priority to European Application No. 09172399.9, filed October 7, 2009, which application and publication is incorporated herein by reference and made a part hereof in its entirety, and the benefit of priority of which is claimed herein.

IN THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application:

1.(Original): A system for updating a neighbour cell list in a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined, the system comprising:

- a detector configured for detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;
- a selector configured for selecting a part of the user terminals;
- a request generator configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;
- a receiver configured for receiving the cell information from the one or more of the selected user terminals; and
- updating means configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

2.(Original): The system according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node.

3.(Original): The system according to claim 2, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

4.(Currently Amended): The system according to claim 1 ~~one or more of the preceding claims~~,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node.

5.(Original): The system according to claim 4, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

6.(Currently Amended): The system ~~infrastructure~~ according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node,

further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

7.(Currently Amended): The system according to claim 1 ~~one or more of the preceding claims~~, wherein the telecommunications system is further configured for receiving location information from one or more of the detected user terminals and wherein the location information is used as a selection parameter for selecting the part of the detected user terminals.

8.(Currently Amended): The system according to claim 1 ~~one or more of the preceding claims~~ , wherein one or more thresholds, possibly service-dependent, are defined in the telecommunications system for transferring the user terminals between the first wireless access network and the second wireless access network and wherein at least one of the thresholds is used as a selection parameter for selecting the part of the detected user terminals.

9.(Original): In a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined, a method for updating at least one of the first and second neighbour cell lists comprising the steps of:

- detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;
- selecting a part of the user terminals;
- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;
- receiving the cell information from the one or more of the selected user terminals; and
- updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

10.(Currently Amended): The method according to claim 9, comprising the steps of:

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;
- receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node, and

- transferring the selected user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node~~, and~~

~~optionally, transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node~~.

11.(Currently Amended): The method according to claim 9 ~~or 10~~, comprising the steps of:

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node, and

- transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node~~, and~~

~~optionally, transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node~~.

12.(Currently Amended): The method according to claim 9, comprising the steps of:

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node; and

transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

13.(Currently Amended): ~~A computer program comprising software code portions configured for, when executed by at least one processor, performing the method of one or more of the claims 9-12~~ A non-transitory computer-readable storage medium containing a set of instructions that, when executed by a processor in a telecommunications architecture comprising a first wireless

access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined, performs a method for updating at least one of the first and second neighbour cell lists, including the steps of:

- detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;
- selecting a part of the user terminals;
- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;
- receiving the cell information from the one or more of the selected user terminals; and
- updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

14.(Currently Amended): A mobile user terminal configured for use in the method according to claim 9~~one or more of the claims 9-11~~, wherein the mobile terminal, in use, contain a neighbour cell list of the first wireless access node, the terminal comprising:

- a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;
- scanning means for detecting the cell information from the wireless access nodes, at least one of the wireless access nodes being absent in the neighbour cell list,
- a transmitter for transmitting the detected cell information,
- wherein the mobile user terminal is arranged for temporarily storing the detected cell information and transmitting the detected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

15.(New): The method according to claim 10, further comprising the step of transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

16.(New): The method according to claim 10, comprising the steps of:

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node, and

- transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node.

17.(New): The method according to claim 11, comprising the step of transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

18.(New): The method according to claim 16, comprising the step of transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

REMARKS AND CONCLUSION

The specification has been amended to update the claim of priority. No new matter has been added.

Claims 4, 6-8, and 10-14 have been amended, no claims are cancelled, and claims 15-18 have been added. As a result, claims 1-18 are pending in this patent application. No new matter has been added by the amendments to the claims.

Applicants respectfully submit that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's representative at the phone number provided below to facilitate prosecution of this application.

If necessary, please charge any additional fees or deficiencies, or credit any overpayments to Deposit Account No. 50-5047.

Respectfully submitted,

/Natalya Hartmann, Reg No 62119/

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Agent for Applicants

Date of Deposit: April 3d, 2012
This paper is being filed on the date indicated above using the USPTOs electronic filing system EFS-Web, and is addressed to The Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

PATENT COOPERATION TREATY

From the RECEIVING OFFICE

PCT

NOTIFICATION OF THE INTERNATIONAL APPLICATION NUMBER AND OF THE INTERNATIONAL FILING DATE

(PCT Rule 20.2(c))

To:

Wuyts, Koenraad Maria
Royal KPN N.V.
P.O. Box 95321
2509 CH The Hague
PAYS-BAS

Date of mailing *(day/month/year)*	04-11-2010
Applicant's or agent's file reference 403446WO	IMPORTANT NOTIFICATION

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2010/064823	5 October 2010 (05-10-2010)	7 October 2009 (07-10-2009)

Applicant
KONINKLIJKE KPN N.V.

Title of the invention

1. The applicant is hereby notified that the international application has been accorded the international application number and the international filing date indicated above.

2. The applicant is further notified that the record copy of the international application:

[X] was transmitted to the International Bureau on **see above date of mailing**

[ ] has not yet been transmitted to the International Bureau for the reason indicated below and a copy of this notification has been sent to the International Bureau*:

[ ] because the necessary national security clearance has not yet been obtained

[ ] because *(reason to be specified)*

* The International Bureau monitors the transmittal of the record copy by the receiving Office and will notify the applicant (with Form PCT/IB/301) of its receipt. Should the record copy not have been received by the expiration of 14 months from the priority date, the International Bureau will notify the applicant (Rule 22.1(c)).

Name and mailing address of the Receiving Office	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	Kuiper-Cristina, Nathalie

Form PCT/RO/105 (April 2007)

PCT REQUEST

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0	**For receiving Office use only**	
0-1	International Application No.	**PCT/EP2010/064823**
0-2	International Filing Date	**05 OCT 2010 (05.10.2010)**
0-3	Name of receiving Office and "PCT International Application"	**RO/EP**

0-4	**Form PCT/RO/101 PCT Request**	
0-4-1	Prepared Using	PCT Online Filing Version 3.5.000.221 MT/FOP 20020701/0.20.5.9
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	European Patent Office (EPO) (RO/EP)
0-7	**Applicant's or agent's file reference**	403446WO
I	**Title of Invention**	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE COMPRISING CO-OPERATING WIRELESS ACCESS NETWORKS AND METHOD THEREFORE
II	**Applicant**	
II-1	This person is	Applicant only
II-2	Applicant for	All designated States except US
II-4	Name	KONINKLIJKE KPN N.V.
II-5	Address	Maanplein 55 2516 CK The Hague Netherlands
II-6	State of nationality	NL
II-7	State of residence	NL
II-8	Telephone No.	+31 70 343 39 55
II-9	Facsimile No.	+31 70 385 54 37
II-10	e-mail	dieneke.vandertoorn-dejager@kpn.com
II-10(a)	E-mail authorization The receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority are authorized to use this e-mail address, if the Office or Authority so wishes, to send notifications issued in respect of this international application:	exclusively in electronic form (no paper notifications will be sent)

PCT REQUEST

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III-1	**Applicant and/or inventor**	
III-1-1	This person is	Applicant only
III-1-2	Applicant for	All designated States except US
III-1-4	Name	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST-NATUURWETENSCHAPPELIJK ONDERZOEK TNO
III-1-5	Address	Schoemakerstraat 97 2628 VK Delft Netherlands
III-1-6	State of nationality	NL
III-1-7	State of residence	NL
III-2	**Applicant and/or inventor**	
III-2-1	This person is	Applicant and inventor
III-2-2	Applicant for	US only
III-2-4	Name (LAST, First)	OOSTVEEN, Job Cornelis
III-2-5	Address	Bilderdijklaan 2 9752 EN Haren Netherlands
III-2-6	State of nationality	NL
III-2-7	State of residence	NL
III-3	**Applicant and/or inventor**	
III-3-1	This person is	Applicant and inventor
III-3-2	Applicant for	US only
III-3-4	Name (LAST, First)	JORGUSESKI, Ljupco
III-3-5	Address	Jozef Israellaan 234 2282 TR Rijswijk Netherlands
III-3-6	State of nationality	NL
III-3-7	State of residence	NL
III-4	**Applicant and/or inventor**	
III-4-1	This person is	Applicant and inventor
III-4-2	Applicant for	US only
III-4-4	Name (LAST, First)	LITJENS, Remco
III-4-5	Address	Van Kempenstraat 22 2352 VH Voorschoten Netherlands
III-4-6	State of nationality	NL
III-4-7	State of residence	NL

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III-5	**Applicant and/or inventor**	
III-5-1	This person is	Applicant and inventor
III-5-2	Applicant for	US only
III-5-4	Name (LAST, First)	PAIS, Adrian Victor
III-5-5	Address	Caan van Necklaan 25 2281 BA Rijswijk Netherlands
III-5-6	State of nationality	NL
III-5-7	State of residence	NL
III-6	**Applicant and/or inventor**	
III-6-1	This person is	Applicant and inventor
III-6-2	Applicant for	US only
III-6-4	Name (LAST, First)	ZHANG, Haibin
III-6-5	Address	Usselincxstraat 142 2593 VP The Hague Netherlands
III-6-6	State of nationality	CN
III-6-7	State of residence	NL
IV-1	**Agent or common representative; or address for correspondence** The person identified below is hereby/ has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	Agent
IV-1-1	Name (LAST, First)	WUYTS, Koenraad
IV-1-2	Address	P.O. Box 95321 2509 CH The Hague Netherlands
IV-1-3	Telephone No.	+31 70 343 39 55
IV-1-4	Facsimile No.	+31 70 385 54 37
IV-1-5	e-mail	dieneke.vandertoorn-dejager@kpn.com
IV-1-5(a)	E-mail authorization The receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority are authorized to use this e-mail address, if the Office or Authority so wishes, to send notifications issued in respect of this international application:	exclusively in electronic form (no paper notifications will be sent)
IV-1-6	Agent's registration No.	100754124
V	**DESIGNATIONS**	
V-1	**The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.**	

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VI-1	**Priority claim of earlier regional application**	
VI-1-1	Filing date	07 October 2009 (07.10.2009)
VI-1-2	Number	09172399.9
VI-1-3	Regional Office	EP
VI-2	**Priority document request** The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1
VI-3	**Incorporation by reference :** where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.	
VII-1	**International Searching Authority Chosen**	European Patent Office (EPO) (ISA/EP)
VII-2	**Request to use results of earlier search; reference to that search**	
VII-2-1	Filing date	07 October 2009 (07.10.2009)
VII-2-2	Application Number	09172399.9
VII-2-3	Country (or regional Office)	EP
VII-2-5	Documents are available to the ISA in a form and manner acceptable to it and therefore do not need to be submitted by the applicant to the ISA (Rule 12bis.1(f)):	A copy of the results of the earlier search A copy of the earlier application A copy of any document cited in the results of the earlier search

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VIII	**Declarations**	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	–	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	–	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	–	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	1	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	–	

VIII-4-1	**Declaration: Inventorship (only for the purposes of the designation of the United States of America)** Declaration of Inventorship (Rules 4.17(iv) and 51bis.1(a)(iv)) for the purposes of the designation of the United States of America:	I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought. This declaration is directed to the international application of which it forms a part (if filing declaration with application). This declaration is directed to international application No. PCT/ . . . . . (if furnishing declaration pursuant to Rule 26ter). I hereby declare that my residence, mailing address, and citizenship are as stated next to my name. I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.
VIII-4-1-1	Prior applications:	

		I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.
VIII-4-1-1-1	Name (LAST, First)	OOSTVEEN, Job Cornelis
VIII-4-1-1-2	Residence: (city and either US State, if applicable, or country)	Haren, Netherlands
VIII-4-1-1-3	Mailing address:	Bilderdijklaan 2 9752 EN Haren Netherlands
VIII-4-1-1-4	Citizenship:	NL
VIII-4-1-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	/Job Cornelis Oostveen/
VIII-4-1-1-6	Date:	04 October 2010 (04.10.2010)

VIII-4-1-2-1	Name (LAST, First)	JORGUSESKI, Ljupco
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Rijswijk, Netherlands
VIII-4-1-2-3	Mailing address:	Jozef Israellaan 234 2282 TR Rijswijk Netherlands
VIII-4-1-2-4	Citizenship:	NL
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	/Ljupco Jorguseski/
VIII-4-1-2-6	Date	04 October 2010 (04.10.2010)
VIII-4-1-3-1	Name (LAST, First)	LITJENS, Remco
VIII-4-1-3-2	Residence: (city and either US State, if applicable, or country)	Voorschoten, Netherlands
VIII-4-1-3-3	Mailing address:	Van Kempenstraat 22 2352 VH Voorschoten Netherlands
VIII-4-1-3-4	Citizenship:	NL
VIII-4-1-3-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	/Remco Litjens/
VIII-4-1-3-6	Date	04 October 2010 (04.10.2010)
VIII-4-1-4-1	Name (LAST, First)	PAIS, Adrian Victor
VIII-4-1-4-2	Residence: (city and either US State, if applicable, or country)	Rijswijk, Netherlands
VIII-4-1-4-3	Mailing address:	Caan van Necklaan 25 2281 BA Rijswijk Netherlands
VIII-4-1-4-4	Citizenship:	NL
VIII-4-1-4-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	/Adrian Victor Pais/
VIII-4-1-4-6	Date	04 October 2010 (04.10.2010)
VIII-4-1-5-1	Name (LAST, First)	ZHANG, Haibin
VIII-4-1-5-2	Residence: (city and either US State, if applicable, or country)	The Hague, Netherlands
VIII-4-1-5-3	Mailing address:	Usselincxstraat 142 2593 VP The Hague Netherlands
VIII-4-1-5-4	Citizenship:	CN
VIII-4-1-5-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	/Haibin Zhang/
VIII-4-1-5-6	Date	04 October 2010 (04.10.2010)

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IX	Check list	Number of sheets	Electronic file(s) attached
IX-1	Request (including declaration sheets)	9	✓
IX-2	Description	19	✓
IX-3	Claims	6	✓
IX-4	Abstract	1	✓
IX-5	Drawings	4	✓
IX-7	TOTAL	39	
	Accompanying Items	Paper document(s) attached	Electronic file(s) attached
IX-8	Fee calculation sheet	–	✓
IX-18	PCT-SAFE physical media	–	–
IX-20	**Figure of the drawings which should accompany the abstract**	2	
IX-21	**Language of filing of the international application**	English	
X-1	**Signature of applicant, agent or common representative**	(PKCS7 Digital Signature)	
X-1-1	Name (LAST, First)	WUYTS, Koenraad	
X-1-2	Name of signatory	NL, Koninklijke KPN N.V., K. Wuyts 16870	
X-1-3	Capacity	(Representative)	

FOR RECEIVING OFFICE USE ONLY

10-1	**Date of actual receipt of the purported international application**	**05 OCT 2010 (05.10.2010)**
10-2	**Drawings:**	
10-2-1	Received	X
10-2-2	Not received	
10-3	**Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application**	
10-4	**Date of timely receipt of the required corrections under PCT Article 11(2)**	
10-5	**International Searching Authority**	ISA/EP
10-6	**Transmittal of search copy delayed until search fee is paid**	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	**Date of receipt of the record copy by the International Bureau**	

PTO/SB/14 (11-08)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	US17827
	Application Number	
Title of Invention	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Applicant Information:

Applicant 1

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Job	Cornelis	Oostveen	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Haren	Country Of Residence[i]	NL

Citizenship under 37 CFR 1.41(b) [i] NL

Mailing Address of Applicant:

Address 1	Bilderdijklaan 2		
Address 2			
City	Haren	State/Province	
Postal Code	9752 EN	Country[i]	NL

Applicant 2

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ljupco		Jorguseski	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Rijswijk	Country Of Residence[i]	NL

Citizenship under 37 CFR 1.41(b) [i] NL

Mailing Address of Applicant:

Address 1	Jozef Israellaan 234		
Address 2			
City	Rijswijk	State/Province	
Postal Code	2282 TR	Country[i]	NL

Applicant 3

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Remco		Litjens	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Voorschoten	Country Of Residence[i]	NL

PTO/SB/14 (11-08)
Approved for use through 09/30/2010. OMB 0651-0032
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	US17827
	Application Number	
Title of Invention	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE	

Citizenship under 37 CFR 1.41(b) i	NL		
Mailing Address of Applicant:			
Address 1	Van Kempenstraat 22		
Address 2			
City	Voorschoten	**State/Province**	
Postal Code	2352 VH	**Country**i	NL

Applicant 4

Applicant Authority ◉ Inventor	○ Legal Representative under 35 U.S.C. 117	○ Party of Interest under 35 U.S.C. 118		
Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Adrian	Victor	Pais	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Rijswijk	**Country Of Residence**i	NL
Citizenship under 37 CFR 1.41(b) i	NL		
Mailing Address of Applicant:			
Address 1	Caan van Necklaan 25		
Address 2			
City	Rijswijk	**State/Province**	
Postal Code	2281 BA	**Country**i	NL

Applicant 5

Applicant Authority ◉ Inventor	○ Legal Representative under 35 U.S.C. 117	○ Party of Interest under 35 U.S.C. 118		
Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Haibin		Zhang	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	The Hague	**Country Of Residence**i	NL
Citizenship under 37 CFR 1.41(b) i	CN		
Mailing Address of Applicant:			
Address 1	Usselincxstraat 142		
Address 2			
City	The Hague	**State/Province**	
Postal Code	2593 VP	**Country**i	NL

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	90057

EFS Web 2.2.2

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	US17827
	Application Number	
Title of Invention	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE	

Email Address	mail@dvme.nl	Add Email	Remove Email

Application Information:

Title of the Invention	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE		
Attorney Docket Number	US17827	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		Sub Class (if any)	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	4	Suggested Figure for Publication (if any)	1

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S. C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	90057		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
PCT/EP2010/064823	a 371 of international	PCT/EP2010/064823	2010-10-05

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

PTO/SB/14 (11-08)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	US17827
	Application Number	
Title of Invention	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE	

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

Application Number	Country [i]	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
09172399.9	EP	2009-10-07	(•) Yes ( ) No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1

If the Assignee is an Organization check here. [X]

Organization Name	KONINKLIJKE KPN N.V.		
Mailing Address Information:			
Address 1	Maanplein 55		
Address 2			
City	The Hague	**State/Province**	
Country [i]	NL	Postal Code	2516 CK
Phone Number		Fax Number	
Email Address			

Assignee 2

If the Assignee is an Organization check here. [X]

Organization Name	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST-NATUURWETENSCHAPPELIJK ONDERZOEK T		
Mailing Address Information:			
Address 1	Schoemakerstraat 97		
Address 2			
City	Delft	**State/Province**	
Country [i]	NL	Postal Code	2628 VK
Phone Number		Fax Number	
Email Address			

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

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Natalya Hartmann,Reg.No.62,119/	Date (YYYY-MM-DD)	2012-04-03

PTO/SB/14 (11-08)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	US17827
	Application Number	
Title of Invention	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE	

First Name	Natalya	Last Name	Hartmann	Registration Number	62119

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

Privacy Act Statement

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	Application Number	
	Filing Date	
	First Named Inventor	OOSTVEEN, Job Cornelis
	Art Unit	
	Examiner Name	
	Attorney Docket Number	US17827

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	1	2009119699	WO		2009-10-01	NEC CORP	page 7, line 28 - page 9, paragraph 15 page 12, paragraph 13 - page 13, paragraph 24; claims 1, 2-8, 9-14, 75, 76; figure	☐
	2	2009064716	WO		2009-05-22	QUALCOMM INC	paragraph [0052] - paragraph [0056], paragraph [0062] - paragraph [0065], claims 2-8, 10-12, 14	☐
	3	2009019319	WO		2009-02-12	NOKIA SIEMENS NETWORKS OY	abstract, page7, line 15 - page 8, line 3, page 8, line 22 - page 9, line 20, claims 1-14	☐

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	Application Number	
	Filing Date	
	First Named Inventor	OOSTVEEN, Job Cornelis
	Art Unit	
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	Attorney Docket Number	US17827

	4	2009045070	WO		2009-04-09	LG ELECTRONICS INC	the whole document, claims 1-14	☐

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	1	International Search Report, mailed January 24, 2011 in connection with International Patent Application No. PCT/EP2010/064823	☐

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	Application Number	
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	First Named Inventor	OOSTVEEN, Job Cornelis
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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

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Name/Print	Natalya Hartmann	Registration Number	62119

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Application Number:	
Filing Date:	
Title of Invention:	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE
First Named Inventor/Applicant Name:	Job Cornelis Oostveen
Filer:	Natalya Hartmann/Tessa Koning
Attorney Docket Number:	US17827

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	380	380
Natl Stage Search Fee - Report provided	1642	1	490	490
National Stage Exam - all other cases	1633	1	250	250
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1120**

Electronic Acknowledgement Receipt

EFS ID:	12453641
Application Number:	13499924
International Application Number:	PCT/EP10/64823
Confirmation Number:	7977
Title of Invention:	SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE
First Named Inventor/Applicant Name:	Job Cornelis Oostveen
Customer Number:	90057
Filer:	Natalya Hartmann/Tessa Koning
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Attorney Docket Number:	US17827
Receipt Date:	03-APR-2012
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	17827_DVME_TransmitalLetter.pdf	23079 bafa4706d72044086defff991e505625a15c776f	no	1
Warnings:					
Information:					
2	Transmittal Letter	17827_TransmittalLetter_NationalStage_pto-1390.pdf	386556 d653597174b8934d1c8a1d84dec72d089f41a24f	no	4
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3		17827_WO2011042433.pdf	1396018 d7b8e6501a93ab5ea5a10e9d0f9201781ab25c36	yes	34

Multipart Description/PDF files in .zip description

Document Description	Start	End
Abstract	1	2
Specification	3	21
Claims	22	27
Drawings-only black and white line drawings	28	31
Documents submitted with 371 Applications	32	34

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4	Transmittal Letter	17827_IDSletter.pdf	18683 f1186d0b95bab48a1557018c93959dd6bf6c3886	no	2
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5	Foreign Reference	IDS_WO2009119699A2.pdf	1455879 73c8b23694297c230aa5f23bb94dd45a702ad676	no	47
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Warnings:					
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7	Foreign Reference	IDS_WO2009019319A2.pdf	763547 ca5e12eb19a4fba1f143075ab782ba4da7b229a9	no	19
Warnings:					
Information:					
8	Foreign Reference	IDS_WO2009045070A2.pdf	1424986 585d6cc9377be2e2863a61d94896fd9c6cf4f0ab	no	46
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10	Preliminary Amendment	17827_PreliminaryAmendment_NationalStage.pdf	44258 84d77a213edea10caa35bb09370a369a6b7f3ad1	no	9
Warnings:					
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11	Documents submitted with 371 Applications	17827_NotificationIntAppNo.pdf	372621 d1fb04480bfae76d85b5cd593570bdc95c143467	no	10
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(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **OOSTVEEN, Job Cornelis** [NL/NL]; Bilderdijklaan 2, NL-9752 EN Haren (NL). **JORGUSESKI, Ljupco** [NL/NL]; Jozef Israellaan 234, NL-2282 TR Rijswijk (NL). **LITJENS, Remco** [NL/NL]; Van Kempenstraat 22, NL-2352 VH Voorschoten (NL). **PAIS, Adrian Victor** [NL/NL]; Caan van Necklaan 25, NL-2281 BA Rijswijk (NL). **ZHANG, Haibin** [CN/NL]; Usselincxstraat 142, NL-2593 VP The Hague (NL).

(74) Agent: **WUYTS, Koenraad**; P.O. Box 95321, NL-2509 CH The Hague (NL).

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Declarations under Rule 4.17:

[Continued on next page]

(54) Title: SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

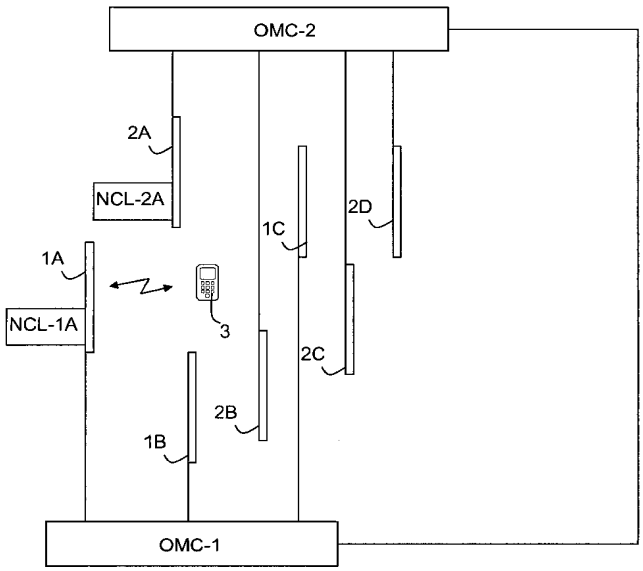


FIG. 1

(57) Abstract: The invention relates to a system and method for updating a neighbour cell list of a wireless access node. User terminals to be to be transferred from a first wireless access node of a first wireless access network to a second wireless access node of a second wireless access network are detected. From the first wireless access node, one or more of the detected user terminals are requested to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The cell information is received from the one or more of the detected user terminals and at least one of the first neighbour cell list and the second neighbour cell list is updated using the received cell information.

WO 2011/042433 A1

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

SYSTEM FOR UPDATING A NEIGHBOUR CELL LIST (NCL) OF A WIRELESS ACCESS NODE OF A TELECOMMUNICATIONS ARCHITECTURE AND METHOD THEREFORE

FIELD OF THE INVENTION

The invention relates to the field of telecommunications systems and a method in telecommunications architecture. More specifically, the invention relates to a telecommunications architecture comprising at least a first and a second wireless access network between which user terminals can be transferred and a method in such a telecommunications system, wherein the neighbour cell lists (NCLs) of at least a wireless access node of the first and/or second wireless access network can be updated using a system.

BACKGROUND OF THE INVENTION

When moving through the coverage area of a wireless access cellular network, mobile user terminals continuously scan the spectrum for pilot or reference signals (beacons) in order to determine which cell (base station) to camp on. In idle mode, this is referred to as cell reselection, while in active/dedicated mode, this is referred to as handover. The cell-specific list of surrounding cells that are considered for cell reselection or handover is called the neighbour cell list (NCL), which is stored in each base station and broadcast within the cell. The mobile user terminal receives and stores the NCL. The NCL contains the cells for which the mobile user terminal should send measurement reports (when certain criteria are met) to the base station currently serving the user terminal.

In case of multiple, cooperating wireless access cellular networks, each cell not only has an intra-network NCL, but also an inter-network NCL.

The optimisation of the NCLs is traditionally done with the aid of off-line planning tools, using path loss predictions and (off-line) optimisation algorithms. Currently, automated configuration and optimisation of intra-network NCLs and inter-network NCLs, based on e.g. actual measurement feedback from

user terminals, observed mobility patterns, base station scans and handover statistics, are being investigated.

3GPP TS 36.300, V8.9.0, discloses an automatic neighbour relation (ANR) function to relieve an operator from the burden of manually managing neighbour relations. Such an ANR function resides in the eNode-B (eNB) of an LTE network and manages a conceptual neighbour relation table (NRT). A neighbour detection function is used to find new neighbours and to add them to the NRT, whereas a neighbour removal function removes outdated neighbours from the NRT. The eNB instructs a user terminal from a serving cell to look for neighbour cells of other networks by scanning all cells. The user terminal first reports the physical cell identifier (PCI) of the detected cells in the other network. When the eNB receives the reports from the user terminals containing the PCI's of the cells, the eNB instructs the user terminal, using the newly discovered cell as a parameter, to read the Cell Global Identifier (CGI) and further cell information from the neighbouring cells. The user terminal also reports this information to the serving cell. The eNB may then update the NRT using the information reported from the user terminals.

SUMMARY OF THE INVENTION

A system is disclosed for a telecommunications architecture that comprises a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined.

The system comprises a detector configured for detecting user terminals about to be transferred, i.e. for which cell reselection or handover will be performed, from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network.

The system also comprises a request generator configured for requesting from the first wireless access node one or

more of the detected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The telecommunications system, particularly at least one of the first and the second wireless access node, also comprises a receiver configured for receiving the cell information from one or more of the detected user terminals. Updating means are provided configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

A method in a telecommunications architecture is also disclosed. User terminals about to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network are detected. From the first wireless access node, one or more of the detected user terminals are requested to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The cell information is received from one or more of the detected user terminals and at least one of the first neighbour cell list and the second neighbour cell list is updated using the received cell information.

Furthermore, a mobile user terminal containing at least one neighbour cell list of the first wireless access node is disclosed. The terminal comprises a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The mobile terminal also contains scanning means configured for detecting the cell information from the wireless access nodes, at least one of the wireless access nodes being absent in the neighbour cell list, and a transmitter for transmitting the detected cell information. At present, standardization does not allow mobile terminals to measure cells not present in the NCL. However, there are no intrinsic obstacles for making performing such measurements. The mobile terminal is arranged for temporarily storing the detected cell information and transmitting the de-

tected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

It is noted that in the present application the terms wireless access node and cell are used as similar terms. The skilled person will appreciate that a single wireless access node may provide multiple cells and that, typically, a neighbour cell list is defined for each of the cells of such a node.

The plurality of wireless access nodes of which cell information is requested may exclude the first wireless access node, or more particularly, the cell thereof currently serving the user terminal. On the other hand, the plurality of wireless access nodes would typically include cells that are absent in the neighbour cell list stored in the user terminal for regularly reporting measurement reports to the serving cell. Otherwise, since the neighbour cell list is obtained from the serving cell, the detection of the cell information by the user terminal would be restricted to this list and would therefore only be suitable for verifying the existing NCL and not for adding new neighbouring cells to the list. In an embodiment, the user terminal performs a complete scan for all cells in the first wireless access network (possibly excluding the currently serving cell) and/or all cells in the second wireless access network to allow the telecommunications system to obtain a complete picture of the available cells around the first wireless access node. This complete information containing the scan of all cells may then be used for updating the NCL(s). Alternatively, the user terminal may compare the received complete information with the NCL it has obtained from the first wireless access node and only report cell information of cells not present on the current NCL.

The first and second wireless access networks may differ in radio access technology (e.g. GSM and UMTS or UMTS and LTE), the deployed release of a given radio access technology, the used frequency spectrum (e.g. the 900 MHz and 1800 MHz frequency bands (the latter also being referred to as a DCS network) for GSM, different 5MHz carriers for UMTS) and/or wire-

less access networks of different mobile operators. The wireless access network may also differ in the type of cells provided, e.g. macro cells and pico cells.

The disclosed system and method are able to specifically direct the request for cell information for the first and/or second network to user terminals in the regions where cell reselection or handover from the first to the second wireless access network is about to occur. By collecting this information specifically at cell reselection or handover moments, the updating of the NCL is inherently based on the inter-network neighbours that a user terminal experiences in the cell reselection or handover region, where the reports of the user terminal measurements are most relevant for construing the NCL.

In some instances, user terminals may move rapidly through an area and cell reselection and handover to the second wireless access network should be performed quickly. In such cases, insufficient time may be available for performing the scan for obtaining the cell information for the first wireless access network and for reporting the cell information to the telecommunications system via the first wireless access network. The embodiments of the invention as defined in claims 2 and 10 provide additional time for completing the method by performing the cell reselection or handover as soon as the mobile user terminal has been instructed for performing the scan for cell information for the first and/or the second wireless access network. By temporarily storing the cell information resulting from the scan at the mobile user terminal, the user terminal may carry the cell information to the second network where it has sufficient time to report the cell information of the plurality of wireless access nodes of the first wireless access network via the second network.

The cell information of the wireless access nodes of the first wireless access network may be used for updating the neighbour cell list of the first wireless access node and/or for updating the neighbour cell list of the second wireless access node, or the cells thereof.

The updating of the neighbour cell list of the second wireless access node is relevant for user terminals reselecting cells or handed over from the second wireless access node to the first wireless access network, i.e. in the cell reselection or handover direction reverse to the direction travelled by the terminals reporting the cell information. Since other user terminals will be transferred from the second wireless access network to the first wireless access network, the neighbour cell list of the first wireless access node may also be updated in this way.

The cell information of the plurality of access nodes of the first wireless access network as received via the second wireless access node may also be transferred back to the first wireless access node, e.g. for updating the intra-network neighbour cell list, as defined in claim 3 and, optionally, in claim 10. In a particular example, this embodiment may be used to reduce the so-called 'missing neighbour' effect in a UMTS network, here being the first wireless access network. User terminals equipped to connect to UMTS networks are restricted to gathering cell information as defined in the neighbour cell list received from the base station currently serving the user terminal. An absent cell in the neighbour cell list of the base station will thus never be measured and reported by the user terminal as a result of this restriction of the user terminal. When the signal of a missing neighbour is too strong, call drops may occur. The present embodiments may reduce this problem by instructing the user terminals to also scan for cell information of wireless access nodes of the UMTS network being absent in the neighbour cell list (and thus possibly revealing the existence of cells not present in the neighbour cell list of the base station) and to report this via the second wireless access network back to the first wireless access node. The NCL of the first wireless access node may then be updated with the missing neighbour cell.

The user terminals may also be instructed to obtain the cell information of the plurality of wireless access nodes of the second wireless access network shortly before cell reselec-

tion or handover to the second wireless access node of this network and report the cell information to the telecommunications system via this second wireless access node, i.e. after cell reselection or handover. This embodiment is defined in claims 4 and 11.

Again, the cell information of the wireless access nodes of the second wireless access network may be used for updating the neighbour cell list of the first wireless access node and/or for updating the neighbour cell list of the second wireless access node. The cell information obtained for the access nodes of the second wireless access network may be relevant for the second wireless access network itself, e.g. for updating the intra-network NCL, in view of the 'missing neighbour' effect occurring in particular types of network such as UMTS, as discussed above for the first wireless access network.

The cell information of the plurality of access nodes of the second wireless access network as received via the second wireless access node may be transferred back to the first wireless access node as defined in claim 5 and, optionally, in claim 11. In doing so, the first wireless access node may update its neighbour cell list using the received cell information obtained shortly before cell reselection or handover, even when the user terminals have insufficient time for reporting the cell information for the plurality of wireless access nodes of the second wireless access network directly to the first wireless access node. The updated NCL is relevant for cell reselection or handover from the first wireless access node to the second wireless access network for other user terminals.

Of course, when sufficient time for reporting the cell information of the plurality of wireless access nodes of the second network is available, this cell information obtained shortly before cell reselection or handover to the second wireless access network can be reported directly to the first wireless access node, as defined in the embodiments of claims 6 and 12.

It is not required that all handover or cell reselection instances trigger a scan for cell information by the user

terminals. A wireless access node may for instance indicate on its broadcast channel not only whether handovers and/or cell re-selections should trigger such reporting, but also a likelihood parameter which the terminal can use to flip a (biased) coin in determining whether it should send cell information at a specific handover or cell reselection instance. Alternatively, the wireless access node may explicitly signal to the specific user terminal whether it should do the cell measurement and reporting. In this manner, the amount of cell information reporting can be tuned, which relates to a trade-off between the measurement overhead (signalling load) and the potential for neighbour cell list optimisation.

One embodiment of tuning the amount of cell list optimisation traffic is to use the location information from the user terminals as a selection criterion as defined in claim 7. The location information may e.g. be obtained from a GPS module in the user terminal or by means of measurements using the first and/or the second wireless access network. This location information can be useful e.g. in identifying where handover regions exist, and in solving location-specific outages or problems, e.g. dropped calls due to 'missing neighbour'. It may also be useful when an operator changes configuration (optimisation of downlink power, antenna tilt, etc) and wants to measure the effect on the cells relevant for inter-RAT cell change or handover.

Another advantageous selection criterion for determining which user terminals should report cell information is the transfer threshold that may have been set by the operator(s) of the telecommunication system, as defined in claim 8. The transfer threshold determines at what level (typically involving pilot signal measurements) cell reselection or handover would occur. The transfer threshold for cell reselection or handover from the first wireless access network to the second wireless access network may be asymmetric (i.e. a different transfer threshold Th2 applies for a transfer from the second to the first wireless access network) and may also be dependent on the service type of the service received by the user terminal when

connected to the first wireless access node. As an example, a user terminal provided with a voice service by a cell of an LTE network that is handed over to a GSM network might not be handed over back to the LTE network. This is because the operator chooses this mode of operation. In such a case, although this user terminal is a detected user terminal in the sense that it is about to be transferred to the second wireless access network (GSM), it is not selected for reporting requested to report cell information of the plurality of wireless access nodes of the first wireless access network (the LTE network), since the hand-over in the direction back to the first network (the LTE network) will generally not be made. On the other hand, for a user terminal using a data service that is temporarily handed over from an LTE network to a GSM network, a handover back to the LTE network is generally preferred and such user terminals can be selected to report cell information of the plurality of wireless access nodes of the second network. The embodiment of the telecommunications system of claim 8 may also be used for the method in the telecommunications system as defined in claims 10-13.

Hereinafter, embodiments of the invention will be described in further detail. It should be appreciated, however, that these embodiments may not be construed as limiting the scope of protection for the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 provides a schematic illustration of a telecommunication system comprising a first and a second wireless access network, each having a plurality of wireless access nodes, according to an embodiment of the invention;

FIG. 2 provides a schematic illustration of a mobile user terminal and wireless access nodes configured for performing a method according to an embodiment of the invention;

FIGS. 3A and 3B provide a schematic illustration of a telecommunications system and a flow chart for operating such a system, wherein cell information of wireless access nodes of the

first wireless access network is obtained and reported via the second wireless access network; and

FIGS. 4A and 4B provide a schematic illustration of a telecommunications system and a flow chart for operating such a system, wherein cell information of wireless access nodes of the second wireless access network is obtained and reported via the first wireless access network.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of first wireless access nodes 1A-1C of a first wireless access network and second wireless access nodes 2A-2D of a second wireless network. As an example, the first wireless access nodes 1A-1C are eNBs of an Long Term Evolution (LTE) network, whereas the second wireless access nodes 2A-2D are NodeBs of an UMTS network. Other examples includes wireless access networks differing in other radio access technologies (RATs), e.g. GSM and UMTS, differences in the deployed release of a given radio access technology, differences in the used frequency spectrum (e.g. the 900 MHz and 1800 MHz frequency bands (the latter also being referred to as a DCS network) for GSM, different 5MHz carriers for UMTS) and/or wireless access networks of different mobile operators. The wireless access network may also differ in the type of cells provided, e.g. macro cells and pico cells.

The wireless access nodes 1A-1C and 2A-2D can be controlled by control systems as schematically illustrated in FIG. 1. As an example, the control system may be Operation and Maintenance Centres (OMCs) as generally known in the art. The OMCs of the wireless access networks can be interconnected. Other connections between the wireless access networks can be used as well. If the wireless access nodes of the first and second wireless access networks originate from the same vendor, a single OMC can be used.

Each of the wireless access nodes 1A-1C and 2A-2D may contain at least one neighbour cell list (NCL). In FIG. 1, NCL-1A and NCL-2A are indicated as NCL of the corresponding wireless

access nodes. When a wireless access node provides multiple cells, typically each cell has a corresponding NCL.

A wireless access node broadcasts the NCL and mobile user terminals 3 camping on such a cell receive and store the NCL. The NCL is typically used to instruct the mobile terminal 3 which cells to monitor and to report every now and then the received signal strengths of each of the monitored cells, such that the network can make a decision whether or not the mobile terminal 3 should select or should be handed over to another cell.

As an example, the mobile terminal 3 receives the NCL-1A from wireless access node 1A to which it is currently connected. NCL-1A contains the cell(s) of neighbouring access nodes 1B and 1C and mobile terminal 3 monitors the signal strengths of these cells and reports these to the wireless access node 1A. Such an NCL-1A is referred to as an intra-network NCL. NCL-1A may also list neighbouring access nodes 2A and 2B of the second wireless access network, in which case NCL-1A would be referred to as an inter-network NCL. NCL-1A may also be a combined NCL, i.e. a combination of an intra-network and an inter-network NCL. Currently, automated configuration and optimisation of intra-network NCLs and inter-network NCLs is based on e.g. actual measurement feedback from user terminals 3 as disclosed in 3GPP TS 36.300, V8.9.0.

Referring also to FIG. 2, an embodiment will now be described in further detail, wherein intra-network NCL-1A contains the cells of eNBs 1B and 1C and inter-network NCL-1A contains the cells of NodeBs 2A and 2B. Note that inter-network NCL-1A does not yet contain NodeBs 2C and 2D.

Mobile user terminal 3 is assumed to camp on a cell of eNB 1A and is monitoring the cells of eNB's 1B, 1C and NodeBs 2A and 2B as indicated in the intra-network and inter-network NCLs transmitted in the cell under consideration. The mobile user terminal 3 regularly sends measurement reports to the eNB 1A as generally known in the art.

As illustrated schematically in FIG. 2, eNB 1A contains a cell reselection/handover detector 10 that recognizes that mo-

bile terminal 3 requires a cell reselection or handover to NodeB 2A of the second wireless access network. The cell reselection or handover indication triggers the following sequence of events in eNB 1A.

First, it may be determined whether or not the mobile terminal 3 for which a cell reselection or handover indication is received should participate, i.e. should be selected, in the process for updating (which includes the verification of the correctness) of an NCL, such as NCL-1A or NCL-2A. To that end, the eNB 1A contains a selection module 11 for selecting a part of the user terminals 3 for which a cell reselection or handover indication is detected. In this manner, it is possible to filter an appropriate portion the user terminals for which cell reselection or handover is about in order to reduce unnecessary signalling over the first and/or second wireless access network. The decision whether or not to participate in the updating process, i.e. whether or not to provide information to the telecommunication system allowing the updating of the NCL's, may either be taken at the mobile terminal or at the telecommunications system, particularly eNB 1A.

As an example, eNB 1A may indicate on its broadcast channel not only whether handovers and/or cell reselections should trigger such reporting, but also a likelihood parameter which the terminal 3 can use to flip a biased coin in determining whether it should send information at a specific handover or cell reselection instance. Alternatively, eNB 1A may explicitly signal to the specific user terminal 3 whether it should do the cell measurement and reporting. In this manner, the amount of cell information reporting can be tuned, which relates to a trade-off between the measurement overhead (signalling load) and the potential for neighbour cell list optimisation.

An advantageous selection criterion at the side of the eNB 1A for determining which user terminals 3 should report cell information is the transfer threshold that may have been set by the operator(s) of the telecommunications system between the first and the second wireless access networks. The transfer threshold determines at what level (typically involving pilot

signal measurements) cell reselection or handover would occur. The transfer threshold Th1 for cell reselection or handover from the first wireless access network to the second wireless access network may be asymmetric (i.e. a different transfer threshold Th2 applies for a transfer from the second to the first wireless access network) and may also be dependent on the service type of the service enjoyed by the user terminal when connected to the first wireless access node.

In FIG. 1, the user terminal 3 camping on a cell of eNB 1A of an LTE network using a data service that is about to be handed over to NodeB 2A of an UMTS network will generally be handed over back to the LTE network, if possible, because the operator applies a low threshold for handing over the user terminal 3 from the UMTS network to the LTE network for data services but a much higher threshold for handing over the user terminal to the UMTS network. In such a case, since a transfer between the networks is more likely in one direction than in the other, the terminal 3 may or may not be selected for providing information useful for the NCL updating process as will now be described in further detail.

The selection stage of user terminals 3 may be omitted completely or may be selectively applied, e.g. during particular hours of the day or at particular stages of the configuration and optimisation of the network.

Once user terminal 3 has been selected, request generator 12 in FIG. 2 is activated in order to request the user terminal 3 to report cell information of a plurality of wireless access nodes.

The plurality of wireless access nodes of which cell information is requested may exclude the cell of eNB 1A currently serving the user terminal 3. On the other hand, the plurality of wireless access nodes would typically include cells that are absent in the neighbour cell list NCL-1A stored in the user terminal 3 for regularly reporting measurement reports to the serving cell. In the example of FIG. 1, the cell information requested would typically include cell information of at least one of the cells NodeB 2C or NodeB 2D. In other words, the user

terminal 3 should at least monitor other cells than included in the neighbour cell list NCL-1A.

The user terminal 3, to that end, contains a receiver 20 (see FIG. 2) for receiving the request for reporting cell information of a plurality of wireless access nodes. The actual determination for which cells the cell information should be obtained and/or should be reported may be performed in the eNB 1A (and than being signalled to the user terminal 3) and/or internally in the user terminal 3.

When the updating of e.g. NCL-1A would only involve the determination whether additional cells should be included in the list, cell information may only be obtained for the cells of NodeB 2C and NodeB 2D. NCL-1A may be used to determine which cell(s) should be excluded for the gathering of cell information for the purpose of updating the NCL in such a case. However, when NCL-2A should be updated, the cells listed in NCL-1A should not necessarily be excluded.

On the other hand, if the NCL updating is also used to verify the existing NCL, cell information for one or more cells of the existing NCL should be gathered as well. In a particular embodiment, user terminal 3 comprises a determination module 21 for determining for which cells the cell information for the purpose of the NCL update should be gathered. As mentioned, the determination by the determination module 21 may be fully based on instructions received from the wireless access node eNB 1A or may be (partly) based on an internal comparison algorithm of the user terminal 3, using the copy of NCL-1A stored in a section of storage 22. The stored NCL may also be applied (illustrated by the arrow between scanning module 23 and determination module 21) after detecting (a part of) the cell information of all the available cells, as will be explained in further detail below.

The gathering of cell information for the purpose of updating an NCL may also be performed independently of the NCL stored in the user terminal 3. In such a case, the user terminal 3 preferably gathers cell information of all measurable cells.

The measurement is performed by a scanning module 23. The scanning module 23 detects the cell information of one or

more cells of wireless access nodes of the first and/or the second wireless access network.

The user terminal 3 is configured for storing the obtained cell information CI, or a derivative thereof, in a section of the storage means 22. While NCL-1A is normally erased from the storage means 22 after cell reselection or handover (in order to store the NCL of the new cell), the cell information remains stored for at least a particular period after the cell reselection or handover in order to transmit the cell information CI to the telecommunications system via the new cell using transmitter 24.

After cell reselection or handover to a cell of NodeB 2A, the transmitter 24 transmits the cell information CI, obtained while camping on the cell of eNB 1A, to a receiver 13 of NodeB 2A. Receiver 13 forwards the cell information to an updater 14 configured for updating (including verification) of the NCL-2A using the cell information CI.

When sufficient time is available, the mobile user terminal 3 may also transmit the cell information CI to the first wireless access network, particularly eNB 1A, in order to e.g. update NCL-1A, prior to cell reselection or handover to NodeB 2A. This transmission is shown by the dashed arrow from transmitter 23 towards eNB 1A.

In a particular example, a request is sent from request generator 12 to user terminal 3 to obtain cell information of the second wireless access network when user terminal is about to be handed over to this network. First, user terminal 3, using scanning means 23 detects as many PCI’s (physical cell identifiers) as possible. As an example, the PCI’s of the cells of nodes 2A-2D are detected. The PCI’s are generally transmitted on a specialized channel (a pilot channel for UMTS). Using NCL-1A stored in storage 22 and determination module 21, the PCI’s of NodeB 2A and NodeB 2B are omitted from the further processing, since these are already present in NCL-1A. The scanning means then detects the signal strengths of the pilot channel of the remaining cells identified by the PCI’s of NodeB 2C and NodeB 2D. It may turn out that the signal strength for the cell of

NodeB 2D is too low and, therefore, determination module 21 also omits further processing for cell NodeB 2D.

Subsequently, the scanning means tunes to the broadcast channel BCH of the cell of NodeB 2C and detects the GCID (global cell identifier) of this cell. If sufficient time is available before handover to the NodeB 2A occurs, the GCID and (possibly) other information is transmitted as cell information, using transmitter 24, to eNB 1A where it is received by receiver 13. Updater 14 may be used to update NCL-1A by adding wireless access node NodeB 2C, as illustrated. The other information may e.g. comprise location information of the mobile terminal 3, obtained using GPS module 25, when the scanning for available cells was performed.

However, time may be insufficient to complete the cell information gathering process and transmission of the cell information via the currently serving cell prior to handover. The GCID of NodeB 2C may then be stored as cell information CI in storage 22. User terminal 3 may then be handed over to NodeB 2A and transmission of the cell information CI may be performed using transmitter 24 to transmit the cell information CI to receiver 13 of NodeB 2A.

The cell information CI revealing the existence of NodeB 2C, i.e. the cell thereof, as an appropriate neighbour cell may be used for updating NCL-2A (for which the cell of NodeB 2C can be called a 'missing neighbour', since it was not present in NCL-2A) and for updating NCL-1A via a connection between the first wireless access network and the second wireless access network transporting cell information CI or a derivative thereof. This connection is indicated by the dashed arrow A in FIG. 2 and may e.g. be implemented using the OMC-2 and OMC-1 presented in FIG. 1.

Instead of or in addition to obtaining and reporting cell information of the second wireless access network, the mobile user terminal 3 may obtain cell information related to the first wireless access terminal. Reference is made to FIGS. 3A and 3B for an example of this.

In order to aid the automated optimisation of inter-network NCL, in one embodiment of the presented invention as illustrated in FIGS. 3A and 3B, an active terminal 3, just before making a handover from network A to network B, takes a snapshot of the pilot channel strengths it sees in network A, indicated by the measurement report. The terminal 3 performs a global scan and does not limit itself to considering only cells on the current NCL in order to identify potential cell candidates for adoption in the existing NCLs. Once the handover to network B is completed, user terminal 3 reports this snapshot to the new serving cell in network B. The new serving cell in network B can combine this report with other equivalent reports obtained from other handed-over terminals, in order to periodically optimise its inter-network NCL. The intra-network NCL of the originally serving cell may be updated as well by making the obtained cell information available to this cell using a connection between the wireless access networks.

FIGS. 4A and 4B provide another representation of an embodiment already discussed with reference to FIG. 2. The active terminal, just before making a handover from network A to network B, takes a snapshot of the pilot channel strengths it sees in network B, reports this to its source cell in network A (if sufficient time is available) and then undergoes the handover to the target cell in network B. Equivalently to the above description, now the source cell in network A can use these reports to self-optimise its inter-network NCL. The advantage of the second embodiment is that the cell in which the NCL is updated is in accordance with the direction of mobility. In other words, user motion from a source cell in network A to a target cell in network B makes use of the NCL in the source cell and hence the snapshot information generated at its handover can be used to update the NCL in the source cell. This advantage is primarily relevant in regions where inter-cell mobility is asymmetric. This is relevant when the operator favours one network over another for providing one or more particular services. This is also relevant in the case where mobility predominantly occurs in one direction (e.g. a one-way street).

Again, the cell information may also be stored using storage 22 and be transmitted to wireless access network A via wireless access network B. Also, the cell information of network B may be relevant for updating the intra-network NCL of the cell of this network.

The cell information CI (e.g. measurement reports) are periodically, or upon observed need, processed in each cell (access node) in order to re-optimise the inter-network NCL. This can be done by ranking all reported global cell IDs based on some weighted combination of the relative frequency at which they are reported and the associated pilot power strengths. This ranked list can then be combined with the actual handover statistics, as this indicates to what extent existing inter-network neighbour relations are actually used.

In an embodiment, a significant part of the processed reports of the mobile user terminals 3 (e.g. say more than 30% of the reported measurements) indicates a Cell ID with sufficient pilot (beacon) quality which is not included in the current inter-network NCL. Then this Cell ID should be added in the NCL.

Another example includes the case where an insignificant part of the processed UE reports (e.g. less than 1%) indicates a Cell ID with sufficient pilot (beacon) quality which is already included in the NCL. Then, this Cell ID should be removed from the NCL. Additionally, a listed neighbour to which hardly ever inter-network handover takes place, may be a candidate for removal from the NCL.

Additions or removals of cells in Network A and Network B may automatically be reflected in the ranking of the Cell IDs with sufficient pilot (beacon) strengths that are reported by the UEs. Consequently, these cells are then automatically added or removed from the NCL and no manual configuration is necessary.

As an alternative to optimising NCLs for each network separately, in an embodiment a single integrated NCL in each cell, containing cells both in the same network and in other (cooperative) networks, and both on the same carrier and differ-

ent carriers is automatically optimised. It is noted that optimisation of such an integrated list may then also implicitly involve a ranking of networks and carriers for potential adoption in the NCL (and possibly even for potential handovers).

One embodiment of the invention may be implemented as a program product for use with a computer system. The program(s) of the program product define functions of the embodiments (including the methods described herein) and can be contained on a variety of computer-readable storage media. Illustrative computer-readable storage media include, but are not limited to: (i) non-writable storage media (e.g., read-only memory devices within a computer such as CD-ROM disks readable by a CD-ROM drive, flash memory, ROM chips or any type of solid-state non-volatile semiconductor memory) on which information is permanently stored; and (ii) writable storage media (e.g., floppy disks within a diskette drive or hard-disk drive or any type of solid-state random-access semiconductor memory) on which alterable information is stored.

CLAIMS

1. A system for updating a neighbour cell list in a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined, the system comprising:

- a detector configured for detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;
- a selector configured for selecting a part of the user terminals;
- a request generator configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;
- a receiver configured for receiving the cell information from the one or more of the selected user terminals; and
- updating means configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

2. The system according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node.

3. The system according to claim 2, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

4. The system according to one or more of the preceding claims,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node.

5. The system according to claim 4, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

6. The infrastructure according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node

further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

7. The system according to one or more of the preceding claims, wherein the telecommunications system is further configured for receiving location information from one or more of the detected user terminals and wherein the location information is used as a selection parameter for selecting the part of the detected user terminals.

8. The system according to one or more of the preceding claims , wherein one or more thresholds, possibly service-dependent, are defined in the telecommunications system for transferring the user terminals between the first wireless access network and the second wireless access network and wherein at least one of the thresholds is used as a selection parameter for selecting the part of the detected user terminals.

9. In a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is

defined, a method for updating at least one of the first and second neighbour cell lists comprising the steps of:

- detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;

- selecting a part of the user terminals;

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

- receiving the cell information from the one or more of the selected user terminals; and

- updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

10. The method according to claim 9, comprising the steps of:

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

- receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node,

- transferring the selected user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node, and

- optionally, transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

11. The method according to claim 9 or 10, comprising the steps of:

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node,

- transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node, and

- optionally, transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

12. The method according to claim 9, comprising the steps of;

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node

- transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

13. A computer program comprising software code portions configured for, when executed by at least one processor, performing the method of one or more of the claims 9-12.

14. A mobile user terminal configured for use in the method according to one or more of the claims 9-11, wherein the mobile terminal, in use, contain a neighbour cell list of the first wireless access node, the terminal comprising:

- a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

- scanning means for detecting the cell information from the wireless access nodes, at least one of the wireless access nodes being absent in the neighbour cell list,

- a transmitter for transmitting the detected cell information,

- wherein the mobile user terminal is arranged for temporarily storing the detected cell information and transmitting the detected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

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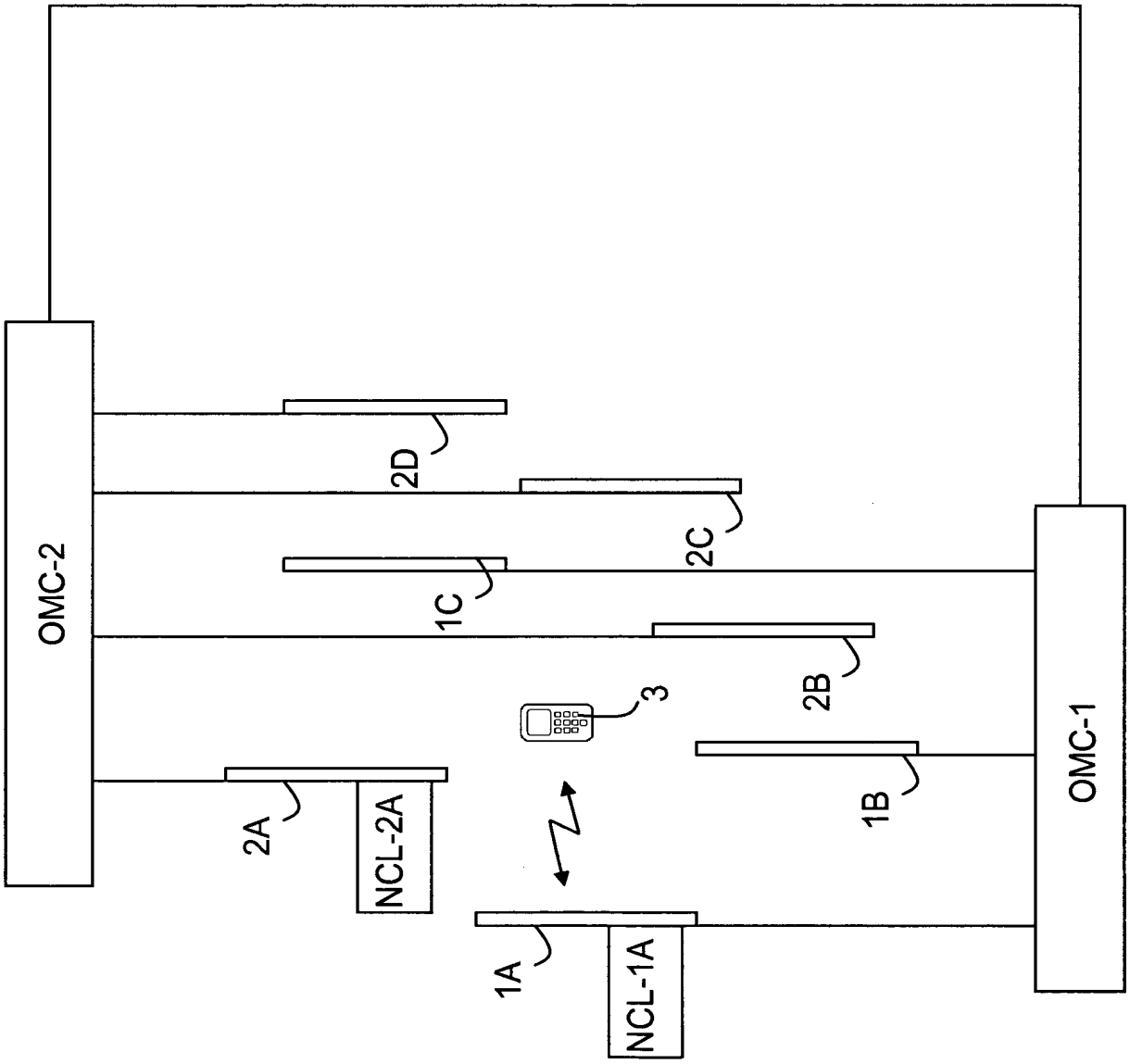


FIG. 1

2/4

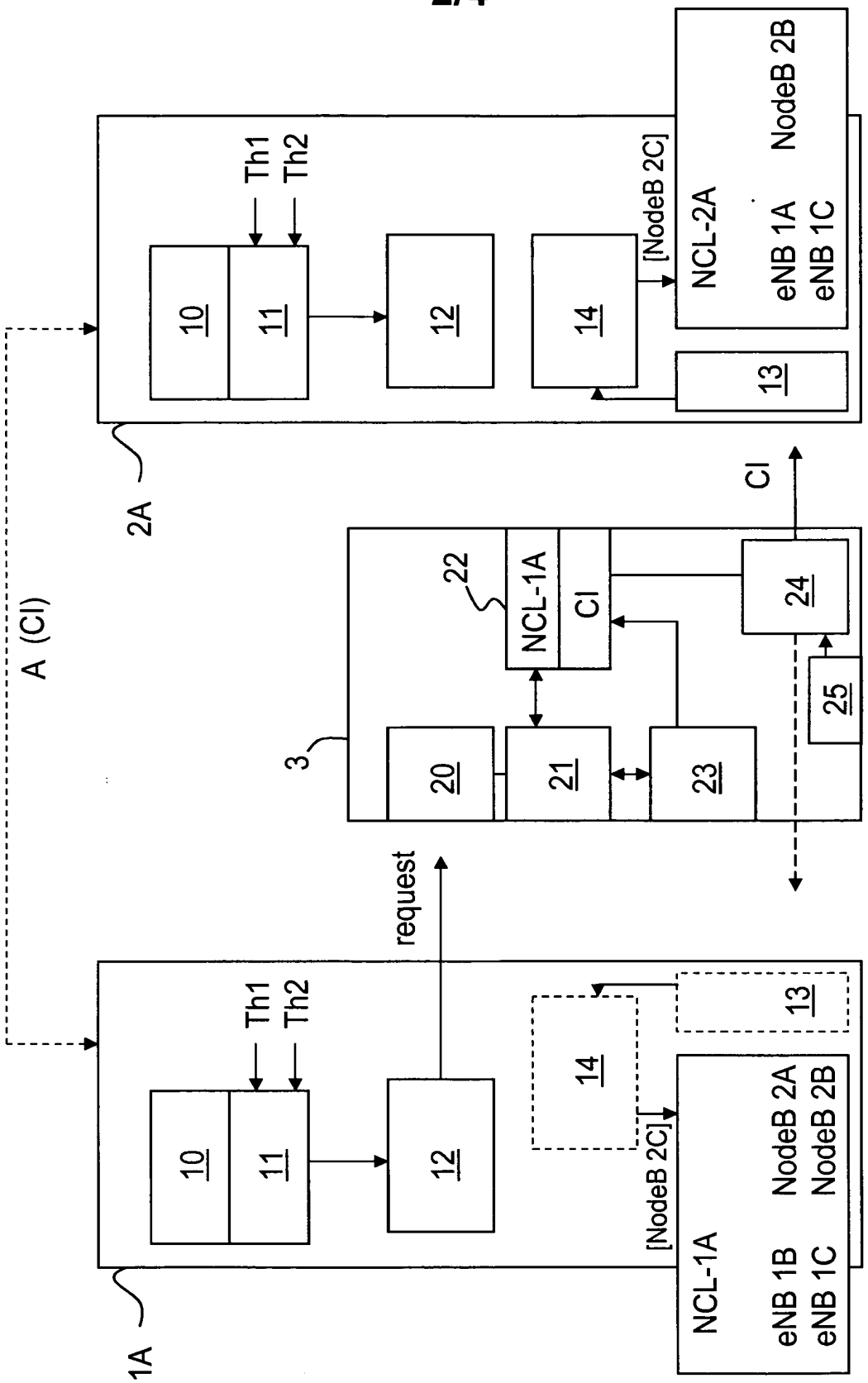

1A
2A
3
A (CI)
request
CI
Th1
Th2
10
11
12
13
14
20
21
22
23
24
25
NCL-1A
CI
[NodeB 2C]
NCL-1A
eNB 1B
eNB 1C
NodeB 2A
NodeB 2B
NCL-2A
eNB 1A
eNB 1C
NodeB 2B

FIG. 2

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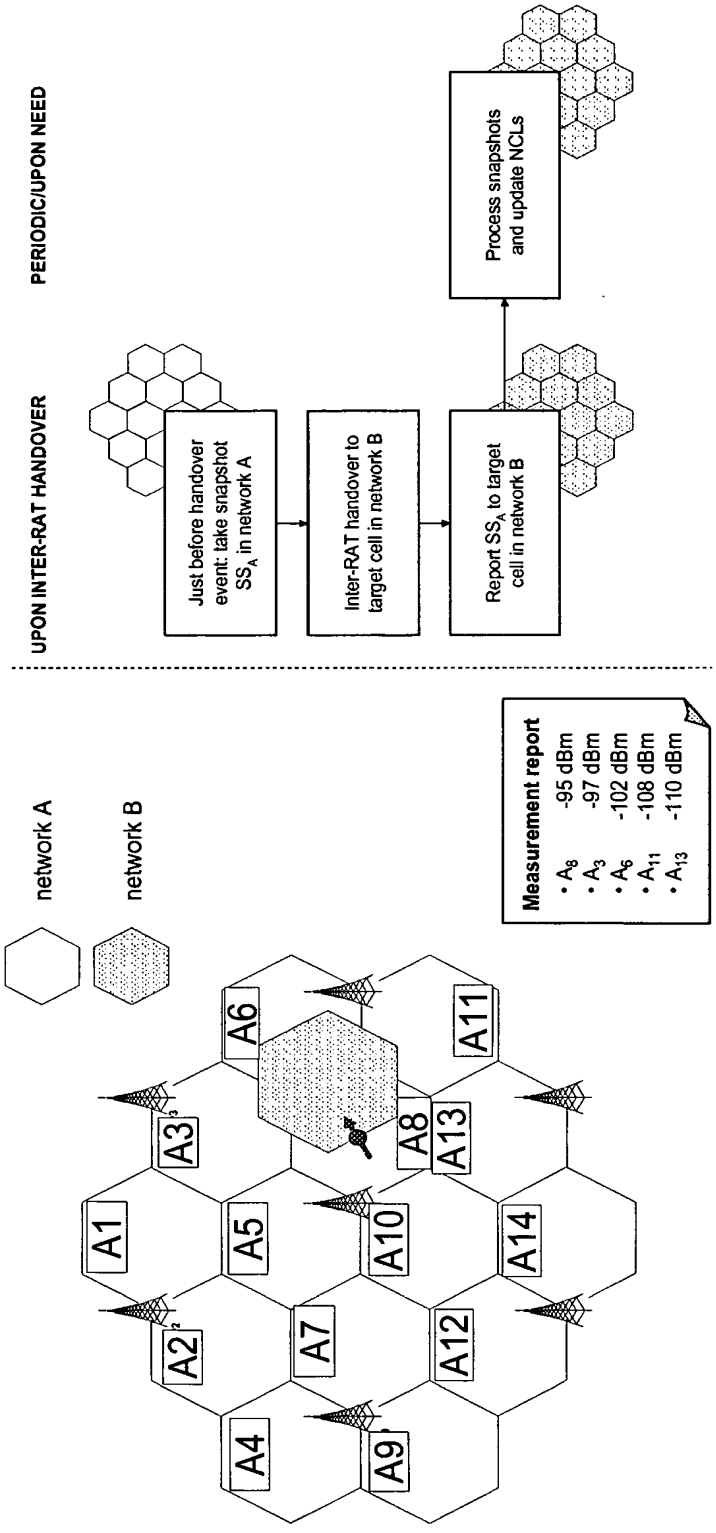


FIG. 3A

FIG. 3B

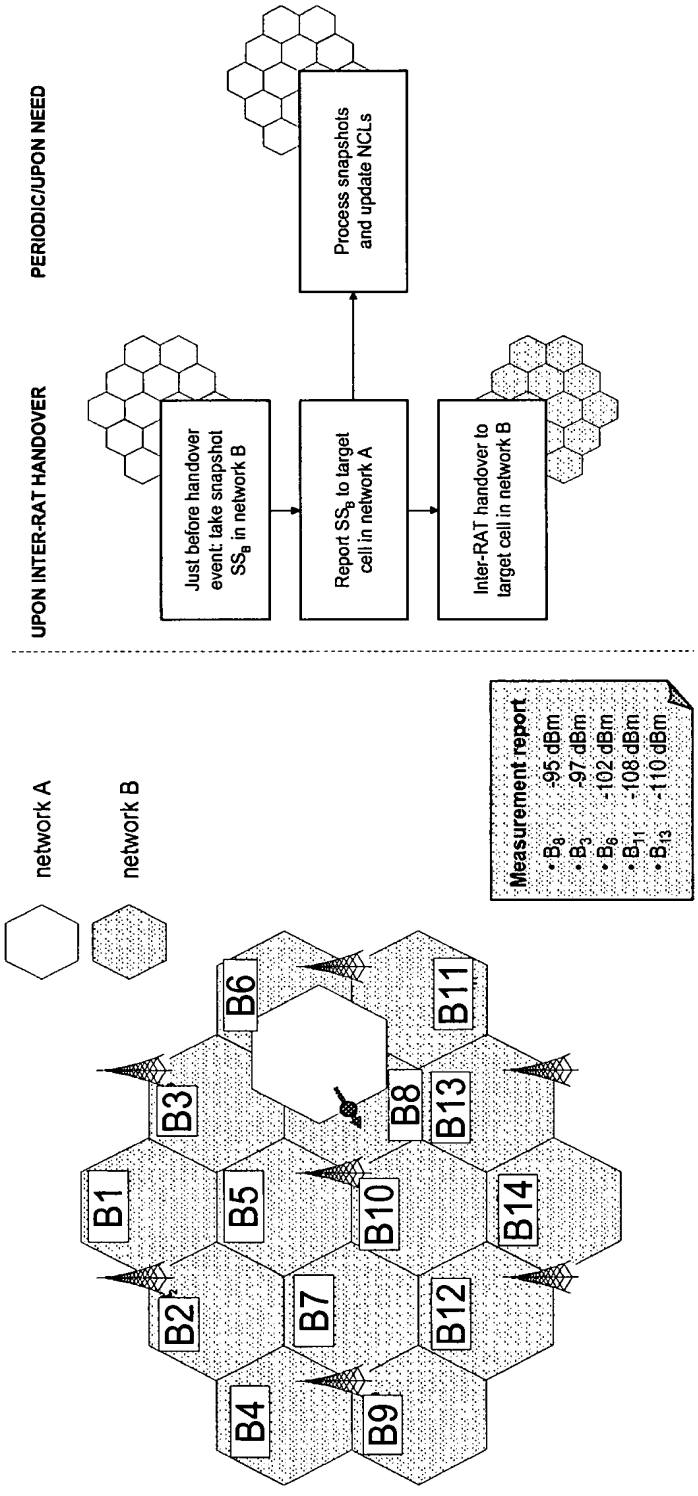

PERIODIC/UPON NEED
Process snapshots and update NCLs
UPON INTER-RAT HANDOVER
Just before handover event: take snapshot SS_B in network B
Report SS_B to target cell in network A
Inter-RAT handover to target cell in network B
network A
network B
Measurement report
• B_8 -95 dBm
• B_3 -97 dBm
• B_6 -102 dBm
• B_{11} -108 dBm
• B_{13} -110 dBm
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
B14

FIG. 4B

FIG. 4A

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Patentanmeldung Nr.	**Patent application No.**	**Demande de brevet n°**
	09172399.9 / EP09172399	

The organization code and number of your priority application, to be used for filing abroad under the Paris Convention, is EP09172399.

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le President de l'Office européen des brevets
p.o.

R.C. van Dijk

Anmeldung Nr:
Application no.: 09172399.9
Demande no :

Anmeldetag:
Date of filing: 07.10.09
Date de dépôt :

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2628 VK Delft/NL

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.)

System for updating a neighbour cell list (NCL) of a wireless access node of a telecommunications architecture comprising co-operating wireless access networks and method therefore

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H04W24/02

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AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR

System for updating a neighbour cell list (NCL) of a wireless access node of a telecommunications architecture comprising co-operating wireless access networks and method therefore

FIELD OF THE INVENTION

The invention relates to the field of telecommunications systems and a method in telecommunications architecture. More specifically, the invention relates to a telecommunications architecture comprising at least a first and a second wireless access network between which user terminals can be transferred and a method in such a telecommunications system, wherein the neighbour cell lists (NCLs) of at least a wireless access node of the first and/or second wireless access network can be updated using a system.

BACKGROUND OF THE INVENTION

When moving through the coverage area of a wireless access cellular network, mobile user terminals continuously scan the spectrum for pilot or reference signals (beacons) in order to determine which cell (base station) to camp on. In idle mode, this is referred to as cell reselection, while in active/dedicated mode, this is referred to as handover. The cell-specific list of surrounding cells that are considered for cell reselection or handover is called the neighbour cell list (NCL), which is stored in each base station and broadcast within the cell. The mobile user terminal receives and stores the NCL. The NCL contains the cells for which the mobile user terminal should send measurement reports (when certain criteria are met) to the base station currently serving the user terminal.

In case of multiple, cooperating wireless access cellular networks, each cell not only has an intra-network NCL, but also an inter-network NCL.

The optimisation of the NCLs is traditionally done with the aid of off-line planning tools, using path loss predictions and (off-line) optimisation algorithms. Currently, automated configuration and optimisation of intra-network NCLs and inter-network NCLs, based on e.g. actual measurement feedback from

user terminals, observed mobility patterns, base station scans and handover statistics, are being investigated.

3GPP TS 36.300, V8.9.0, discloses an automatic neighbour relation (ANR) function to relieve an operator from the burden of manually managing neighbour relations. Such an ANR function resides in the eNode-B (eNB) of an LTE network and manages a conceptual neighbour relation table (NRT). A neighbour detection function is used to find new neighbours and to add them to the NRT, whereas a neighbour removal function removes outdated neighbours from the NRT. The eNB instructs a user terminal from a serving cell to look for neighbour cells of other networks by scanning all cells. The user terminal first reports the physical cell identifier (PCI) of the detected cells in the other network. When the eNB receives the reports from the user terminals containing the PCI's of the cells, the eNB instructs the user terminal, using the newly discovered cell as a parameter, to read the Cell Global Identifier (CGI) and further cell information from the neighbouring cells. The user terminal also reports this information to the serving cell. The eNB may then update the NRT using the information reported from the user terminals.

SUMMARY OF THE INVENTION

A system is disclosed for a telecommunications architecture that comprises a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined.

The system comprises a detector configured for detecting user terminals about to be transferred, i.e. for which cell reselection or handover will be performed, from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network.

The system also comprises a request generator configured for requesting from the first wireless access node one or

more of the detected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The telecommunications system, particularly at least one of the first and the second wireless access node, also comprises a receiver configured for receiving the cell information from one or more of the detected user terminals. Updating means are provided configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

A method in a telecommunications architecture is also disclosed. User terminals about to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network are detected. From the first wireless access node, one or more of the detected user terminals are requested to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The cell information is received from one or more of the detected user terminals and at least one of the first neighbour cell list and the second neighbour cell list is updated using the received cell information.

Furthermore, a mobile user terminal containing at least one neighbour cell list of the first wireless access node is disclosed. The terminal comprises a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The mobile terminal also contains scanning means configured for detecting the cell information from the wireless access nodes, at least one of the wireless access nodes being absent in the neighbour cell list, and a transmitter for transmitting the detected cell information. At present, standardization does not allow mobile terminals to measure cells not present in the NCL. However, there are no intrinsic obstacles for making performing such measurements. The mobile terminal is arranged for temporarily storing the detected cell information and transmitting the de-

tected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

It is noted that in the present application the terms wireless access node and cell are used as similar terms. The skilled person will appreciate that a single wireless access node may provide multiple cells and that, typically, a neighbour cell list is defined for each of the cells of such a node.

The plurality of wireless access nodes of which cell information is requested may exclude the first wireless access node, or more particularly, the cell thereof currently serving the user terminal. On the other hand, the plurality of wireless access nodes would typically include cells that are absent in the neighbour cell list stored in the user terminal for regularly reporting measurement reports to the serving cell. Otherwise, since the neighbour cell list is obtained from the serving cell, the detection of the cell information by the user terminal would be restricted to this list and would therefore only be suitable for verifying the existing NCL and not for adding new neighbouring cells to the list. In an embodiment, the user terminal performs a complete scan for all cells in the first wireless access network (possibly excluding the currently serving cell) and/or all cells in the second wireless access network to allow the telecommunications system to obtain a complete picture of the available cells around the first wireless access node. This complete information containing the scan of all cells may then be used for updating the NCL(s). Alternatively, the user terminal may compare the received complete information with the NCL it has obtained from the first wireless access node and only report cell information of cells not present on the current NCL.

The first and second wireless access networks may differ in radio access technology (e.g. GSM and UMTS or UMTS and LTE), the deployed release of a given radio access technology, the used frequency spectrum (e.g. the 900 MHz and 1800 MHz frequency bands (the latter also being referred to as a DCS network) for GSM, different 5MHz carriers for UMTS) and/or wire-

less access networks of different mobile operators. The wireless access network may also differ in the type of cells provided, e.g. macro cells and pico cells.

The disclosed system and method are able to specifically direct the request for cell information for the first and/or second network to user terminals in the regions where cell reselection or handover from the first to the second wireless access network is about to occur. By collecting this information specifically at cell reselection or handover moments, the updating of the NCL is inherently based on the inter-network neighbours that a user terminal experiences in the cell reselection or handover region, where the reports of the user terminal measurements are most relevant for construing the NCL.

In some instances, user terminals may move rapidly through an area and cell reselection and handover to the second wireless access network should be performed quickly. In such cases, insufficient time may be available for performing the scan for obtaining the cell information for the first wireless access network and for reporting the cell information to the telecommunications system via the first wireless access network. The embodiments of the invention as defined in claims 2 and 11 provide additional time for completing the method by performing the cell reselection or handover as soon as the mobile user terminal has been instructed for performing the scan for cell information for the first and/or the second wireless access network. By temporarily storing the cell information resulting from the scan at the mobile user terminal, the user terminal may carry the cell information to the second network where it has sufficient time to report the cell information of the plurality of wireless access nodes of the first wireless access network via the second network.

The cell information of the wireless access nodes of the first wireless access network may be used for updating the neighbour cell list of the first wireless access node and/or for updating the neighbour cell list of the second wireless access node, or the cells thereof.

The updating of the neighbour cell list of the second wireless access node is relevant for user terminals reselecting cells or handed over from the second wireless access node to the first wireless access network, i.e. in the cell reselection or handover direction reverse to the direction travelled by the terminals reporting the cell information. Since other user terminals will be transferred from the second wireless access network to the first wireless access network, the neighbour cell list of the first wireless access node may also be updated in this way.

The cell information of the plurality of access nodes of the first wireless access network as received via the second wireless access node may also be transferred back to the first wireless access node, e.g. for updating the intra-network neighbour cell list, as defined in claim 3 and, optionally, in claim 11. In a particular example, this embodiment may be used to reduce the so-called 'missing neighbour' effect in a UMTS network, here being the first wireless access network. User terminals equipped to connect to UMTS networks are restricted to gathering cell information as defined in the neighbour cell list received from the base station currently serving the user terminal. An absent cell in the neighbour cell list of the base station will thus never be measured and reported by the user terminal as a result of this restriction of the user terminal. When the signal of a missing neighbour is too strong, call drops may occur. The present embodiments may reduce this problem by instructing the user terminals to also scan for cell information of wireless access nodes of the UMTS network being absent in the neighbour cell list (and thus possibly revealing the existence of cells not present in the neighbour cell list of the base station) and to report this via the second wireless access network back to the first wireless access node. The NCL of the first wireless access node may then be updated with the missing neighbour cell.

The user terminals may also be instructed to obtain the cell information of the plurality of wireless access nodes of the second wireless access network shortly before cell reselec-

tion or handover to the second wireless access node of this network and report the cell information to the telecommunications system via this second wireless access node, i.e. after cell reselection or handover. This embodiment is defined in claims 4 and 12.

Again, the cell information of the wireless access nodes of the second wireless access network may be used for updating the neighbour cell list of the first wireless access node and/or for updating the neighbour cell list of the second wireless access node. The cell information obtained for the access nodes of the second wireless access network may be relevant for the second wireless access network itself, e.g. for updating the intra-network NCL, in view of the 'missing neighbour' effect occurring in particular types of network such as UMTS, as discussed above for the first wireless access network.

The cell information of the plurality of access nodes of the second wireless access network as received via the second wireless access node may be transferred back to the first wireless access node as defined in claim 5 and, optionally, in claim 12. In doing so, the first wireless access node may update its neighbour cell list using the received cell information obtained shortly before cell reselection or handover, even when the user terminals have insufficient time for reporting the cell information for the plurality of wireless access nodes of the second wireless access network directly to the first wireless access node. The updated NCL is relevant for cell reselection or handover from the first wireless access node to the second wireless access network for other user terminals.

Of course, when sufficient time for reporting the cell information of the plurality of wireless access nodes of the second network is available, this cell information obtained shortly before cell reselection or handover to the second wireless access network can be reported directly to the first wireless access node, as defined in the embodiments of claims 6 and 13.

It is not required that all handover or cell reselection instances trigger a scan for cell information by the user

terminals. A wireless access node may for instance indicate on its broadcast channel not only whether handovers and/or cell re-selections should trigger such reporting, but also a likelihood parameter which the terminal can use to flip a (biased) coin in determining whether it should send cell information at a specific handover or cell reselection instance. Alternatively, the wireless access node may explicitly signal to the specific user terminal whether it should do the cell measurement and reporting. In this manner, the amount of cell information reporting can be tuned, which relates to a trade-off between the measurement overhead (signalling load) and the potential for neighbour cell list optimisation. The embodiment of the invention as defined in claim 7 provides the possibility of achieving such an appropriate trade-off. The embodiment of the telecommunications system of claim 7 may also be used for the method in the telecommunications system as defined in claims 10-13.

One embodiment of tuning the amount of cell list optimisation traffic is to use the location information from the user terminals as a selection criterion as defined in claim 8. The location information may e.g. be obtained from a GPS module in the user terminal or by means of measurements using the first and/or the second wireless access network. This location information can be useful e.g. in identifying where handover regions exist, and in solving location-specific outages or problems, e.g. dropped calls due to 'missing neighbour'. It may also be useful when an operator changes configuration (optimisation of downlink power, antenna tilt, etc) and wants to measure the effect on the cells relevant for inter-RAT cell change or handover.

Another advantageous selection criterion for determining which user terminals should report cell information is the transfer threshold that may have been set by the operator(s) of the telecommunication system, as defined in claim 9. The transfer threshold determines at what level (typically involving pilot signal measurements) cell reselection or handover would occur. The transfer threshold for cell reselection or handover from the first wireless access network to the second wireless

access network may be asymmetric (i.e. a different transfer threshold Th2 applies for a transfer from the second to the first wireless access network) and may also be dependent on the service type of the service received by the user terminal when connected to the first wireless access node. As an example, a user terminal provided with a voice service by a cell of an LTE network that is handed over to a GSM network might not be handed over back to the LTE network. This is because the operator chooses this mode of operation. In such a case, although this user terminal is a detected user terminal in the sense that it is about to be transferred to the second wireless access network (GSM), it is not selected for reporting requested to report cell information of the plurality of wireless access nodes of the first wireless access network (the LTE network), since the hand-over in the direction back to the first network (the LTE network) will generally not be made. On the other hand, for a user terminal using a data service that is temporarily handed over from an LTE network to a GSM network, a handover back to the LTE network is generally preferred and such user terminals can be selected to report cell information of the plurality of wireless access nodes of the second network. The embodiment of the telecommunications system of claim 9 may also be used for the method in the telecommunications system as defined in claims 10-13.

Hereinafter, embodiments of the invention will be described in further detail. It should be appreciated, however, that these embodiments may not be construed as limiting the scope of protection for the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 provides a schematic illustration of a telecommunication system comprising a first and a second wireless access network, each having a plurality of wireless access nodes, according to an embodiment of the invention;

FIG. 2 provides a schematic illustration of a mobile user terminal and wireless access nodes configured for performing a method according to an embodiment of the invention;

FIGS. 3A and 3B provide a schematic illustration of a telecommunications system and a flow chart for operating such a system, wherein cell information of wireless access nodes of the first wireless access network is obtained and reported via the second wireless access network; and

FIGS. 4A and 4B provide a schematic illustration of a telecommunications system and a flow chart for operating such a system, wherein cell information of wireless access nodes of the second wireless access network is obtained and reported via the first wireless access network.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of first wireless access nodes 1A-1C of a first wireless access network and second wireless access nodes 2A-2D of a second wireless network. As an example, the first wireless access nodes 1A-1C are eNBs of an Long Term Evolution (LTE) network, whereas the second wireless access nodes 2A-2D are NodeBs of an UMTS network. Other examples includes wireless access networks differing in other radio access technologies (RATs), e.g. GSM and UMTS, differences in the deployed release of a given radio access technology, differences in the used frequency spectrum (e.g. the 900 MHz and 1800 MHz frequency bands (the latter also being referred to as a DCS network) for GSM, different 5MHz carriers for UMTS) and/or wireless access networks of different mobile operators. The wireless access network may also differ in the type of cells provided, e.g. macro cells and pico cells.

The wireless access nodes 1A-1C and 2A-2D can be controlled by control systems as schematically illustrated in FIG. 1. As an example, the control system may be Operation and Maintenance Centres (OMCs) as generally known in the art. The OMCs of the wireless access networks can be interconnected. Other connections between the wireless access networks can be used as well. If the wireless access nodes of the first and second wire-

less access networks originate from the same vendor, a single OMC can be used.

Each of the wireless access nodes 1A-1C and 2A-2D may contain at least one neighbour cell list (NCL). In FIG. 1, NCL-1A and NCL-2A are indicated as NCL of the corresponding wireless access nodes. When a wireless access node provides multiple cells, typically each cell has a corresponding NCL.

A wireless access node broadcasts the NCL and mobile user terminals 3 camping on such a cell receive and store the NCL. The NCL is typically used to instruct the mobile terminal 3 which cells to monitor and to report every now and then the received signal strengths of each of the monitored cells, such that the network can make a decision whether or not the mobile terminal 3 should select or should be handed over to another cell.

As an example, the mobile terminal 3 receives the NCL-1A from wireless access node 1A to which it is currently connected. NCL-1A contains the cell(s) of neighbouring access nodes 1B and 1C and mobile terminal 3 monitors the signal strengths of these cells and reports these to the wireless access node 1A. Such an NCL-1A is referred to as an intra-network NCL. NCL-1A may also list neighbouring access nodes 2A and 2B of the second wireless access network, in which case NCL-1A would be referred to as an inter-network NCL. NCL-1A may also be a combined NCL, i.e. a combination of an intra-network and an inter-network NCL. Currently, automated configuration and optimisation of intra-network NCLs and inter-network NCLs is based on e.g. actual measurement feedback from user terminals 3 as disclosed in 3GPP TS 36.300, V8.9.0.

Referring also to FIGS. 2A and 2B, an embodiment will now be described in further detail, wherein intra-network NCL-1A contains the cells of eNBs 1B and 1C and inter-network NCL-1A contains the cells of NodeBs 2A and 2B. Note that inter-network NCL-1A does not yet contain NodeBs 2C and 2D.

Mobile user terminal 3 is assumed to camp on a cell of eNB 1A and is monitoring the cells of eNB's 1B, 1C and NodeBs 2A and 2B as indicated in the intra-network and inter-network NCLs

transmitted in the cell under consideration. The mobile user terminal 3 regularly sends measurement reports to the eNB 1A as generally known in the art.

As illustrated schematically in FIG. 2A, eNB 1A contains a cell reselection/handover detector 10 that recognizes that mobile terminal 3 requires a cell reselection or handover to NodeB 2A of the second wireless access network. The cell reselection or handover indication triggers the following sequence of events in eNB 1A.

First, it may be determined whether or not the mobile terminal 3 for which a cell reselection or handover indication is received should participate, i.e. should be selected, in the process for updating (which includes the verification of the correctness) of an NCL, such as NCL-1A or NCL-2A. To that end, the eNB 1A contains a selection module 11 for selecting a part of the user terminals 3 for which a cell reselection or handover indication is detected. In this manner, it is possible to filter an appropriate portion the user terminals for which cell reselection or handover is about in order to reduce unnecessary signalling over the first and/or second wireless access network. The decision whether or not to participate in the updating process, i.e. whether or not to provide information to the telecommunication system allowing the updating of the NCL's, may either be taken at the mobile terminal or at the telecommunications system, particularly eNB 1A.

As an example, eNB 1A may indicate on its broadcast channel not only whether handovers and/or cell reselections should trigger such reporting, but also a likelihood parameter which the terminal 3 can use to flip a biased coin in determining whether it should send information at a specific handover or cell reselection instance. Alternatively, eNB 1A may explicitly signal to the specific user terminal 3 whether it should do the cell measurement and reporting. In this manner, the amount of cell information reporting can be tuned, which relates to a trade-off between the measurement overhead (signalling load) and the potential for neighbour cell list optimisation.

An advantageous selection criterion at the side of the eNB 1A for determining which user terminals 3 should report cell information is the transfer threshold that may have been set by the operator(s) of the telecommunications system between the first and the second wireless access networks. The transfer threshold determines at what level (typically involving pilot signal measurements) cell reselection or handover would occur. The transfer threshold Th1 for cell reselection or handover from the first wireless access network to the second wireless access network may be asymmetric (i.e. a different transfer threshold Th2 applies for a transfer from the second to the first wireless access network) and may also be dependent on the service type of the service enjoyed by the user terminal when connected to the first wireless access node.

In FIG. 1, the user terminal 3 camping on a cell of eNB 1A of an LTE network using a data service that is about to be handed over to NodeB 2A of an UMTS network will generally be handed over back to the LTE network, if possible, because the operator applies a low threshold for handing over the user terminal 3 from the UMTS network to the LTE network for data services but a much higher threshold for handing over the user terminal to the UMTS network. In such a case, since a transfer between the networks is more likely in one direction than in the other, the terminal 3 may or may not be selected for providing information useful for the NCL updating process as will now be described in further detail.

The selection stage of user terminals 3 may be omitted completely or may be selectively applied, e.g. during particular hours of the day or at particular stages of the configuration and optimisation of the network.

Once user terminal 3 has been selected, request generator 12 in FIG. 2 is activated in order to request the user terminal 3 to report cell information of a plurality of wireless access nodes.

The plurality of wireless access nodes of which cell information is requested may exclude the cell of eNB 1A currently serving the user terminal 3. On the other hand, the

plurality of wireless access nodes would typically include cells that are absent in the neighbour cell list NCL-1A stored in the user terminal 3 for regularly reporting measurement reports to the serving cell. In the example of FIG. 1, the cell information requested would typically include cell information of at least one of the cells NodeB 2C or NodeB 2D. In other words, the user terminal 3 should at least monitor other cells than included in the neighbour cell list NCL-1A.

The user terminal 3, to that end, contains a receiver 20 (see FIG. 2) for receiving the request for reporting cell information of a plurality of wireless access nodes. The actual determination for which cells the cell information should be obtained and/or should be reported may be performed in the eNB 1A (and than being signalled to the user terminal 3) and/or internally in the user terminal 3.

When the updating of e.g. NCL-1A would only involve the determination whether additional cells should be included in the list, cell information may only be obtained for the cells of NodeB 2C and NodeB 2D. NCL-1A may be used to determine which cell(s) should be excluded for the gathering of cell information for the purpose of updating the NCL in such a case. However, when NCL-2A should be updated, the cells listed in NCL-1A should not necessarily be excluded.

On the other hand, if the NCL updating is also used to verify the existing NCL, cell information for one or more cells of the existing NCL should be gathered as well. In a particular embodiment, user terminal 3 comprises a determination module 21 for determining for which cells the cell information for the purpose of the NCL update should be gathered. As mentioned, the determination by the determination module 21 may be fully based on instructions received from the wireless access node eNB 1A or may be (partly) based on an internal comparison algorithm of the user terminal 3, using the copy of NCL-1A stored in a section of storage 22. The stored NCL may also be applied (illustrated by the arrow between scanning module 23 and determination module 21) after detecting (a part of) the cell information of all the available cells, as will be explained in further detail below.

The gathering of cell information for the purpose of updating an NCL may also be performed independently of the NCL stored in the user terminal 3. In such a case, the user terminal 3 preferably gathers cell information of all measurable cells.

The measurement is performed by a scanning module 23. The scanning module 23 detects the cell information of one or more cells of wireless access nodes of the first and/or the second wireless access network.

The user terminal 3 is configured for storing the obtained cell information CI, or a derivative thereof, in a section of the storage means 22. While NCL-1A is normally erased from the storage means 22 after cell reselection or handover (in order to store the NCL of the new cell), the cell information remains stored for at least a particular period after the cell reselection or handover in order to transmit the cell information CI to the telecommunications system via the new cell using transmitter 24.

After cell reselection or handover to a cell of NodeB 2A, the transmitter 24 transmits the cell information CI, obtained while camping on the cell of eNB 1A, to a receiver 13 of NodeB 2A. Receiver 13 forwards the cell information to an updater 14 configured for updating (including verification) of the NCL-2A using the cell information CI.

When sufficient time is available, the mobile user terminal 3 may also transmit the cell information CI to the first wireless access network, particularly eNB 1A, in order to e.g. update NCL-1A, prior to cell reselection or handover to NodeB 2A. This transmission is shown by the dashed arrow from transmitter 23 towards eNB 1A.

In a particular example, a request is sent from request generator 12 to user terminal 3 to obtain cell information of the second wireless access network when user terminal is about to be handed over to this network. First, user terminal 3, using scanning means 23 detects as many PCI's (physical cell identifiers) as possible. As an example, the PCI's of the cells of nodes 2A-2D are detected. The PCI's are generally transmitted on a specialized channel (a pilot channel for UMTS). Using NCL-1A

stored in storage 22 and determination module 21, the PCI's of NodeB 2A and NodeB 2B are omitted from the further processing, since these are already present in NCL-1A. The scanning means then detects the signal strengths of the pilot channel of the remaining cells identified by the PCI's of NodeB 2C and NodeB 2D. It may turn out that the signal strength for the cell of NodeB 2D is too low and, therefore, determination module 21 also omits further processing for cell NodeB 2D.

Subsequently, the scanning means tunes to the broadcast channel BCH of the cell of NodeB 2C and detects the GCID (global cell identifier) of this cell. If sufficient time is available before handover to the NodeB 2A occurs, the GCID and (possibly) other information is transmitted as cell information, using transmitter 24, to eNB 1A where it is received by receiver 13. Updater 14 may be used to update NCL-1A by adding wireless access node NodeB 2C, as illustrated. The other information may e.g. comprise location information of the mobile terminal 3, obtained using GPS module 25, when the scanning for available cells was performed.

However, time may be insufficient to complete the cell information gathering process and transmission of the cell information via the currently serving cell prior to handover. The GCID of NodeB 2C may then be stored as cell information CI in storage 22. User terminal 3 may then be handed over to NodeB 2A and transmission of the cell information CI may be performed using transmitter 24 to transmit the cell information CI to receiver 13 of NodeB 2A.

The cell information CI revealing the existence of NodeB 2C, i.e. the cell thereof, as an appropriate neighbour cell may be used for updating NCL-2A (for which the cell of NodeB 2C can be called a 'missing neighbour', since it was not present in NCL-2A) and for updating NCL-1A via a connection between the first wireless access network and the second wireless access network transporting cell information CI or a derivative thereof. This connection is indicated by the dashed arrow A in FIG. 2 and may e.g. be implemented using the OMC-2 and OMC-1 presented in FIG. 1.

Instead of or in addition to obtaining and reporting cell information of the second wireless access network, the mobile user terminal 3 may obtain cell information related to the first wireless access terminal. Reference is made to FIGS. 3A and 3B for an example of this.

In order to aid the automated optimisation of inter-network NCL, in one embodiment of the presented invention as illustrated in FIGS. 3A and 3B, an active terminal 3, just before making a handover from network A to network B, takes a snapshot of the pilot channel strengths it sees in network A, indicated by the measurement report. The terminal 3 performs a global scan and does not limit itself to considering only cells on the current NCL in order to identify potential cell candidates for adoption in the existing NCLs. Once the handover to network B is completed, user terminal 3 reports this snapshot to the new serving cell in network B. The new serving cell in network B can combine this report with other equivalent reports obtained from other handed-over terminals, in order to periodically optimise its inter-network NCL. The intra-network NCL of the originally serving cell may be updated as well by making the obtained cell information available to this cell using a connection between the wireless access networks.

FIGS. 4A and 4B provide another representation of an embodiment already discussed with reference to FIG. 2. The active terminal, just before making a handover from network A to network B, takes a snapshot of the pilot channel strengths it sees in network B, reports this to its source cell in network A (if sufficient time is available) and then undergoes the handover to the target cell in network B. Equivalently to the above description, now the source cell in network A can use these reports to self-optimise its inter-network NCL. The advantage of the second embodiment is that the cell in which the NCL is updated is in accordance with the direction of mobility. In other words, user motion from a source cell in network A to a target cell in network B makes use of the NCL in the source cell and hence the snapshot information generated at its handover can be used to update the NCL in the source cell. This advantage is

primarily relevant in regions where inter-cell mobility is asymmetric. This is relevant when the operator favours one network over another for providing one or more particular services. This is also relevant in the case where mobility predominantly occurs in one direction (e.g. a one-way street).

Again, the cell information may also be stored using storage 22 and be transmitted to wireless access network A via wireless access network B. Also, the cell information of network B may be relevant for updating the intra-network NCL of the cell of this network.

The cell information CI (e.g. measurement reports) are periodically, or upon observed need, processed in each cell (access node) in order to re-optimise the inter-network NCL. This can be done by ranking all reported global cell IDs based on some weighted combination of the relative frequency at which they are reported and the associated pilot power strengths. This ranked list can then be combined with the actual handover statistics, as this indicates to what extent existing inter-network neighbour relations are actually used.

In an embodiment, a significant part of the processed reports of the mobile user terminals 3 (e.g. say more than 30% of the reported measurements) indicates a Cell ID with sufficient pilot (beacon) quality which is not included in the current inter-network NCL. Then this Cell ID should be added in the NCL.

Another example includes the case where an insignificant part of the processed UE reports (e.g. less than 1%) indicates a Cell ID with sufficient pilot (beacon) quality which is already included in the NCL. Then, this Cell ID should be removed from the NCL. Additionally, a listed neighbour to which hardly ever inter-network handover takes place, may be a candidate for removal from the NCL.

Additions or removals of cells in Network A and Network B may automatically be reflected in the ranking of the Cell IDs with sufficient pilot (beacon) strengths that are reported by the UEs. Consequently, these cells are then automatically added

or removed from the NCL and no manual configuration is necessary.

As an alternative to optimising NCLs for each network separately, in an embodiment a single integrated NCL in each cell, containing cells both in the same network and in other (cooperative) networks, and both on the same carrier and different carriers is automatically optimised. It is noted that optimisation of such an integrated list may then also implicitly involve a ranking of networks and carriers for potential adoption in the NCL (and possibly even for potential handovers).

One embodiment of the invention may be implemented as a program product for use with a computer system. The program(s) of the program product define functions of the embodiments (including the methods described herein) and can be contained on a variety of computer-readable storage media. Illustrative computer-readable storage media include, but are not limited to: (i) non-writable storage media (e.g., read-only memory devices within a computer such as CD-ROM disks readable by a CD-ROM drive, flash memory, ROM chips or any type of solid-state non-volatile semiconductor memory) on which information is permanently stored; and (ii) writable storage media (e.g., floppy disks within a diskette drive or hard-disk drive or any type of solid-state random-access semiconductor memory) on which alterable information is stored.

CLAIMS

1. A system for updating a neighbour cell list in a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is defined, the system comprising:

- a detector configured for detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;

- a request generator configured for requesting from the first wireless access node one or more of the detected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

- a receiver configured for receiving the cell information from the one or more of the detected user terminals; and

- updating means configured for updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

2. The system according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the detected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node.

3. The system according to claim 2, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

4. The system according to one or more of the preceding claims,

wherein the request generator is configured for requesting from the first wireless access node one or more of the detected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node,

the system further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node.

5. The system according to claim 4, further comprising a data transfer system for transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

6. The infrastructure according to claim 1,

wherein the request generator is configured for requesting from the first wireless access node one or more of the

selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

wherein the receiver is configured for receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node

further comprising a transfer system configured for transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

7. The system according to one or more of the preceding claims, wherein the telecommunications system is further configured for selecting a part of the detected user terminals for transmitting the cell information to the receiver.

8. The system according to claim 7 one or more of the preceding claims, wherein the telecommunications system is further configured for receiving location information from one or more of the detected user terminals and wherein the location information is used as a selection parameter for selecting the part of the detected user terminals.

9. The system according to claim 7, wherein one or more thresholds, possibly service-dependent, are defined in the telecommunications system for transferring the user terminals between the first wireless access network and the second wireless access network and wherein at least one of the thresholds is used as a selection parameter for selecting the part of the detected user terminals.

10. In a telecommunications architecture comprising a first wireless access network having a first wireless access node for which at least one first neighbour cell list is defined and a second wireless access network having a second wireless access node for which at least one second neighbour cell list is

defined, a method for updating at least one of the first and second neighbour cell lists comprising the steps of:

- detecting user terminals to be transferred from the first wireless access node of the first wireless access network to the second wireless access node of the second wireless access network;

- requesting from the first wireless access node one or more of the detected user terminals to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

- receiving the cell information from the one or more of the detected user terminals; and

- updating at least one of the first neighbour cell list and the second neighbour cell list using the received cell information.

11. The method according to claim 10, comprising the steps of:

- requesting from the first wireless access node one or more of the detected user terminals to report cell information of a plurality of wireless access nodes of the first wireless access network;

- receiving the cell information of the wireless nodes of the first wireless access network via the second wireless access node,

- transferring the detected user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the first wireless access network via the second wireless access node, and

- optionally, transferring the cell information, or a derivative thereof, of the wireless access nodes of the first wireless access network to the first wireless access node.

12. The method according to claim 10 or 11, comprising the steps of:

- requesting from the first wireless access node one or more of the detected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless nodes of the second wireless access network via the second wireless access node,

- transferring user terminals from the first wireless access network to the second wireless access network prior to receiving the cell information of the plurality of wireless access nodes of the second wireless access network via the second wireless access node, and

- optionally, transferring the cell information, or a derivative thereof, of the wireless access nodes of the second wireless access network to the first wireless access node.

13. The method according to claim 10, comprising the steps of;

- requesting from the first wireless access node one or more of the selected user terminals to report cell information of a plurality of wireless access nodes of the second wireless access network;

- receiving the cell information of the wireless access nodes of the second wireless access network via the first wireless access node

- transferring user terminals from the first wireless access network to the second wireless access network after receiving the one or more cell parameters of wireless access nodes of the second wireless access network via the first wireless access node.

14. A computer program comprising software code portions configured for, when executed by at least one processor, performing the method of one or more of the claims 10-13.

15. A mobile user terminal configured for use in the method according to one or more of the claims 10-12, wherein the

mobile terminal, in use, contain a neighbour cell list of the first wireless access node, the terminal comprising:

- a receiver for receiving the request for reporting cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network;

- scanning means for detecting the cell information from the wireless access nodes, at least one of the wireless access nodes being absent in the neighbour cell list,

- a transmitter for transmitting the detected cell information,

- wherein the mobile user terminal is arranged for temporarily storing the detected cell information and transmitting the detected cell information to the second wireless access node after being transferred from the first to the second wireless access network.

ABSTRACT

The invention relates to a system and method for updating a neighbour cell list of a wireless access node. User terminals to be to be transferred from a first wireless access node of a first wireless access network to a second wireless access node of a second wireless access network are detected. From the first wireless access node, one or more of the detected user terminals are requested to report cell information of a plurality of wireless access nodes of at least one of the first wireless access network and the second wireless access network. The cell information is received from the one or more of the detected user terminals and at least one of the first neighbour cell list and the second neighbour cell list is updated using the received cell information.

+ FIG. 2

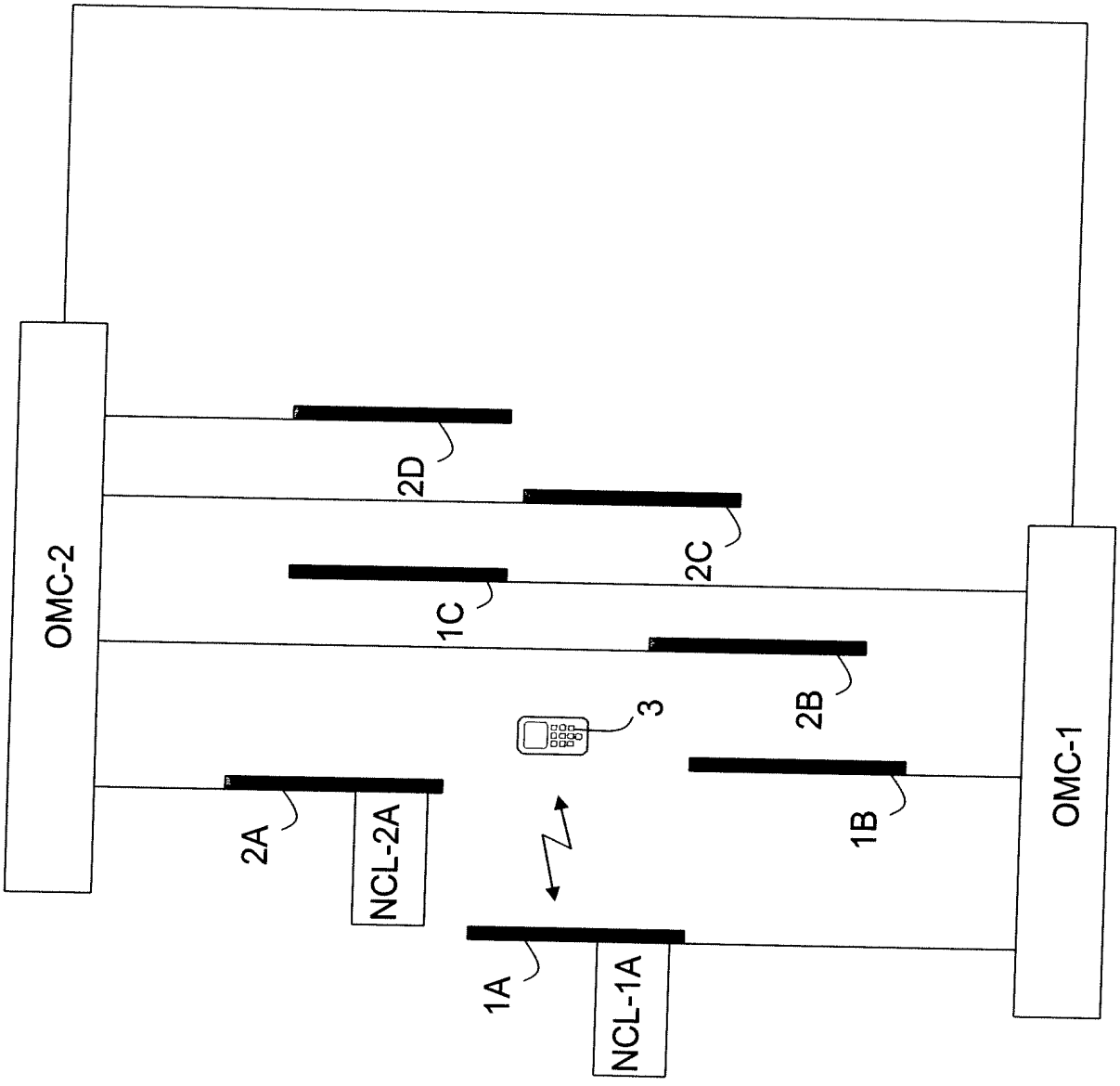


FIG. 1

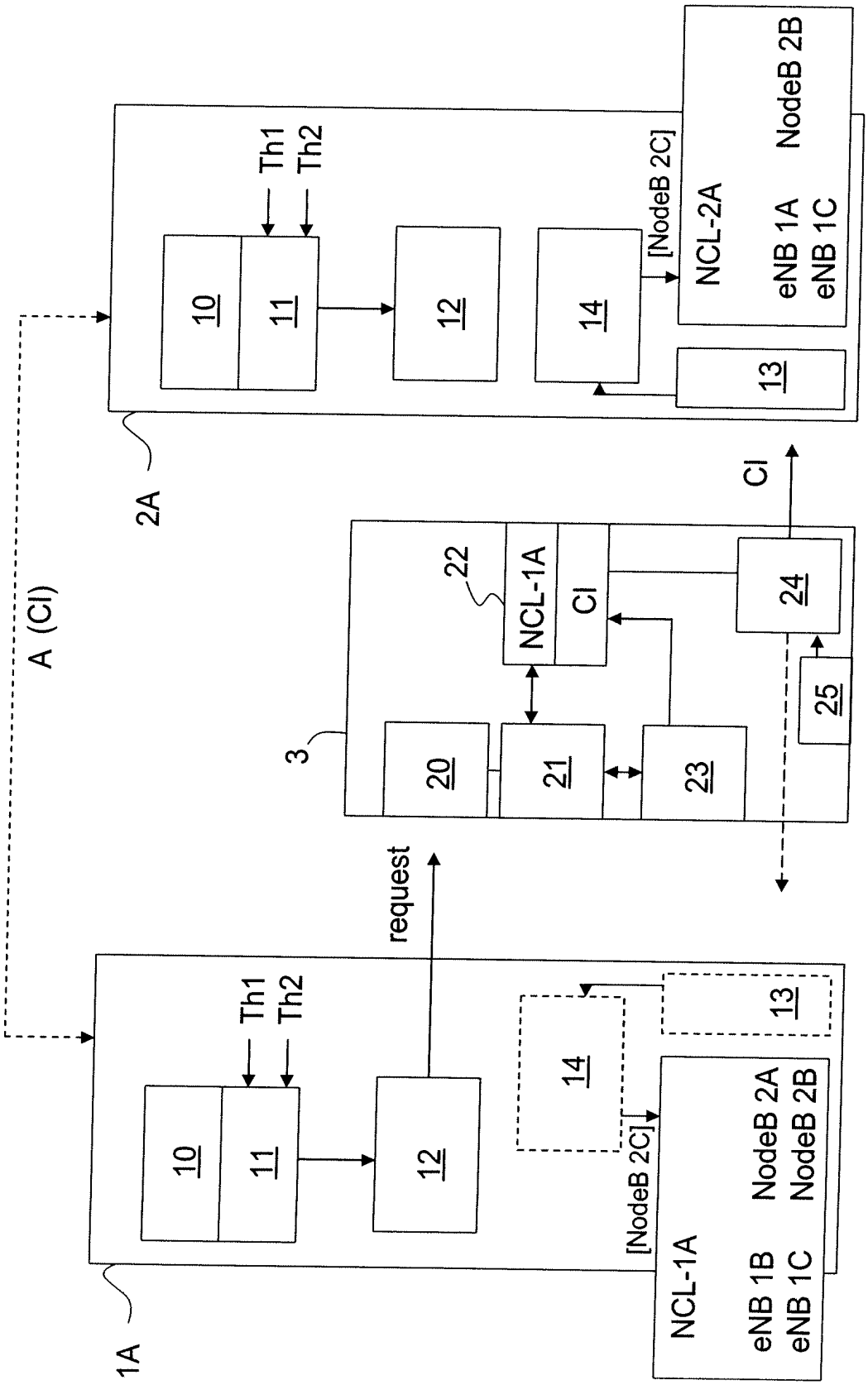

1A
2A
3
A (CI)
Th1
Th2
10
11
12
13
14
request
CI
20
21
22
23
24
25
NCL-1A
[NodeB 2C]
eNB 1B
eNB 1C
NodeB 2A
NodeB 2B
eNB 1A
eNB 1C

FIG. 2

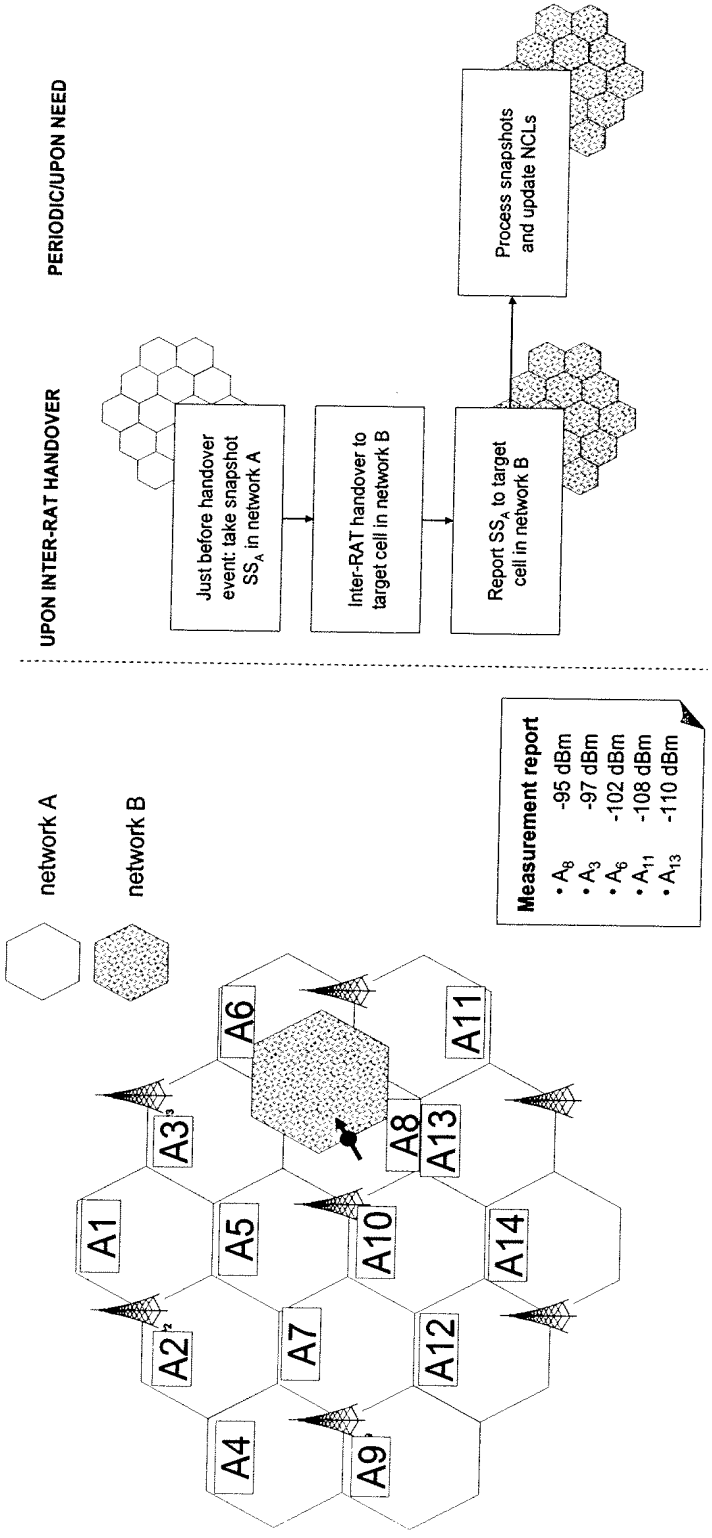

network A
network B
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
Measurement report
• A_8 -95 dBm
• A_3 -97 dBm
• A_6 -102 dBm
• A_{11} -108 dBm
• A_{13} -110 dBm
UPON INTER-RAT HANDOVER
Just before handover event: take snapshot SS_A in network A
Inter-RAT handover to target cell in network B
Report SS_A to target cell in network B
PERIODIC/UPON NEED
Process snapshots and update NCLs

FIG. 3A

FIG. 3B

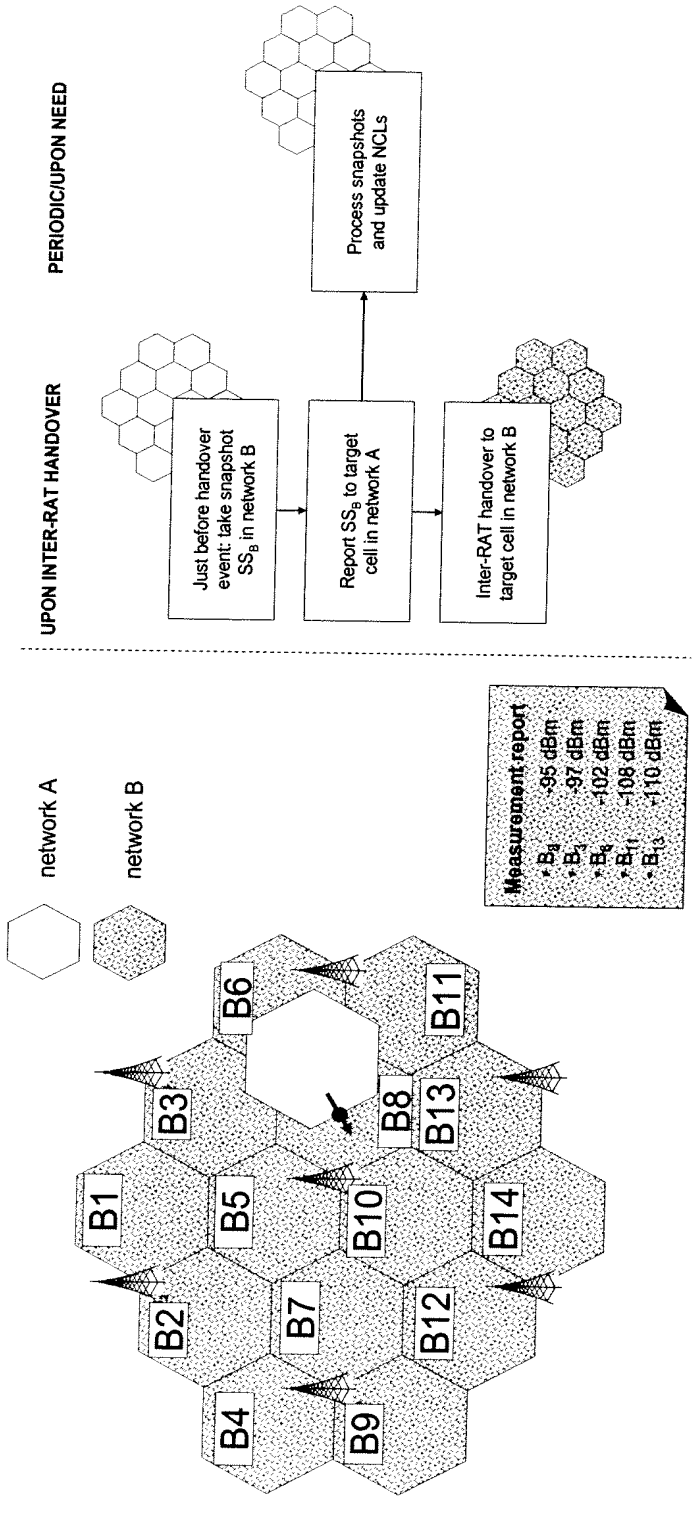

network A
network B
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
B14
Measurement report
-95 dBm
-97 dBm
-102 dBm
-108 dBm
-110 dBm
UPON INTER-RAT HANDOVER
Just before handover event: take snapshot SS_B in network B
Report SS_B to target cell in network A
Inter-RAT handover to target cell in network B
PERIODIC/UPON NEED
Process snapshots and update NCLs

FIG. 4A

FIG. 4B

VIII-4-1	**Declaration: Inventorship (only for the purposes of the designation of the United States of America)** Declaration of Inventorship (Rules 4.17(iv) and 51bis.1(a)(iv)) for the purposes of the designation of the United States of America:	I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought. This declaration is directed to the international application of which it forms a part (if filing declaration with application). This declaration is directed to international application No. PCT/ . . . . . (if furnishing declaration pursuant to Rule 26ter). I hereby declare that my residence, mailing address, and citizenship are as stated next to my name. I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.
VIII-4-1-1	Prior applications:	

		I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.
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VIII-4-1-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	/Job Cornelis Oostveen/
VIII-4-1-1-6	Date:	04 October 2010 (04.10.2010)

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VIII-4-1-2-6	Date	04 October 2010 (04.10.2010)
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VIII-4-1-4-6	Date	04 October 2010 (04.10.2010)
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VIII-4-1-5-6	Date	04 October 2010 (04.10.2010)

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/499,924	Filing Date 04/03/2012	☐ To be Mailed

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	04/03/2012	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0	X $ =		OR	X $60=	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $ =		OR	X $250=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/STELLA LITTLE/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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