PTO-1390 (09-11)
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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	U.S. APPLICATION NO. (If known, see 37 CFR 1.5)
006.P078	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/US2011/034470	4/29/2011	4/29/2011

TITLE OF INVENTION
WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

APPLICANT(S) FOR DO/EO/US
Ezekiel Kruglick

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.**

Samsung Ex. 1002, Page 1 of 615

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
	PCT/US2011/034470	006.P078

20. Other items or information:

Copy of the International Search Report and Written Opinion

The following fees have been submitted	CALCULATIONS	PTO USE ONLY
21. ☐ Basic national fee (37 CFR 1.492(a))..... **$380**	$ 380.00	
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**	$ 250.00	
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**	$ 490.00	
TOTAL OF 21, 22 and 23 =	$ 1,120.00	

☐ 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)).
The fee is **$310** for each additional 50 sheets of paper or fraction thereof.

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round **up** to a whole number)	RATE	
- 100 =	/50 =		x $**310**	$

Surcharge of **$130.00** for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h)).	$	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	$	
Total claims	32 - 20 =	12	x $ **60**	$720.00	
Independent claims	5 - 3 =	2	x **$250**	$500.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$450**	$	
			TOTAL OF ABOVE CALCULATIONS =	$1,220.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. Fees above are reduced by ½.					
			SUBTOTAL =	$	
Processing fee of **$130.00** for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)). +				$	
			TOTAL NATIONAL FEE =	$ 2,340.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$	
			TOTAL FEES ENCLOSED =	$ 2,340.00	
			Amount to be refunded:	$	
			Amount to be charged	$	

Samsung Ex. 1002, Page 2 of 615

a. ☐ A check in the amount of $ _____ to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees.

c. ☐ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. _____.

d. ☑ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038. The PTO-2038 should only be mailed or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO.

ADVISORY: If filing by EFS-Web, do **NOT** attach the PTO-2038 form as a PDF along with your EFS-Web submission. Please be advised that this is **not** recommended and by doing so your **credit card information may be displayed via PAIR**. To protect your information, it is recommended paying fees online by using the electronic payment method.

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

SEND ALL CORRESPONDENCE TO:

Omikron IP Law Group
Attn: Ted A. Crawford
16325 Boones Ferry Road Suite 204
Lake Oswego, OR 97035

/Ted A. Crawford/
SIGNATURE

Ted A. Crawford
NAME

50,610
REGISTRATION NUMBER

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
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.

PTO/SB/14 (11-08)
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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	006.P078
	Application Number	
Title of Invention	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS	

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 Remove

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
	Ezekiel		Kruglick	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Poway	State/Province	CA	Country of Residence [i]	US

Citizenship under 37 CFR 1.41(b) [i] US

Mailing Address of Applicant:

Address 1	13842 Deergrass Ct.		
Address 2			
City	Poway	State/Province	CA
Postal Code	92064-2276	Country [i]	US

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	65638		
Email Address	robert.chang@omikronlaw.com	Add Email	Remove Email
Email Address	ted.crawford@omikronlaw.com	Add Email	Remove Email
Email Address	blayne.green@omikronlaw.com		Remove Email

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	006.P078
	Application Number	
Title of Invention	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS	

Application Information:

Title of the Invention	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS		
Attorney Docket Number	006.P078	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter			
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	9	**Suggested Figure for Publication (if any)**	

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	65638		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	a 371 of international	PCT/US2011/034470	2011-04-29

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

PTO/SB/14 (11-08)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	006.P078
	Application Number	
Title of Invention	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS	

Remove

Application Number	Country [i]	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			○ Yes ◉ No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

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.

Remove

Assignee 1

If the Assignee is an Organization check here. ☒

Organization Name	Empire Technology Development LLC		
Mailing Address Information:			
Address 1	2711 Centerville Road, Suite 400		
Address 2			
City	Wilmington	**State/Province**	DE
Country [i] US		Postal Code	19088
Phone Number		Fax Number	
Email Address			

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

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	/Ted A. Crawford/			Date (YYYY-MM-DD)	2011-10-10
First Name	Ted	Last Name	Crawford	Registration Number	50610

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

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

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

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

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

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.

PTO/SB/80 (11-08)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

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

I hereby appoint:

☑ Practitioners associated with the Customer Number: 65638

OR

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

Name	Registration Number	Name	Registration Number

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

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

☑ The address associated with Customer Number: 65638

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

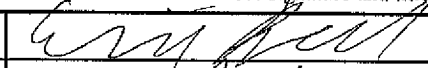
Assignee Name and Address:

Empire Technology Development LLC
2711 Centerville Road, Suite 400
Wilmington, Delaware 19808

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

SIGNATURE of Assignee of Record

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

Signature		Date	4/11/04
Name	Eric Bell	Telephone	+1-425-444-7090
Title	Authorized Person		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Privacy Act Statement

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/96 (07-09)
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 displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Empire Technology Development LLC

Application No./Patent No.: _____ Filed/Issue Date: October 10, 2011

Titled: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

Empire Technology Development LLC , a corporation

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

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is _____ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

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

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

OR

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

1. From: Ezekiel Kruglick To: Ardent Research Corporation

The document was recorded in the United States Patent and Trademark Office at
Reel 026203 , Frame 0993 , or for which a copy thereof is attached.

2. From: Ardent Research Corporation To: Empire Technology Development LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 026204 , Frame 0004 , or for which a copy thereof is attached.

3. From: _____ To: _____

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

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

☒ As required by 37 CFR 3.73(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.

/Ted A. Crawford/	10/10/2011
Signature	Date
Ted A. Crawford	Attorney of Record
Printed or Typed Name	Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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.

Doc Code: Oath
Document Description: Oath or declaration filed

PTO/SB/01 (04-09)
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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.

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☑ Declaration Submitted With Initial Filing OR ☐ Declaration Submitted After Initial Filing (surcharge (37 CFR 1.16(f)) required)

Attorney Docket Number	006.P078
First Named Inventor	Ezekiel Kruglick
COMPLETE IF KNOWN	
Application Number	
Filing Date	
Art Unit	
Examiner Name	

I hereby declare that: (1) Each inventor's residence, mailing address, and citizenship are as stated below next to their name; and (2) I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention titled:

WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

(Title of the Invention)

the application of which

☐ is attached hereto

OR

☑ was filed on (MM/DD/YYYY) 04/29/2011 as United States Application Number or PCT International Application Number PCT/US2011/34470 and was amended on (MM/DD/YYYY) _____ (if applicable).

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

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

Authorization To Permit Access To Application by Participating Offices

☐ If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the above-identified patent application is filed access to the above-identified patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the above-identified patent application is filed to have access to the above-identified patent application.

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.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 21 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.

PTO/SB/01 (04-09)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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DECLARATION — Utility or Design Patent Application

Claim of Foreign Priority Benefits

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

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application number(s) are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

PTO/SB/01 (04-09)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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DECLARATION — Utility or Design Patent Application

Direct all correspondence to:	☑	The address associated with Customer Number:	65638	OR ☐	Correspondence address below

Name		
Address		
City	State	Zip
Country	Telephone	Email

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. Petitioner/applicant is advised that documents which form the record of a patent application (such as the PTO/SB/01) are placed into the Privacy Act system of records DEPARTMENT OF COMMERCE, COMMERCE-PAT-7, System name: *Patent Application Files*. Documents not retained in an application file (such as the PTO-2038) are placed into the Privacy Act system of COMMERCE/PAT-TM-10, System name: *Deposit Accounts and Electronic Funds Transfer Profiles*.

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 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR:	☐ A petition has been filed for this unsigned inventor
Given Name (first and middle [if any])	Family Name or Surname
Ezekiel	Kruglick
Inventor's Signature	Date
	9/13/2011

Residence: City	State	Country	Citizenship
Poway	California	US	US

Mailing Address			
13842 Deergrass Ct.			
City	State	Zip	Country
Poway	California	92064-2276	US

☐ Additional inventors or a legal representative are being named on the _____ supplemental sheet(s) PTO/SB/02A or 02LR attached hereto

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.

Australian Government
IP Australia

Discovery House, Phillip ACT 2606
PO Box 200, Woden ACT 2606
Australia
Phone: 1300 651 010
International Callers: +61-2 6283 2999
Facsimile: +61-2 6283 7999
Email: assist@ipaustralia.gov.au
Website: www.ipaustralia.gov.au

CRAWFORD, Ted A.
Omikron IP Law Group
16325 Boones Ferry Road Suite 204,
Lake Oswego, Oregon 97035
US

Your Ref: 006.PCT078

Re: International Search Report and Written Opinion on Application No. PCT/US2011/034470 in the name of EMPIRE TECHNOLOGY DEVELOPMENT LLC et al

Dear Madam/Sir

Please find attached a copy of the International Search Report and Written Opinion of the International Searching Authority on your application.

I apologise for any inconvenience resulting from this International Search Report and Written Opinion not issuing within the time set out in our Customer Service Charter.

Yours faithfully

KIM UNG
Examiner of Patents, Section A5
Telephone: (03) 99359621

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:

CRAWFORD, Ted A.
Omikron IP Law Group
16325 Boones Ferry Road Suite 204
Lake Oswego, Oregon 97035
US

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 006.PCT078	Date of mailing *(day/month/year)* 28 July 2011
International application No. **PCT/US2011/034470**	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
Applicant EMPIRE TECHNOLOGY DEVELOPMENT LLC et al	International filing date *(day/month/year)* 29 April 2011

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, Facsimile No.: +41 22 338 82 70

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

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:**

[ ] the protest together with the decision thereon has been transmitted to the International Bureau together with 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 the 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 ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	Authorized officer **KIM UNG** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. +61 3 9935 9621

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.
006.PCT078		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US2011/034470	29 April 2011	29 April 2011

Applicant

EMPIRE TECHNOLOGY DEVELOPMENT LLC et al

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 5 sheets.

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

1. **Basis of the report**

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

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

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

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

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

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

3. ☐ **Unity of invention is lacking** (See Box No. III).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

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

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

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2, 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. **1A**

☐ as suggested by the applicant.

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

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

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/034470

Box No. IV Text of the Abstract (Continuation of item 5 of the first sheet)

A method implemented at a first wireless network to handoff a wireless device to a second wireless network, the method comprising:
i) receiving coverage information associated with the wireless;
ii) determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information; and
iii) transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/034470

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

H04W 36/14 (2009.01) *H04W 36/32* (2009.01)

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)

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 practicable, search terms used)
EPODOC, WPI, ESPACE, Google Patents. Search terms: wireless, mobile, network, handoff, handover, coverage, beam, map, location, and other similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/0187780 A1 (SOUISSI) 12 December 2002 See for example: abstract; paragraphs [0011], [0040], [0055], [0087], [0089], [0090]-[0092], [0099]; Figure 8.	1-7, 9-11, 13-20, 22-23, 25-31
X	US 2008/0273506 A1 (KEZYS) 6 November 2008 See for example: abstract; paragraphs [0004], [0016], [0032].	1-2, 7-12, 14-15, 20-24, 26-27, 31-32
A	US 2008/0310371 A1 (RUSSELL) 18 December 2008 See for example: whole document	
A	US 6, 438, 389 B1 (SANDHU et al.) 20 August 2002 See for example: whole document	

[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 application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 July 2011	28 July 2011
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	Authorized officer KIM UNG AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 3 9935 9621

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/034470

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2008/0076430 A1 (OLSON) 27 March 2008 See for example: whole document	
A	US 2007/0021119 A1 (LEE et al.) 25 January 2007 See for example: whole document	
A	US 2006/0148451 A1 (NARASIMHA) 6 July 2006 See for example: whole document	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2011/034470

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	2002187780	EP	1410656	EP	2200376	US	6829481
		WO	02093955				
US	2008273506	US	7684370	US	2010135184	US	7936724
		US	2011170520				
US	2008310371	AU	2003241592	EP	1540499	US	2004249915
		US	7437158	US	2009024728	WO	03100647
US	6438389	NONE					
US	2008076430	EP	2050286	WO	2008016778		
US	2007021119	KR	20060134607				
US	2006148451	WO	2006073675				

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX

PATENT COOPERATION TREATY

From the:
INTERNATIONAL SEARCHING AUTHORITY

To:

CRAWFORD, Ted A.
Omikron IP Law Group
16325 Boones Ferry Road Suite 204
Lake Oswego, Oregon 97035
US

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Applicant's or agent's file reference 006.PCT078	Date of mailing *(day/month/year)*28 July 2011 FOR FURTHER ACTION See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2011/034470	29 April 2011	29 April 2011

International Patent Classification (IPC) or both national classification and IPC
Int. Cl.

H04W 36/14 (2009.01) *H04W 36/32* (2009.01)

Applicant
EMPIRE TECHNOLOGY DEVELOPMENT LLC et al

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

- [X] 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
- [X] 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 be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

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

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

Name and mailing address of the ISA	Date of completion of this opinion	Authorized Officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	27 July 2011	KIM UNG AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. +61 3 9935 9621

Form PCT/ISA/237 (Cover sheet) (July 2011)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2011/034470

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established 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 (under Rules 12.3(a) and 23.1(b)).

2. [ ] This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      [ ] on paper

      [ ] in electronic form

   b. (time)

      [ ] in the international application as filed

      [ ] together with the international application in electronic form

      [ ] subsequently to this Authority for the purposes of search

4. [ ] In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2011/034470

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)	Claims	NONE	YES
	Claims	1-32	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-32	NO
Industrial applicability (IA)	Claims	1-32	YES
	Claims	NONE	NO

2. Citations and explanations:

CITATIONS
D1. US 2002/0187780 A1 (SOUISSI) 12 December 2002
D2. US 2008/0273506 A1 (KEZYS) 6 November 2008

NOVELTY (N)

Claims 1, 14, 26
The features of claims 1, 14, 26 are not considered novel with respect to D1 or D2.
D1 discloses a method implemented at a first wireless network to handoff a wireless device to a second wireless network, the method comprising:
i) receiving coverage information associated with the wireless device (see e.g. abstract "accurate location of the mobile unit is determined by a global position fix");
ii) determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information (see e.g. abstract "a coverage map is consulted to verify the availability of a preferred network"; paragraph [0089] "calculates the distance between the mobile device and the nearest preferred network"; Fig. 8, integer 803); and
iii) transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network (see e.g. paragraph [0091] and Fig. 8, integer 808. It is considered implicit that the process of acquiring a different network involves transmitting a handoff request).

An apparatus comprising of a coverage manager having logic, and a computer program product comprising a non-transitory medium having instructions, are considered implicit features in D1. D2 also discloses similar subject matter (see e.g. abstract "mobile device handoffs between the WLAN and a wireless wide area network"; paragraph [0004] "a wireless access point (AP) may be deployed specifically to cover regions of ingress and/or egress of the WLAN and serve as a "tripwire" to provide such advance handoff notice").

Claims 10, 22
The features of claims 10, 22 are not considered novel with respect to D1 or D2.
In addition to the features disclosed above, D1 (see e.g. paragraph [0087] "beam forming techniques") and D2 (see e.g. abstract "adaptive beamforming technique", and paragraph [0032] "antenna array") both disclose adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network.

See Supplemental Box 1

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International Application No.
PCT/US2011/034470

Supplemental Box 1

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

Continuation of V:

Claims 2, 15, 27

The features of claims 2, 15, 27 are not considered novel with respect to D1 or D2.
It is considered that receiving a *confirmation* that the handoff request has been accepted by the second network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network is an implicit feature in documents D1-D2.

Claims 7, 20, 31

The features of claims 7, 20, 31 are not considered novel with respect to D1 or D2.
It is considered that *transmitting* a handoff request via a wireless communication link that communicatively couples the first wireless network to the second wireless network is an implicit feature in documents D1-D2.

Claims 11, 23

The features of claims 11, 23 are not considered novel with respect to D1 or D2.
It is considered that *receiving* the handoff request via a wireless communication link that communicatively couples the first wireless network to the second wireless network is an implicit feature in documents D1-D2.

Claims 3, 16, 28

The features of claims 3, 16, 28 are not considered novel with respect to D1.
D1 discloses that the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network (see e.g. Fig. 8 integer 806; paragraph [0090] "if the proximity threshold determination fails, then the multi-mode station will remain camped onto the non-preferred network").

Claims 4-5, 17-18, 29-30

The features of claims 4-5, 17-18, 29-30 are not considered novel with respect to D1.
D1 discloses coverage information that further includes mapping information of one or more locations for which the second wireless network has previously had coverage, the one or more locations to indicate the location of the wireless device (see e.g. paragraph [0099] "an ability to map the subscriber's calendar of events to actual event locations would add a location-based enhancement, furthering predictability"; [0092] "habit profiles"). Habit profiles are considered to contain previous locations of the wireless device for which the second wireless network has previously covered.

Claims 6, 19

The features of claims 6, 19 are not considered novel with respect to D1.
D1 discloses transmitting a handoff based on estimated cost, or estimated signal strength, or whether the device is a mobile wireless device (see e.g. [0011] "cost savings", [0055], [0089] "proximity check" is equivalent to "estimated signal strength").

Claims 8, 12, 21, 24, 32

The features of claims 8, 12, 21, 24, 32 are not considered novel with respect to D2.
D2 discloses a wireless device that serves as a relay between the first wireless network and the second wireless network (see e.g. paragraph [0016] "AP tripwire is appropriately adjusted and set so as to help provide reliable and timely mobile device handoffs between the WLAN and the WWAN").

See Supplemental Box 2

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International Application No.
PCT/US2011/034470

Supplemental Box 2

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

Continuation of V:

Claim 9

The features of claim 9 are not considered novel with respect to D1 or D2.
D1 (see e.g. paragraph [0040] "different communication protocols") and D2 (see e.g. abstract 'handoffs between the WLAN and the wireless wide area network") both disclose a first wireless network that is a different type of wireless network than the second wireless network.

Claims 13, 25

The features of claims 13, 25 are not considered novel with respect to D1.

D1 discloses that adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load placed on the first network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network (see e.g. paragraph [0055] "based on speed, cost, quality of service, traffic, etc. as a programmable parameter"). A parameter such as the amount of traffic is considered to be an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

Therefore the subject matter of claims 1-32 is not new and does not meet the requirements of Article 33(2) of the PCT with regard to novelty.

INVENTIVE STEP (IS)

Claims 1-32 are not considered inventive for the same reasons mentioned under 'novelty'.

Therefore the subject matter of claim 1-32 is obvious and does not meet the requirements of Article 33(3) of the PCT with regard to inventive step.

INDUSTRIAL APPLICABILITY (IA)

The invention defined in claims 1-32 is considered to meet the requirements of Industrial Applicability under Article 33(4) of the PCT because it can be made by, or used, in industry.

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	2011-10-10
First Named Inventor	Ezekiel Kruglick
Art Unit	
Examiner Name	
Attorney Docket Number	006.P078

U.S.PATENTS Remove

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	6438389	B1	2002-08-20	SANDHU et al.	Whole document
	2	6829481		2004-12-07	SOUISSI	

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

U.S.PATENT APPLICATION PUBLICATIONS Remove

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
	1	20020187780	A1	2002-12-12	SOUISSI	Abstract, paras [0011],[0040],[0055], [0087],[0089],]0090]-[0092], [0099]; Fig. 8
	2	20080273506	A1	2008-11-06	KEZYS	Abstract, paras [0004],[0016],[0032]
	3	20080310371	A1	2008-12-18	RUSSELL	Whole document
	4	20080076430	A1	2008-03-27	OLSON	Whole document

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	
	Examiner Name	
	Attorney Docket Number	006.P078

	5	20070021119	A1	2007-01-25	LEE et al.	Whole document
	6	20060148451	A1	2006-07-06	NARASIMHA	Whole document

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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	AUSTRALIA PATENT OFFICE, International Search Report and Written Opinion of the International Searching Authority for PCT/US2011/034470, prepared on July 27, 2011, Australia.	☐
	2	CHENG, Sheng-Tzong et al., IPv6-based dynamic coordinated call admission control mechanism over integrated wireless networks, IEEE Journal on Selected Areas in Communications 23, no. 11 (11, 2005): pp. 2093-2103.	☐
	3	MOHANTY, S. et al., A cross-layer (layer 2+ 3) handoff management protocol for next-generation wireless systems, IEEE Transactions on Mobile Computing 5, no. 10 (2006): 1347-1360.	☐
	4	FERRUS, R., Vertical handover support in coordinated heterogeneous radio access networks, Proceedings of the 14th IST Mobile and Wireless Communications Summit, June 2005, Dresden, Germany, accessed online via http://www.eurasip.org/Proceedings/Ext/IST05/papers/430.pdf on October 10, 2011	☐

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	
	Examiner Name	
	Attorney Docket Number	006.P078

EXAMINER SIGNATURE			
Examiner Signature		Date Considered	

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

[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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	
	Examiner Name	
	Attorney Docket Number	006.P078

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.

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

☒ A certification statement is not submitted herewith.

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	/Ted A. Crawford/	Date (YYYY-MM-DD)	2011-10-10
Name/Print	Ted A. Crawford	Registration Number	50610

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

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Filer:	Ted A. Crawford/Lindsey Hunt
Attorney Docket Number:	006.P078

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:				
Claims in excess of 20	1615	12	60	720
Independent claims in excess of 3	1614	2	250	500
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**2340**

Electronic Acknowledgement Receipt

EFS ID:	11153804
Application Number:	13263835
International Application Number:	PCT/US11/34470
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Customer Number:	65638
Filer:	Ted A. Crawford/Lindsey Hunt
Filer Authorized By:	Ted A. Crawford
Attorney Docket Number:	006.P078
Receipt Date:	10-OCT-2011
Filing Date:	
Time Stamp:	18:27:16
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$2340
RAM confirmation Number	12433
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Transmittal of New Application	Transmittal_Letter_006_P078.pdf	245257 658177ef10b222dd93e3d622e0440859f43da523	no	4
Warnings:					
Information:					
2	Application Data Sheet	ADS_006_P078.pdf	1031196 404ad033ade877365dc051251238dada112d97f1	no	4
Warnings:					
Information:					
3	Power of Attorney	POA_Empire_Tech_Dev_LLC_Signed.pdf	100164 31c244d56bf6f4def81a3e4689d41303b1894182	no	2
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73(b).	Statement_373b_006_P078.pdf	427118 3d1c9497aecfc8133439e43c50ee7a6653d7eb85	no	2
Warnings:					
Information:					
5	Oath or Declaration filed	Declaration_006_P078.pdf	335589 881cf6be40cc7f72dc8af645254a0731e1fb4d2d	no	4
Warnings:					
Information:					
6	Documents submitted with 371 Applications	Copy_ISR_WO_006_P078.pdf	4103732 1a1aa61139941e8205ea2c4925fbd9883bcc97c2	no	12
Warnings:					
Information:					
7	Information Disclosure Statement (IDS) Form (SB08)	IDS_006_P078.pdf	612914 3f67ebae10a24510db38ad7ebdbd3ffd1dd1827a	no	5
Warnings:					
Information:					
8	Non Patent Literature	NPL_1.pdf	4103732 efdf8dccd1a12ae8398f1eb6d0ac1ef2c9a40574	no	12
Warnings:					
Information:					
9	Non Patent Literature	NPL_2.pdf	457656 92f4007b74f5856571e9fbfa2ee3ca538049b2a0	no	11
Warnings:					
Information:					

10	Non Patent Literature	NPL_3.pdf	3069165 3d7d1147c409322c65b43edf257e4f12a7fc71ab	no	14
Warnings:					
Information:					
11	Non Patent Literature	NPL_4.pdf	263156 5e686c44f225028bb9f2f2a92f2f8e8525636779	no	5
Warnings:					
Information:					
12	Fee Worksheet (SB06)	fee-info.pdf	38318 4ecba5ac649236e38ac3a6f1abe493e3a9a74a75	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	14787997	

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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

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.
13/263,835	Ezekiel KRUGLICK	006.P078

65638
OMIKRON IP LAW GROUP
16325 Boones Ferry Rd.
SUITE 204
LAKE OSWEGO, OR 97035

INTERNATIONAL APPLICATION NO.	
PCT/US2011/034470	
I.A. FILING DATE	PRIORITY DATE
04/29/2011	

CONFIRMATION NO. 1463
371 FORMALITIES LETTER

OC000000053657886

Date Mailed: 04/11/2012

NOTICE OF INSUFFICIENT BASIC NATIONAL FEE REQUIRED AND/OR MISSING COPY OF INTERNATIONAL APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

Indication of Small Entity Status has not been received.

The following items must be furnished:

Copy of International Application, which includes a copy of the Request Form, submitted to the International Bureau is missing. A copy of the International Application must be provided prior to 30 months from the priority date to avoid abandonment. Extensions of time under the provisions of 37 CFR 1.136 are not available for compliance with the requirements of 37 CFR 1.495(b). The international application may not be submitted via facsimile transmission.

The basic national fee to enter the national stage in the United States of America under 35 U.S.C. 371 must be paid by 30 months from the priority date (37 CFR 1.495(b)(2)).

If the proper basic national fee is not paid within 30 months from the priority date, the international application will become ABANDONED as to the United States of America, and will not be accepted for national examination.

The amount required shown above reflects the correct fee as of the date of this Notice. If the amount changes prior to payment, applicant must pay the revised amount.

The current basic national fees are listed at 37 CFR 1.492(a). In addition, current PCT related fees are listed in each weekly issue of the Official Gazette of the United States Patent and Trademark Office and the amount of the fees can be obtained from the USPTO 's web site www.uspto.gov or by contacting the Public Service Center at (703) 308-4357.

Extensions of time under the provisions of 37 CFR 1.136 are not available for compliance with the requirements of 37 CFR 1.495(b)(2).

For filing the basic national fee, the first class certificate of mailing procedure of 37 CFR 1.8 is NOT available to establish the date of mailing as the date of receipt in the USPTO (see 37 CFR 1.8(a)(2)(i)(F)). The Express Mail procedure of 37 CFR 1.10 may be used.

The basic national fee may not be submitted via facsimile transmission.

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)

FORM PCT/DO/EO/912 (371 Formalities Notice)

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

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

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

WINSTON M ALVARADO

Telephone: (703) 756-1466

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/263,835

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))	0 minus 20 =	*			OR	x 60 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	0 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	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
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.

Electronic Acknowledgement Receipt

EFS ID:	9986358
Application Number:	
International Application Number:	PCT/US11/34470
Confirmation Number:	6470
Title of Invention:	Wireless Device Handoff Between Wireless Networks
First Named Inventor/Applicant Name:	Empire Technology Development LLC
Customer Number:	65638
Correspondence Address:	Omikron IP Law Group Ted A. Crawford 16325 Boones Ferry Road Suite 204 - Lake Oswego OR 97035 US 5037199473 ted.crawford@omikronlaw.com
Filer:	Ted A. Crawford/Lindsey Hunt
Filer Authorized By:	Ted A. Crawford
Attorney Docket Number:	006.PCT078
Receipt Date:	29-APR-2011
Filing Date:	
Time Stamp:	13:40:05
Application Type:	International Application for filing in the US receiving office

Payment information:

Submitted with Payment	yes

Payment Type	Credit Card
Payment was successfully received in RAM	$3731
RAM confirmation Number	13919
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	PCT-Transmittal Letter	Transmittal_Letter_006_PCT078.pdf	679135 e37668bb6ba82894e334417dd68a44d9855a9ba5	no	1
Warnings:					
Information:					
2	RO/101 - Request form for new IA - Conventional	PCT_Request_006_PCT078.pdf	2871450 45c717ef82e18694a653f7fff7fd8e4b47bd451f	no	6
Warnings:					
Information:					
3		Specification_006_PCT078.pdf	256579 82f849630d2dfc8806d25db2b0d56e624dffa8f4	yes	41

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	32
Claims	33	40
Abstract	41	41

Warnings:					
Information:					
4	Drawings-only black and white line drawings	Figures_006_PCT078.pdf	688324 826d57178cbeffbd2530a033b592b5e348f273f7	no	9
Warnings:					

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

Information:					
5	RO/101 - Annex (fee calculation sheet)	Fee_Calculation_Sheet_006_PCT078.pdf	431339 948fd1dd75965baee2238e376949c034a3d7ecbf	no	1
Warnings:					
Information:					

6	Fee Worksheet (PTO-875)	fee-info.pdf	36228 91a0a108c809c0da89085625de55bc3b5860bd45	no	2

Warnings:	
Information:	
Total Files Size (in bytes):	4963055

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.

PTO-1382 (Rev. 07-2009)
Approved for use through 02/28/2010. OMB 0651-0021
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.

TRANSMITTAL LETTER TO THE UNITED STATES RECEIVING OFFICE

Express Mail mailing number: via EFS-Web	Date of deposit: 29.04.2011
File reference no.: 006.PCT078	International application no. (if known):
Customer Number[1]: 65638	Earliest priority date claimed (Day/Month/Year):
Title of the invention: Wireless Device Handoff Between Wireless Networks	

[1] **Customer Number will allow access to the application in Private PAIR but cannot be used to establish or change the correspondence address.**

☑ **This is a new International Application**

SCREENING DISCLOSURE INFORMATION:

In order to assist in screening the accompanying international application for purposes of determining whether a license for foreign transmittal should and could be granted and for other purposes, the following information is supplied. (check as boxes as apply):

☐ The invention disclosed was **not** made in the United States of America.

☑ There is no prior U.S. application relating to this invention.

☐ The following prior U.S. application(s) contain subject matter which is related to the invention disclosed in the attached international application. (*NOTE: priority to these applications may or may not be claimed on the Request (form PCT/RO/101) and this listing does **not** constitute a claim for priority.*)

application no.		filed on	
application no.		filed on	

☐ The present international application contains additional subject matter not found in the prior U.S. application(s) identified above. The additional subject matter is found on pages _____ and ☐ **DOES NOT ALTER** ☐ **MIGHT BE CONSIDERED TO ALTER** the general nature of the invention in a manner which would require the U.S. application to have been made available for inspection by the appropriate defense agencies under 35 U.S.C. 181 and 37 C.F.R. 5.15.

Itemized list of contents

Sheets of Request form: 6	Check no.:
Sheets of description (excluding sequence listing): 32	Return receipt postcard:
Sheets of claims: 8	Power of attorney:
Sheets of abstract: 1	Certified copy of priority document (specify):
Sheets of drawings: 9	Other (specify): Fee Calculation Sheet (1 page)
Sheets of sequence listing:	
Sequence listing diskette/CD:	
56	

The person signing this form is:	☐ Applicant	
	☑ Attorney/Agent (Reg. No.) 50,610	Name of person signing: Ted A. Crawford
	☐ Common Representative	Signature: Ted Crawford

This collection of information is required by 37 CFR 1.10 and 1.412. The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 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 FEES OR COMPLETED FORMS TO THIS ADDRESS.
SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* 006.PCT078

Box No. I TITLE OF INVENTION

WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

Box No. II APPLICANT ☐ This person is also inventor

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

EMPIRE TECHNOLOGY DEVELOPMENT LLC
2711 Centerville Road, Suite 400
Wilmington, Delaware 19808
US

Telephone No.

Facsimile No.

Applicant's registration No. with the Office

E-mail authorization: Marking one of the check-boxes below authorizes the receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority to use the e-mail address indicated in this Box to send, notifications issued in respect of this international application to that e-mail address if those offices are willing to do so.

☐ as advance copies followed by paper notifications; or ☐ exclusively in electronic form (no paper notifications will be sent).

E-mail address:

State *(that is, country)* of nationality: US

State *(that is, country)* of residence: US

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV 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 ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

CRAWFORD, Ted A.
Omikron IP Law Group
16325 Boones Ferry Road Suite 204
Lake Oswego, Oregon 97035
US

Telephone No. 503-719-9473

Facsimile No. 503-305-6760

Agent's registration No. with the Office 50,610

E-mail authorization: Marking one of the check-boxes below authorizes the receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority to use the e-mail address indicated in this Box to send, notifications issued in respect of this international application to that e-mail address if those offices are willing to do so.

☒ as advance copies followed by paper notifications; or ☐ exclusively in electronic form (no paper notifications will be sent).

E-mail address: ted.crawford@omikronlaw.com

☐ **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

KRUGLICK, Ezekiel
13842 Deergrass Ct.
Poway, CA 92064-2276
US

This person is:
- ☐ applicant only
- ☒ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office

State *(that is, country)* of nationality: US

State *(that is, country)* of residence: US

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

---

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:
- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

---

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:
- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

---

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:
- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

---

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No. V DESIGNATIONS

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.

However,

☐ DE Germany **is not designated** for any kind of national protection

☐ JP Japan **is not designated** for any kind of national protection

☐ KR Republic of Korea **is not designated** for any kind of national protection

(The check-boxes above may only be used to exclude (irrevocably) the designations concerned if, at the time of filing or subsequently under Rule 26bis.1, the international application contains in Box No. VI a priority claim to an earlier national application filed in the particular State concerned, in order to avoid the ceasing of the effect, under the national law, of this earlier national application.)

Box No. VI PRIORITY CLAIM

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application *(day/month/year)*	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application: regional Office	international application: receiving Office
item (1)				
item (2)				
item (3)				

☐ Further priority claims are indicated in the Supplemental Box.

☐ The **International Bureau** is requested to obtain from a digital library, a certified copy of the earlier application(s) *(if the earlier application(s) is available to it from a digital library)* identified above as:*

☐ all items ☐ item (1) ☐ item (2) ☐ item (3) ☐ other, see Supplemental Box

☐ The **receiving Office** is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(if the earlier application(s) was filed with the Office which for the purposes of this international application is the receiving Office)* or to obtain a certified copy of the earlier application(s) from a digital library and transmit a copy of it to the International Bureau *(if the earlier application(s) is available to the receiving Office from a digital library)*, identified above as:*

☐ all items ☐ item (1) ☐ item (2) ☐ item (3) ☐ other, see Supplemental Box

* Where the certified copy of the earlier application(s) is not stored in a digital library under the number of the earlier application indicated above but under the application number of another application which also claims priority from it, indicate that number in the supplemental sheet (item 4).

Restore the right of priority: the receiving Office is requested to restore the right of priority for the earlier application(s) identified above or in the Supplemental Box as item(s) (_____). *(See also the Notes to Box No. VI; further information **must** be provided to support a request to restore the right of priority.)*

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.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if more than one International Searching Authority is competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):*

ISA/ AU

Continuation of Box No. VII USE OF RESULTS OF EARLIER SEARCH, REFERENCE TO THAT SEARCH

☐ The ISA indicated in Box No. VII is requested to take into account the results of the earlier search(es) indicated below (*see also Notes to Box VII; use of results of more than one earlier search*).

Filing date *(day/month/year)* | Application Number | Country *(or regional Office)*

☐ **Statement (Rule 4.12(ii))**: this international application is the same, or substantially the same, as the application in respect of which the earlier search was carried out except, where applicable, that it is filed in a different language.

☐ **Availability of documents**: the following 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 12*bis*.1(f)):

- ☐ a copy of the results of the earlier search,*
- ☐ a copy of the earlier application,
- ☐ a translation of the earlier application into a language which is accepted by the ISA,
- ☐ a translation of the results of the earlier search into a language which is accepted by the ISA,
- ☐ a copy of any document cited in the results of the earlier search. *(If known, please indicate below the document(s) available to the ISA):*

☐ **Transmit copy of results of earlier search and other documents** *(where the earlier search **was not** carried out by the ISA indicated above but by the same Office as that which is acting as the receiving Office)*: the **receiving Office** is requested to prepare and transmit to the ISA (Rule 12*bis*.1(c)):

- ☐ 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.

* Where the results of the earlier search are neither available from a digital library nor transmitted by the receiving Office, the applicant is required to submit them to the receiving Office (Rule 12*bis*.1(a)) (*See item 11. in the check-list and also Notes to Box No. VII*).

Filing date *(day/month/year)* | Application Number | Country *(or regional Office)*

☐ **Statement (Rule 4.12(ii))**: this international application is the same, or substantially the same, as the application in respect of which the earlier search was carried out except, where applicable, that it is filed in a different language.

☐ **Availability of documents**: the following 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 12*bis*.1(f)):

- ☐ a copy of the results of the earlier search,*
- ☐ a copy of the earlier application,
- ☐ a translation of the earlier application into a language which is accepted by the ISA,
- ☐ a translation of the results of the earlier search into a language which is accepted by the ISA,
- ☐ a copy of any document cited in the results of the earlier search. *(If known, please indicate below the document(s) available to the ISA):*

☐ **Transmit copy of results of earlier search and other documents** *(where the earlier search **was not** carried out by the ISA indicated above but by the same Office as that which is acting as the receiving Office)*: the **receiving Office** is requested to prepare and transmit to the ISA (Rule 12*bis*.1(c)):

- ☐ 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.

* Where the results of the earlier search are neither available from a digital library nor transmitted by the receiving Office, the applicant is required to submit them to the receiving Office (Rule 12*bis*.1(a)) (*See item 11. in the check-list and also Notes to Box No. VII*).

☐ Further earlier searches are indicated on a continuation sheet.

Box No. VIII DECLARATIONS

The following **declarations** are contained in Boxes Nos. VIII (i) to (v) *(mark the applicable check-boxes below and indicate in the right column the number of each type of declaration)*:

			Number of declarations
☐	Box No. VIII (i)	Declaration as to the identity of the inventor :	
☒	Box No. VIII (ii)	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent :	1
☐	Box No. VIII (iii)	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application :	
☐	Box No. VIII (iv)	Declaration of inventorship (only for the purposes of the designation of the United States of America) :	
☐	Box No. VIII (v)	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty :	

Box No. VIII (ii) DECLARATION: ENTITLEMENT TO APPLY FOR AND BE GRANTED A PATENT

The declaration must conform to the standardized wording provided for in Section 212; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No.VIII (ii). If this Box is not used, this sheet should not be included in the request.

Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51*bis*.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate:

In relation to this international application,

EMPIRE TECHNOLOGY DEVELOPMENT LLC, is entitled to apply for and be granted a patent by virtue of the following:

an assignment from EZEKIEL KRUGLICK to ARDENT RESEARCH CORPORATION dated 28 April 2011 (28.04.2011); and

an assignment from ARDENT RESEARCH CORPORATION to EMPIRE TECHNOLOGY DEVELOPMENT LLC dated 28 April 2011 (28.04.2011).

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (ii)".

Sheet No. 6

Box No. IX CHECK LIST for EFS-Web filings - this sheet is only to be used when filing an international application with RO/US via EFS-Web

This international application **contains** the following:	Number of sheets
(a) request form PCT/RO/101 (including any declarations and supplemental sheets)	6
(b) description (excluding any sequence listing part of the description, see (f), below)	32
(c) claims	8
(d) abstract	1
(e) drawings (if any)	9
(f) sequence listing part of the description in the form of an **image file** (e.g. PDF)	
Total number of sheets (including the sequence listing part of the description if **filed as an image file**)	56

(g) sequence listing part of the description

- ☐ filed in the form of an **Annex C/ST.25 text file**
- ☐ WILL BE filed separately on physical data carrier(s), on the same day and in the form of an **Annex C/ST.25 text file**

Indicate type and number of physical data carrier(s):

This international application is **accompanied by** the following item(s) *(mark the applicable check-boxes below and indicate in right column the number of each item)*:	Number of items
1. ☒ fee calculation sheet	1
2. ☐ original separate power of attorney	
3. ☐ original general power of attorney	
4. ☐ copy of general power of attorney; reference number:	
5. ☐ statement explaining lack of signature	
6. ☐ priority document(s) identified in Box No. VI as item(s)	
7. ☐ Translation of international application into *(language)*:	
8. ☐ separate indications concerning deposited microorganism or other biological material	
9. ☐ *(only where item (f) is marked in the left column)* copy of the sequence listing in electronic form (Annex C/ST.25 text file) not forming part of the international application but **furnished only for the purposes of international search** under Rule 13*ter*	
10. ☐ *(only where item (f) is marked in the left column)* a statement confirming that "the information recorded in electronic form submitted under Rule 13*ter* is identical to the sequence listing as contained in the international application" as filed via EFS-Web:	
11. ☐ copy of results of earlier search(es) (Rule 12*bis*.1(a))	
12. ☒ other *(specify)*: Transmittal Letter	1

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: English

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Ted Crawford

Ted A. Crawford, Reg. No. 50,610

April 30, 2011

Date

For receiving Office use only

1. Date of actual receipt of the purported international application:
2. Drawings: ☐ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority (if two or more are competent): ISA /
6. ☐ Transmittal of search copy delayed until search fee is paid

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Date of receipt of the record copy by the International Bureau:

Wireless Device Handoff Between Wireless Networks

BACKGROUND

[0001] Unless otherwise indicated herein, the approaches described in this section are not prior art to the claims in this application and are not admitted to be prior art by inclusion in this section.

[0002] Complex wireless communication systems may be deployed such that coverage areas for different types of wireless networks ("heterogeneous wireless networks") included in the wireless communication systems may at least temporarily overlay or overlap. These complex wireless communication systems may include at least some wireless networks using adaptive antenna capabilities to allow for active beamforming. The active beamforming, for example, may be in response to user traffic patterns and other system management strategies. Also, some wireless networks may include towers with antenna arrays having dozens of constantly changing sectors of coverage due to active beamforming. As a result of the constantly changing sectors of coverage, a wireless device may able to detect a wireless network at a location at a given period of time. But as the sectors of coverage change, the wireless device may no longer detect the wireless network at the same location at another given period of time.

SUMMARY

[0003] The present disclosure describes example methods to be implemented at a first wireless network to handoff a wireless device to a second wireless network. The methods may include receiving coverage information associated with the wireless device and determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information. A handoff request may then be transmitted to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network.

[0004] The present disclosure also describes example methods to be implemented at a first wireless network for a wireless device handoff between a second wireless network and the first wireless network. The methods may include receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network. Based, at least in part, on the handoff request, one or more beams of an antenna array may be adapted to facilitate coverage of the wireless device by the first wireless network. The wireless device may then be handed off from the second wireless network to the first wireless network.

[0005] The present disclosure also describes example devices for a first wireless network to handoff a wireless device to a second wireless network. The example devices may have a coverage manager that has logic. The logic may be configured to receive coverage information associated with the wireless device and determine whether the wireless device is possibly capable of being covered by the second wireless network based, at least in part, on the coverage information. The logic may also be configured to transmit a handoff request to

the second wireless network based, at least in part, on the determination that the wireless device is possibly capable of being covered by the second wireless network.

[0006] The present disclosure also describes example systems for a wireless device handoff between a first wireless network and a second wireless network. The example systems may include an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network. The example systems may also include an adaption manager. The adaption manager may have logic configured to receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network. The logic may also be configured to cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network. The logic may further be configured to transmit a confirmation to the second wireless network to indicate acceptance of the handoff request and the wireless device may then be handed off from the second wireless network to the first wireless network.

[0007] The present disclosure also describes example computer program products. In some examples, the computer program products may include a signal bearing medium having instructions for a first wireless network to handoff a wireless device to a second wireless network. The instructions, which, when executed by logic may cause the logic to receive coverage information associated with the wireless device. Responsive to the received indication, the instructions may also cause the logic to determine whether the wireless device is possibly covered by the second wireless network based, at least in part, on the coverage information. The instructions may then cause the logic to transmit a handoff request to the second wireless network based, at least in part, on a determination that the wireless device is possibly covered by the second wireless network.

[0008] The foregoing summary is illustrative only and is not intended to be in any way limiting. In addition to the illustrative aspects, embodiments, and features described above, further aspects, embodiments, and features will become apparent by reference to the drawings and the following detailed description.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The foregoing and other features of this disclosure will become more fully apparent from the following description and appended claims, taken in conjunction with the accompanying drawings. Understanding that these drawings depict only several embodiments in accordance with the disclosure and are, therefore, not to be considered limiting of its scope, the disclosure will be described with additional specificity and detail through use of the accompanying drawings.

[0010] **FIGS. 1A-C** illustrate an example wireless communication system that includes two wireless networks;

FIG. 2 illustrates a block diagram of an example architecture for a coverage manager;

FIG. 3 illustrates a block diagram of an example architecture for an adaption manager;

FIG. 4 illustrates a flow chart of example methods implemented at a wireless network to handoff a wireless device to another wireless network;

FIG. 5 illustrates a flow chart of example methods implemented at the other wireless network for the wireless device handoff between the other wireless network and the wireless network;

FIG. 6 illustrates a block diagram of an example computer program product; and

FIG. 7 illustrates an example computing device;

all arranged in accordance with the present disclosure.

DETAILED DESCRIPTION

[0011] In the following detailed description, reference is made to the accompanying drawings, which form a part hereof. In the drawings, similar symbols typically identify similar components, unless context dictates otherwise. The illustrative examples or embodiments described in the detailed description, drawings, and claims are not meant to be limiting. Other examples or embodiments may be utilized, and other changes may be made, without departing from the spirit or scope of the subject matter presented here. It will be readily understood that aspects of this disclosure, as generally described herein, and illustrated in the Figures, can be arranged, substituted, combined, and designed in a wide variety of different configurations, all of which are explicitly contemplated and make part of this disclosure.

[0012] This disclosure is drawn, *inter alia*, to methods, apparatus, systems and computer program products related to a wireless device handoff between a first wireless network and a second wireless network.

[0013] As contemplated in the present disclosure, constantly changing sectors of coverage may result in a wireless device being able to detect a wireless network at a location at a given period of time. However, as the sectors of coverage change, the wireless device may no longer detect the wireless network at the same location at another given period of time. Thus, beamforming or beam shaping may cause handoff challenges for a wireless device to possibly be handed off to the wireless network.

[0014] In some examples, methods are implemented at a first wireless network to handoff a wireless device to a second wireless network. The methods may include receiving coverage information associated with the wireless device and determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information. A handoff request may then be transmitted to the second

wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network. For some examples, a confirmation may then be received that indicates the handoff request has been accepted by the second wireless network. The wireless device may then be handed off to the second wireless network based, at least in part, on the received confirmation.

[0015] In some other examples, methods are implemented at a first wireless network for a wireless device handoff between a second wireless network and the first wireless network. The methods may include receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless device but is capable of being covered by the first wireless network. Based, at least in part, on the handoff request, one or more beams of an antenna array may be adapted to facilitate coverage of the wireless device by the first wireless network. The wireless device may then be handed off from the second wireless network to the first wireless network.

[0016] **FIGS. 1A-C** illustrate an example wireless communication system 100 that includes wireless networks 110 and 120. As shown in FIGS. 1A-C, wireless network 110 includes a coverage manager 112 and an antenna array 114. Also, wireless network 120 includes an adaption manager 122 and an antenna array 124. In some examples, wireless network 110 may have a coverage area indicated in FIGS. 1A-C as coverage area 115. Also, for these examples, the antenna array 124 of wireless network 120 may be adaptable (e.g., via beamforming) to enable wireless network 120 to have variable coverage areas. These variable coverage areas are shown in FIGS. 1A-C as coverage area 125-1 and coverage area 125-2.

[0017] According to some examples, as shown in FIGS. 1A-C, wireless device 130A may communicatively couple to wireless network 110 via communication link 116A. Also,

wireless device 140A may communicatively couple to wireless network 120 via communication link 126A. In some examples, wireless device 140A may also be communicatively coupled to network 110 via communication link 116I. As described more below, since wireless device 140A may be communicatively coupled to both wireless networks, a communication channel 160 may be established that includes communication links 116I and 126A. Either wireless network 110 or wireless network 120 may use wireless device 140A as a relay to communicate with the other wireless network via communication channel 160. Additionally and/or alternatively, wireless network 110 may be communicatively coupled to wireless network 120 via communication channel 170 as shown in FIGS. 1A-C.

[0018] In some examples, wireless networks 110 and 120 may be wireless base-stations that operate and/or may be separately associated with heterogeneous wireless networks. Wireless networks 110 and 120 may be heterogeneous based on each wireless network possibly operated by different network service providers and/or in accordance with different types of wireless network technologies. For these examples, the different network service providers may be able to handoff wireless devices between the different wireless networks but may not share operating characteristics such as current and past coverage areas One type of wireless network technology may be described in an industry standard known as Institute of Electrical and Electronics Engineers (IEEE) 802.16-2009 and may be referred to as "WiMax". Another type of wireless network technology may be described in one or more industry standards associated with the 3rd Generation Partnership Project such as GSM, GPRS, EDGE, W-CDMA, HSPA, LTE or LTE-Advanced and may be referred to as "3GPP". Yet another type of wireless network technology may be described in one or one or more industry standards associated with the 3rd Generation Partnership Project 2 such as CDMA-2000, EV-DO, EV-DO Rev. A or EV-DO Rev. B and may be referred to as "3GPP2". WiMax, 3GPP

or 3GPP3 types of wireless networks may also be referred to as wireless wide area networks (WLANs). Although this disclosure is not limited to only the above-mentioned standards and types of wireless networks.

[0019] As mentioned above, wireless networks 110 and 120 may be coupled via communication channels 160 and/or 170. In some examples, communication channels 160 and 170 may operate in compliance with one or more industry standards. The one or more industry standards may be associated with 3GPP, 3GPP2, IEEE 802.11-2007, or IEEE 802.16-2009 or may be associated with other industry standards such as standards associated with IEEE 802.1. In some examples, communication channels 160 and 170 may include wireless and/or wired communication links to couple wireless networks 110 and 120 and these communication links may also be configured to operate in compliance with standards associated with 3GPP, 3GPP2, IEEE 802.11-2007, IEEE 802.16-2009 or IEEE 802.1. Although this disclosure is not limited to only the above-mentioned standards. As an example, the communication channel 170 may be used in an LTE wireless communication system as a network X1 channel. The network X1 channel may be used for instances where heterogeneous wireless networks coordinate/manage base-station to base-station communications between wireless networks.

[0020] In some examples, coverage manager 112 may be co-located with a base-station associated with wireless network 110. In other examples, although not shown in FIGS. 1A-C, coverage manager 112 may be located with control elements (e.g., a wireless communication system head end) that may remotely manage and/or control wireless network 110. For these other examples, coverage manager 112 may be located remote to antenna array 114, which provides coverage area 115 for wireless network 110. Similarly, adaption manager 122 may be co-located with a base-station associated with wireless network 120. Also, in other examples, adaption manager 122 may be located with control elements that

may remotely manage and/or control wireless network 120. For these other examples, adaption manager 122 may be located remote to antenna array 124, which provides coverage areas 125-1 and 125-2 for wireless network 120.

[0021] In some examples, coverage area 125-1 may indicate a coverage area for network 120 for a past time period and coverage area 125-2 may indicate a coverage area for a current or present time period. Although this disclosure is not limited to a wireless network having two coverage areas over past and present time periods, but may include any number of coverage areas over any number of time periods. As mentioned previously, antenna array 124 of wireless network 120 may be adaptable (e.g., via beamforming) to enable wireless network 120 to have variable coverage areas. As a result of the variable coverage areas, wireless device 130A, as shown in **FIG. 1A**, is within past coverage area 125-1 but is outside of current coverage area 125-2. Thus, although wireless device 130A is not currently covered by wireless network 120, past coverage area 125-1 indicates that network 120 may be capable of providing coverage.

[0022] **FIG. 1B** depicts a view of wireless communication system 100 that shows numerous wireless devices communicatively coupled to wireless network 110. As shown in FIG. 1A, wireless devices 130A-H and 140A may couple to wireless network 110 via communication links 116A-I. In some examples, as described more below, coverage manager 112 of wireless network 110 may include logic and/or features configured to receive coverage information from wireless devices 130A-H and 140A to generate a coverage map to indicate possible coverage areas for neighboring wireless networks such as wireless network 120. The coverage information received from a given wireless device may include information such as a location for the given wireless device, whether a signal from one or more neighboring wireless networks can be detected (e.g., strong enough to communicatively

couple with the one or more neighboring wireless networks) or an indication of signal strength from the one or more neighboring wireless networks.

[0023] In some examples, as shown in FIG. 1B, wireless devices 130A and 130H are in coverage area 125-1. As a result of being in coverage area 125-1, coverage information from wireless devices 130A and 130H may indicate that network 120 did provide coverage to these wireless devices at a past time period and this information may be indicated on the coverage map generated as described above. Therefore, although coverage area 125-2 indicates no coverage for wireless devices 130A and 130H at present, coverage manager 112 may be configured to determine that wireless device 130A and/or wireless device 130H may be capable of being covered by wireless network 120 based at least on the coverage map.

[0024] According to some examples, it may be determined that wireless device 130 and/or wireless network 110 would benefit from the handoff of wireless device 130 to wireless network 120. For example, wireless device 130 may obtain a stronger signal from wireless network 120 or wireless network 110 may be overburdened and may need to reduce the number of wireless devices coupled to its network. Also, wireless device 130 may be a mobile wireless device and coverage map information may indicate that wireless device 130 may be moving towards wireless network 120 and away from wireless network 110.

[0025] Coverage manager 112 of wireless network 110, as mentioned above, may have already determined that wireless device 130A may be capable being covered by wireless network 120. As a result of wireless network 120 being capable of covering wireless device 130A, coverage manager 112 may include logic and/or features to transmit a handoff request to wireless network 120. The handoff request, for example, may be transmitted via communication channel 160 or 170. As described more below, adaption manager 122 of wireless network 120 may include logic and/or features configured to receive the handoff request and determine whether to adapt antenna array 124 to facilitate coverage of wireless

device 130A. If a determination was made to adapt antenna array 124, adaption manager 122 may transmit a confirmation (e.g., via communication channel 160 or 170) to indicate acceptance of the handoff request. The coverage area for wireless network 120 may now be similar to coverage area 125-1 and wireless device 130A may then be handed off from wireless network 110 to wireless network 120.

[0026] **FIG. 1C** depicts a view of wireless communication system 100 that shows numerous wireless devices communicatively coupled to wireless network 120. As shown in FIG. 1C, wireless devices 140A-I and 130A may couple to wireless network 120 via communication links 126A-J. In some examples, as described more below, adaption manager 122 of wireless network 120 may include logic and/or features configured to receive a handoff request from wireless network 110 (e.g., via communication channel 160 or 170). As described above, the handoff request may be based on a determination by wireless network 110 that wireless device 130A may not be currently covered by wireless network 120 but may be capable of being covered by wireless network 120. Adaption manager 122 may also include logic and/or features to adapt one or more beams of antenna array 124 to adjust wireless network 120's coverage area (e.g., back to coverage area 125-1) based at least on the handoff request. For example, the one or more beams of antenna array 124 may be configured to provide directional signal transmissions for wireless network 120 via the use of beamforming techniques to include, but not limited to, the use of conventional beamformers or adaptive beamformers.

[0027] In some examples, adaption manager 122 may adapt the one or more beams of antenna array 124 based on certain criteria. For example, adaption manager 122 may include logic and/or features configured to predetermine criteria such as what network load would be placed on wireless network 120 if wireless device 130A was handed off from wireless network 110. The network load, for example, may be based on an estimate of an average

load for wireless devices in general (e.g., based on historical network data) or may be based on information included in the handoff request received from wireless network 110.

[0028] According to some examples, adaption manager 122 may also include logic and/or features to determine an effect of adapting one or more beams may have on wireless devices 140A-I. For example, as shown in FIG. 1C, wireless device 140C may be within coverage area 125-2. However, if the one or more beams of antenna array 124 are adapted to adjust the coverage area back to coverage area 125-1, wireless device 140C is outside of this coverage area. Since wireless device 140C may no longer be covered, adaption manager 122 may determine not to adapt the one or more beams. Hence, a confirmation to indicate an acceptance will not be transmitted to wireless network 110. Alternatively, if adaption manager 122 values the addition of wireless device 130A higher than the subtraction of wireless device 140C (e.g., wireless device 130A may be a more profitable/preferred user), a confirmation may be transmitted to wireless network 110. The coverage area for wireless network 120 may then be adjusted to be similar to coverage area 125-1 and wireless device 130A may then be handed off from wireless network 110 to wireless network 120.

[0029] In some examples, wireless devices 130A-I or wireless devices 140A-J may be mobile or stationary wireless devices, e.g., a computer, laptop, netbook, e-book, tablet-PC, small-form factor portable (or mobile) electronic device such as a cell phone, smart phone, a personal data assistant (PDA), a personal media player device, a wireless web-watch device, a personal headset device, an application specific device, or a hybrid device that may include any of the above functions.

[0030] **FIG. 2** illustrates a block diagram of an example architecture for a coverage manager 112. As described above for wireless communication system 100 in FIGS. 1A-C, wireless network 110 may include a coverage manager 112. In some examples, coverage manager 112 includes features and/or logic configured or arranged for a first wireless network (e.g.,

wireless network 110) to handoff a wireless device to a second wireless network (e.g., wireless network 120).

[0031] The example coverage manager 112 of FIG. 2, includes coverage logic 210, control logic 220, memory 230, input/output (I/O) interfaces 240 and optionally one or more applications 250. As illustrated in FIG. 2, coverage logic 210 is coupled to control logic 220, memory 230 and I/O interfaces 240. Also illustrated in FIG. 2, the optional applications 250 are arranged in cooperation with control logic 220. Coverage logic 210 may further include one or more of an interval feature 212, a receive feature 214, a determine feature 216, a request feature 218 or a handoff feature 219, or any reasonable combination thereof.

[0032] In some examples, the elements portrayed in FIG. 2's block diagram are configured to support or enable coverage manager 112 as described in this disclosure. A given coverage manager 112 may include some, all or more elements than those depicted in FIG. 2. For example, coverage logic 210 and control logic 220 may separately or collectively represent a wide variety of logic device(s) to implement the features of coverage manager 112. An example logic device may include one or more of a computer, a microprocessor, a microcontroller, a field programmable gate array (FPGA), an application specific integrated circuit (ASIC), a sequestered thread or a core of a multi-core/multi-threaded microprocessor or a combination thereof.

[0033] In some examples, as shown in FIG. 2, coverage logic 210 includes one or more of an interval feature 212, a receive feature 214, a determine feature 216, a request feature 218 or a handoff feature 219. Coverage logic 210 may be configured to use one or more of these features to perform operations. As described in more detail below, example operations may include implementing a handoff of a wireless device between a first wireless network and a second wireless network.

[0034] In some examples, control logic 220 may be configured to control the overall operation of coverage manager 112. As mentioned above, control logic 220 may represent any of a wide variety of logic device(s) configured to operate in conjunction with executable content or instructions to implement the control of coverage manager 112. In some alternate examples, the features and functionality of control logic 220 may be implemented within coverage logic 210.

[0035] According to some examples, memory 230 is arranged to store executable content or instructions. The executable content or instructions may be used by control logic 220 and/or coverage logic 210 to implement or activate features or elements of coverage manager 112. As described more below, memory 230 may also be arranged to at least temporarily maintain coverage information (e.g., coverage maps). The coverage information may be associated with a plurality of wireless devices coupled to a wireless network (e.g., wireless network 110).

[0036] Memory 230 may include a wide variety of memory media including, but not limited to, one or more of volatile memory, non-volatile memory, flash memory, programmable variables or states, random access memory (RAM), read-only memory (ROM), or other static or dynamic storage media.

[0037] In some examples, I/O interfaces 240 may provide an interface via an internal communication medium or link between a coverage manager 112 and elements resident on or co-located with coverage manager 112. For example, I/O interfaces 240 may provide an interface to elements co-located with coverage manager 112 at a wireless base-station or if coverage manager 112 is located remote to the wireless base-station, elements co-located at the remote location, e.g., at a wireless communication system head end. I/O interfaces 240 may include interfaces that operate according to various communication protocols to

communicate over the internal communication link (e.g., Inter-Integrated Circuit (I^2C), System Management Bus (SMBus) or Serial Peripheral Interface Bus (SPI), etc.).

[0038] I/O interfaces 240 may also provide an interface between coverage manager 112 and elements remote to coverage manager 112. In some examples, as mentioned above for FIGS. 1A-C, wireless network 110 may couple to wireless network 120 via communication channels 160 or 170. The I/O interfaces 240, for example, include an interface configured to operate according to various wireless and/or wired communication protocols to allow coverage manager(s) 112 to communicate over communication channels 160 or 170 (e.g., IEEE, 802.1, IEEE 802.11, IEEE 802.16, GSM, GPRS, EDGE, W-CDMA, HSPA, LTE, CDMA-2000, EV-DO, etc.). In other examples, I/O interfaces 240 may allow coverage manager 112 to communicate to elements such as antenna array 114 if coverage manager 112 is remotely located to antenna array 114, e.g., at a wireless communication system head end.

[0039] In some examples, coverage manager 112 includes one or more applications 250 to provide instructions to control logic 220 and/or coverage logic 210. Instructions, for example, may include instructions for coverage manager 112 to implement or use one or more of an interval feature 212, a receive feature 214, a determine feature 216, a request feature 218 or a handoff feature 219.

[0040] **FIG. 3** illustrates a block diagram of an example architecture for an adaption manager 122. As described above for wireless communication system 100 in FIGS. 1A-C, wireless network 120 may include an adaption manager 122. In some examples, adaption manager 122 includes features and/or logic configured or arranged for a handoff of a wireless device between wireless networks (e.g., wireless networks 110 and 120).

[0041] The example adaption manager 122 of FIG. 3 includes adapt logic 310, control logic 320, memory 330, input/output (I/O) interfaces 340 and optionally one or more applications 350. As illustrated in FIG. 3, adapt logic 310 is coupled to control logic 320, memory 330

and I/O interfaces 340. Also illustrated in FIG. 3, the optional applications 350 are arranged in cooperation with control logic 320. Adapt logic 310 may further include one or more of a receive feature 312, a cost feature 314, a beam feature 316 or a handoff feature 218, or any reasonable combination thereof.

[0042] In some examples, the elements portrayed in FIG. 3's block diagram are configured to support or enable adaption manager 122 as described in this disclosure. A given adaption manager 122 may include some, all or more elements than those depicted in FIG. 3. For example, adapt logic 310 and control logic 320 may separately or collectively represent a wide variety of logic device(s) to implement the features of adaption manager 122. An example logic device may include one or more of a computer, a microprocessor, a microcontroller, a field programmable gate array (FPGA), an application specific integrated circuit (ASIC), a sequestered thread or a core of a multi-core/multi-threaded microprocessor or a combination thereof.

[0043] In some examples, as shown in FIG. 3, adapt logic 310 includes one or more of a receive feature 312, a cost feature 314, a beam feature 316 or a handoff feature 318. Adapt logic 310 may be configured to use one or more of these features to perform operations. As described in more detail below, example operations may include implementing a handoff of a wireless device between a first wireless network and a second wireless network.

[0044] In some examples, control logic 320 may be configured to control the overall operation of adaption manager 122. Similar to control logic 220 mentioned above, control logic 320 may represent any of a wide variety of logic device(s) configured to operate in conjunction with executable content or instructions to implement the control of adaption manager 122. In some alternate examples, the features and functionality of control logic 320 may be implemented within adapt logic 310.

[0045] According to some examples, memory 330 is arranged to store executable content or instructions. The executable content or instructions may be used by control logic 320 and/or adapt logic 310 to implement or activate features or elements of adaption manager 122. Memory 330 may also be arranged to temporarily maintain information associated with determining whether to accept a handoff request (e.g., predetermined network loads).

[0046] Memory 330 may include a wide variety of memory media including, but not limited to, one or more of volatile memory, non-volatile memory, flash memory, programmable variables or states, RAM, ROM, or other static or dynamic storage media.

[0047] In some examples, similar to I/O interfaces 240 described above, I/O interfaces 340 may provide an interface via an internal communication medium or link between adaption manager 122 and elements resident on co-located with adaption manager 122. Also similar to I/O interface 240, I/O interfaces 340 may also provide an interface between adaption manager 122 and elements remote to adaption manager 122. In some examples, as mentioned above for FIGS. 1A-C, wireless network 120 may couple to wireless network 110 via communication channels 160 or 170 that may operate according to various wireless and/or wired communication protocols. In other examples, I/O interfaces 340 may allow adaption manager 122 to communicate to elements such as antenna array 124 if adaption manager 122 is remotely located to antenna array 114, e.g., at a wireless communication system head end.

[0048] In some examples, adaption manager 122 includes one or more applications 350 to provide instructions to control logic 320 and/or adapt logic 310. Instructions, for example, may include instructions for adaption manager 122 to implement or use one or more of a receive feature 312, a cost feature 314, a beam feature 316 or a handoff feature 318.

[0049] **FIG. 4** illustrates a flow chart of example methods implemented at a wireless network (e.g., wireless network 110) to handoff a wireless device to another wireless network (e.g.,

wireless network 120). In some examples, wireless communication system 100 as shown in FIGS. 1A-C, is used to illustrate example methods related to the flow chart depicted in FIG. 4. A coverage manager 112 as shown in FIG. 2 may also be used to illustrate the example methods. But the described methods are not limited to implementations on wireless communication system 100 as shown in FIGS. 1A-C or to the coverage manager 112 shown in FIG. 2. The example methods may be implemented on other wireless communication systems having one or more of the elements depicted in FIGS. 1A-C or FIG. 2.

[0050] Beginning at block 410 (Begin Coverage Interval), coverage manager 112 may include logic and/or features configured to start a coverage interval (e.g., via interval feature 212). In some examples, the coverage interval may be a time interval that may indicate to coverage manager 112 at wireless network 110 to decide if wireless devices can/should be handed off to another wireless network. The time interval may be based on an amount of time that does not overburden the wireless communication system with excessive overhead yet provides timely information to dynamically adjust to changing network environments (e.g., mobile/moving wireless devices and/or changing network loads).

[0051] Continuing from block 410 to decision block 420 (Possible Wireless Device to Handoff?), coverage manager 112 may include logic and/or features configured to determine whether a wireless device may need to be handed over to another wireless network (e.g., via receive feature 214). In some examples, a possible wireless device to handoff may be a wireless device (e.g., wireless device 130A) that is mobile and moving in the direction that may soon take the wireless device out of wireless network 110's coverage area 115. For this example, cover manager 112 may or may not determine that wireless device 130A is a possible handoff candidate to be handed off to wireless network 120. So for the above example, if wireless device 130A is a possible wireless device to handoff, the processing may

continue from decision block 420 to block 430. Otherwise, processing moves to decision block 490.

[0052] Continuing from decision block 420 to block 430 (Receive Coverage Information), coverage manager 112 may include logic and/or features configured to receive coverage information associated with the wireless device to possibly handoff to wireless network 120 (e.g., via receive feature 214). In some examples, as mentioned above for FIGS. 1A-C, the coverage information may include a coverage map generated based on information received from wireless devices 130A-130H. Also the coverage information may include additional information associated with a physical location of wireless device 130A and/or an indication that wireless device 130A does not detect a signal from wireless network 120.

[0053] Continuing from block 430 to decision block 440 (Coverage Possible?), coverage manager 112 may include logic and/or features configured to determine whether wireless device 130A was in a coverage area (e.g., coverage area 125-1) that was covered by wireless network 120 in the past (e.g., via determine feature 216). In some examples, the coverage map may be used to determine the potential for coverage by wireless network 120. If the coverage map indicates that wireless device 130A may be covered by wireless network 120, processing may continue from decision block 440 to decision block 450. Otherwise, processing moves to decision block 490.

[0054] Continuing from decision block 440 to decision block 450 (Transmit Handoff Request?), coverage manager 112 may include logic and/or features configured to determine whether to transmit a handoff request to wireless network 120 (e.g., via request feature 218). In some examples, coverage manager 112 may assess various criteria to determine whether a handoff of wireless device is cost effective or beneficial to wireless device 130A and/or wireless network 110. The criteria may include an estimated cost to handoff wireless device 130A to wireless network 120. For example, wireless device 130A may not be a contracted

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user with a service provider that operates wireless network 120 and a high fee (e.g., roaming charge) may make a handoff unacceptably costly. The criteria may also include estimated signal strength from wireless network 120 if the handoff request is accepted. The criteria may further include whether wireless device 130A is mobile or stationary. For example, if wireless device 130A is mobile and coverage information indicates wireless device 130A is moving towards wireless network 120 it may be beneficial to request a handoff. If a handoff request is to be transmitted to wireless network 120, processing may continue from decision block 450 to block 460. Otherwise, processing moves to decision block 490.

[0055] Continuing from decision block 450 to block 460 (Transmit Handoff Request), coverage manager 112 may include logic and/or features configured to transmit the handoff request (e.g., via request feature 218) to wireless network 120. In some examples, the handoff request may be transmitted via communication channel 160 that may include the use of wireless device 140A as a relay. In other examples, the handoff request may be transmitted via communication channel 170. Also, the handoff request may include location or other information to allow wireless network 120 to possibly determine how the one or more beams of antenna array 124 may be adapted to cover wireless device 130A.

[0056] Continuing from block 460 to decision block 470 (Conf. Received?), coverage manager 112 may include logic and/or features configured to determine whether a confirmation has been received from wireless network 120 (e.g., via receive feature 218). In some examples, the received confirmation indicates to coverage manager 112 that the handoff request has been accepted for the handoff of wireless device 130A to wireless network 120. The confirmation may also indicate that wireless network 120 has adapted its coverage area to now cover the location of wireless device 130A. Coverage manager 112 may also included logic and/or features configured to start a confirmation interval (e.g., via interval feature 212) that establishes a period of time to wait for a confirmation. If a

confirmation is received from wireless network 120 before the confirmation interval expires, processing may continue from decision block 470 to block 480. Otherwise, if the confirmation interval expires and no confirmation has been received, processing moves to decision block 490.

[0057] Continuing from decision block 470 to block 480 (Handoff Wireless Device), coverage manager 112 may include logic and/or features configured to handoff wireless device 130A to wireless network 120 (e.g., via handoff feature 219). In some examples, coverage manager 112 may be configured to follow protocols/procedures as described in operating agreements between operators of wireless networks 110 and 120 to conduct the handoff. Also, various industry standards may be followed to conduct the handoff (e.g., IEEE 802.16, GSM, GPRS, EDGE, W-CDMA, HSPA, LTE, CDMA-2000, EV-DO, etc).

[0058] Moving from block 480 to decision block 490 (Coverage Interval Over?), coverage manager 112 may include logic and/or features configured to determine whether the coverage interval is over (e.g., via interval feature 212). In some examples, as mentioned above, the coverage interval may be a time interval that may indicate to coverage manager 112 at wireless network 110 to decide if wireless devices can/should be handed off to another wireless network. If the coverage interval is over, the process moves to block 410 and a new interval begins or is started. Otherwise, if the coverage interval is not yet over, the process moves to decision block 420 and other wireless devices coupled to wireless network 110 may be considered for a handoff.

[0059] **FIG. 5** illustrates a flow chart of example methods implemented at a wireless network (e.g., wireless network 120) for a wireless device handoff between another wireless network (e.g., wireless network 110) and the wireless network. In some examples, wireless communication system 100 as shown in FIGS. 1A-C, is used to illustrate example methods related to the flow chart depicted in FIG. 5. An adaption manager 122 as shown in FIG. 3

may also be used to illustrate the example methods. But the described methods are not limited to implementations on wireless communication system 100 as shown in FIGS. 1A-C or to the adaption manager 122 shown in FIG. 3. The example methods may be implemented on other wireless communication systems having one or more of the elements depicted in FIGS. 1A-C or FIG. 3.

[0060] Moving from the start to block 510 (Receive Handoff Request), adaption manager 122 of wireless network 120 may include logic and/or features configured to receive a handoff request from wireless network 110 (e.g., via receive feature 312). In some examples, the handoff request may be based on a determination by wireless network 110 that wireless device 130A is not currently covered by wireless network 120 (e.g., coverage area 125-2) but is capable of being covered by wireless network 120 (e.g., coverage area 125-1). As mentioned above, the handoff request may be received via either communication channel 160 or 170.

[0061] Continuing from block 510 to decision block 520 (Adapt Coverage Area?), adaption manager 122 may include logic and/or features configured to determine whether to adapt the coverage area for wireless network 120 (e.g., via cost feature 214). In some examples, adaption manager 122 may evaluate the costs associated with a handoff of wireless device 130A to wireless network 120 and base a determination on the associated costs. Those costs may be based on criteria to include a predetermined network load placed on wireless network 120 if wireless device 130A is handed off. The costs may also be based on an effect of adapting the coverage area on other wireless devices coupled to wireless network 120 (e.g., wireless device 140A-I). If a determination is made by adaption manager 122 to adapt the coverage area, processing continues from decision block 520 to block 530. Otherwise, processing comes to an end.

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[0062] Continuing from decision block 520 to block 530 (Adapt One or More Beams), adaption manager 122 may include logic and/or features configured to adapt one or more beams generated from or by antenna array 124 to facilitate coverage of wireless device 130A by wireless network 120 (e.g., via beam feature 216). In some examples, a combination of beams generated by antenna array 124 may be directional beams. For these examples, adaption manager 122 may cause at least one of the directional beams to be adapted in order to change the coverage area (e.g., similar to coverage area 125-1) of wireless network 120 to enable wireless device 130A to be covered by wireless network 120.

[0063] Continuing from block 530 to block 540 (Transmit Confirmation), adaption manager 122 may include logic and/or features configured to transmit a confirmation to indicate acceptance of the handoff request from wireless network 110 for wireless device 130A (e.g., via beam feature 216). In some examples, the confirmation may be transmitted via communication channel 160 or 170 and may indicate acceptance of the handoff request. The confirmation may also indicate that wireless network 120's coverage area has been adapted to now cover wireless device 130A.

[0064] Continuing from block 540 to block 550 (Handoff Wireless Device), adaption manager 122 may include logic and/or features configured to handoff wireless device 130A from wireless network 110 (e.g., via handoff feature 318). In some examples, adaption manager 122 may be configured to follow protocols/procedures as described in operating agreements between operators of wireless networks 110 and 120 to conduct the handoff. Also, various industry standards may be followed to conduct the handoff. The process then moves from block 550 and comes to an end.

[0065] **FIG. 6** illustrates a block diagram of an example computer program product 600. In some examples, as shown in FIG. 6, computer program product 600 includes a signal bearing medium 602 that may also include instructions 604 for a first wireless network (e.g., wireless

network 110) to handoff a wireless device (e.g., wireless device 130A) to a second wireless network (e.g., wireless network 120). Instructions 604, which, when executed by logic (e.g., coverage logic 210), may cause the logic to receive coverage information associated with the wireless device. The instructions 604 may also cause the logic to determine whether the wireless device is possibly covered by the second wireless network based, at least in part, on the coverage information. The instructions 604 may also cause the logic to transmit a handoff request to the second wireless network based, at least in part, on a determination that the wireless device is possibly covered by the second wireless network.

[0066] Also depicted in FIG. 6, in some examples, computer product 600 may include one or more of a computer readable medium 606, a recordable medium 608 and a communications medium 610. The dotted boxes around these elements depict different types of mediums included within, but not limited to, signal bearing medium 602. These types of mediums may distribute instructions 604 to be executed by logic (e.g., coverage logic 210). Computer readable medium 606 and recordable medium 608 may include, but are not limited to, a flexible disk, a hard disk drive (HDD), a Compact Disc (CD), a Digital Versatile Disk (DVD), a digital tape, a computer memory, etc. Communications medium 610 may include, but is not limited to, a digital and/or an analog communication medium (e.g., a fiber optic cable, a waveguide, a wired communication link, a wireless communication link, etc.).

[0067] **FIG. 7** illustrates an example computing device 700. In some examples, coverage manager 112 or adaption manager 122 depicted in FIGS. 1A-C, FIG. 2 or FIG. 3 may be implemented on computing device 700. In these examples, elements of computing device 700 may be arranged or configured for a wireless device handoff between a first wireless network and a second wireless network. In a very basic configuration 701, computing device 700 typically includes one or more processors 710 and system memory 720. A memory bus 730 can be used for communicating between the processor 710 and the system memory 720.

[0068] Depending on the desired configuration, processor 710 can be of any type including but not limited to a microprocessor (μP), a microcontroller (μC), a digital signal processor (DSP), or any combination thereof. Processor 710 can include one more levels of caching, such as a level one cache 711 and a level two cache 712, a processor core 713, and registers 714. The processor core 713 can include an arithmetic logic unit (ALU), a floating point unit (FPU), a digital signal processing core (DSP Core), or any combination thereof. A memory controller 715 can also be used with the processor 710, or in some implementations the memory controller 715 can be an internal part of the processor 710.

[0069] Depending on the desired configuration, the system memory 720 can be of any type including but not limited to volatile memory (such as RAM), non-volatile memory (such as ROM, flash memory, etc.) or any combination thereof. System memory 720 typically includes an operating system 721, one or more applications 722, and program data 724. Application 722 includes instructions 723 that are arranged to perform the functions as described herein including the actions described with respect to coverage manager 112 architecture shown in FIG. 2, adaption manager 122 architecture shown in FIG. 3 or including the actions described with respect to the flow charts shown in FIGS. 4 and 5. Program Data 724 includes handoff data 725 that is useful for implementing instructions 723 (e.g., determining whether to handoff, coordinating or executing handoffs between wireless networks). In some examples, application 722 can be arranged to operate with program data 724 on an operating system 721 such that implementations for a wireless device handoff between a first wireless network and a second wireless network may be provided as described herein. This described basic configuration is illustrated in FIG. 7 by those components within dashed line 701.

[0070] Computing device 700 can have additional features or functionality, and additional interfaces to facilitate communications between the basic configuration 701 and any required

devices and interfaces. For example, a bus/interface controller 740 can be used to facilitate communications between the basic configuration 701 and one or more data storage devices 750 via a storage interface bus 741. The data storage devices 750 can be removable storage devices 751, non-removable storage devices 752, or a combination thereof. Examples of removable storage and non-removable storage devices include magnetic disk devices such as flexible disk drives and hard-disk drives (HDD), optical disk drives such as compact disk (CD) drives or digital versatile disk (DVD) drives, solid state drives (SSD), and tape drives to name a few. Example computer storage media can include volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information, such as computer readable instructions, data structures, program modules, or other data.

[0071] System memory 720, removable storage 751 and non-removable storage 752 are all examples of computer storage media. Computer storage media includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by computing device 700 (e.g., coverage maps). Any such computer storage media can be part of device 700.

[0072] Computing device 700 can also include an interface bus 742 for facilitating communication from various interface devices (e.g., output interfaces, peripheral interfaces, and communication interfaces) to the basic configuration 701 via the bus/interface controller 740. Example output interfaces 760 include a graphics processing unit 761 and an audio processing unit 762, which can be configured to communicate to various external devices such as a display or speakers via one or more A/V ports 763. Example peripheral interfaces 760 include a serial interface controller 771 or a parallel interface controller 772, which can

be configured to communicate with external devices such as input devices (e.g., keyboard, mouse, pen, voice input device, touch input device, etc.) or other peripheral devices (e.g., printer, scanner, etc.) via one or more I/O ports 773. An example communication interface 780 includes a network controller 781, which can be arranged to facilitate communications with one or more other computing devices 790 over a network communication via one or more communication ports 782. A network communication connection is one example of a communication media. Communication media may typically be embodied by computer readable instructions, data structures, program modules, or other data in a modulated data signal, such as a carrier wave or other transport mechanism, and includes any information delivery media. A "modulated data signal" can be a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media can include wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, radio frequency (RF), infrared (IR) and other wireless media. The term computer readable media as used herein can include both storage media and communication media.

[0073] Computing device 700 can be implemented as a portion of a personal computer including both laptop computer and non-laptop computer configurations or implemented in a workstation or a server configuration. In some examples, computing device 700 may be included in or associated with a base-station for a wireless network (e.g., wireless networks 110 or 120). In other examples, computing device 700 may be part of a wireless communication system head end that may control/manage a wireless network.

[0074] References made in this disclosure to the term "responsive to" or "in response to" are not limited to responsiveness to a particular feature and/or structure. A feature may also be responsive to another feature and/or structure and also be located within that feature and/or structure. Moreover, when terms or phrases such as "coupled" or "responsive" or "in

response to" or "in communication with", etc. are used herein or in the claims that follow, these terms should be interpreted broadly. For example, the phrase "coupled to" may refer to being communicatively, electrically and/or operatively coupled as appropriate for the context in which the phrase is used.

[0075] Those skilled in the art will recognize that it is common within the art to describe devices and/or processes in the fashion set forth herein, and thereafter use engineering practices to integrate such described devices (e.g., transmitters, receivers, wireless devices, computing platforms, computing devices, etc.) and/or methods into data processing systems. That is, at least a portion of the devices and/or methods described herein can be integrated into a data processing system via a reasonable amount of experimentation. Those having skill in the art will recognize that a typical data processing system generally includes one or more of a system unit housing, a video display device, a memory such as volatile and non-volatile memory, processors such as microprocessors and digital signal processors, computational entities such as operating systems, drivers, graphical user interfaces, and applications programs, one or more interaction devices, such as a touch pad or screen, and/or control systems including feedback loops and control motors (e.g., feedback for sensing position and/or velocity; control motors for moving and/or adjusting components and/or quantities). A typical data processing system may be implemented utilizing any suitable commercially available component, such as those typically found in data computing/communication and/or network computing/communication systems.

[0076] The herein described subject matter sometimes illustrates different components or elements contained within, or connected with, different other components or elements. It is to be understood that such depicted architectures are merely examples, and that in fact many other architectures can be implemented which achieve the same functionality. In a conceptual sense, any arrangement of components to achieve the same functionality is

effectively "associated" such that the desired functionality is achieved. Hence, any two components herein combined to achieve a particular functionality can be seen as "associated with" each other such that the desired functionality is achieved, irrespective of architectures or intermedial components. Likewise, any two components so associated can also be viewed as being "operably connected", or "operably coupled", to each other to achieve the desired functionality, and any two components capable of being so associated can also be viewed as being "operably couplable", to each other to achieve the desired functionality. Specific examples of operably couplable include but are not limited to physically mateable and/or physically interacting components and/or wirelessly interactable and/or wirelessly interacting components and/or logically interacting and/or logically interactable components.

[0077] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

[0078] It will be understood by those within the art that, in general, terms used herein, and especially in the appended claims (e.g., bodies of the appended claims) are generally intended as "open" terms (e.g., the term "including" should be interpreted as "including but not limited to," the term "having" should be interpreted as "having at least," the term "includes" should be interpreted as "includes but is not limited to," etc.). It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases "at least one" and "one or more" to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles "a" or "an" limits any particular

claim containing such introduced claim recitation to inventions containing only one such recitation, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an" (e.g., "a" and/or "an" should typically be interpreted to mean "at least one" or "one or more"); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation *is* explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean *at least* the recited number (e.g., the bare recitation of "two recitations," without other modifiers, typically means *at least* two recitations, or *two or more* recitations). Furthermore, in those instances where a convention analogous to "at least one of A, B, and C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, and C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to "at least one of A, B, or C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, or C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase "A or B" will be understood to include the possibilities of "A" or "B" or "A and B."

[0079] While various aspects and embodiments have been disclosed herein, other aspects and embodiments will be apparent to those skilled in the art. The various aspects and

embodiments disclosed herein are for purposes of illustration and are not intended to be limiting, with the true scope and spirit being indicated by the following claims.

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CLAIMS:

What is claimed is:

1. A method implemented at a first wireless network to handoff a wireless device to a second wireless network, the method comprising:

receiving coverage information associated with the wireless device;

determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information; and

transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network.

2. A method according to claim 1, further comprising:

receiving a confirmation that the handoff request has been accepted by the second wireless network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network.

3. A method according to claim 1, wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

4. A method according to claim 3, wherein the coverage information further includes mapping information of one or more locations for which the second wireless network has previously had coverage, the one or more locations to indicate the location of the wireless device.

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5. A method according to claim 4, wherein the mapping information of one or more locations for which the second wireless has previously had coverage comprises a map generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the one or more wireless devices.

6. A method according to claim 1, wherein transmitting the handoff request comprises transmitting a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted, or whether the wireless device is a mobile wireless device.

7. A method according to claim 1, wherein transmitting the handoff request comprises transmitting a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

8. A method according to claim 1, wherein transmitting the handoff request comprises transmitting a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

9. A method according to claim 1, wherein the first wireless network is a different type of wireless network than the second wireless network.

10. A method implemented at a first wireless network for a wireless device handoff between a second wireless network and the first wireless network, the method comprising:

receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless device but is capable of being covered by the first wireless network;

based, at least in part, on the handoff request, adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network; and

transmitting a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

11. A method according to claim 10, wherein receiving the handoff request comprises receiving the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

12. A method according to claim 10, wherein receiving the handoff request comprises receiving the handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

13. A method according to claim 10, wherein adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load

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placed on the first network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

14. An apparatus for a first wireless network to handoff a wireless device to a second wireless network, the apparatus comprising:

a coverage manager having logic, the logic configured to:

receive coverage information associated with the wireless device;

determine whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the coverage information; and

transmit a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network.

15. An apparatus according to claim 14, wherein the logic is further configured to:

receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

16. An apparatus according to claim 14, wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

17. An apparatus according to claim 16, wherein the coverage information further includes mapping information of one or more locations for which the second wireless

network has previously had coverage, the one or more locations to indicate the location of the wireless device.

18. An apparatus according to claim 17, wherein the logic is further configured to generate the mapping information based, at least in part, on information received from wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the wireless devices.

19. An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted, or whether the wireless device is a mobile wireless device.

20. An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

21. An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

22. A system for a wireless device handoff between a first wireless network and a second wireless network, the system comprising:

an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network; and

an adaption manager having logic, the logic configured to:

receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network;

cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network; and

transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

23. A system according to claim 22, wherein to receive the handoff request comprises to receive a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

24. A system according to claim 22, wherein to receive the handoff request comprises to receive a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

25. A system according to claim 22, wherein to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first network due to the handoff of the wireless device or an impact of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

26. A computer program product comprising a non-transitory medium having instructions for a first wireless network to handoff a wireless device to a second wireless network, which, when executed by logic, cause the logic to:

receive coverage information associated with the wireless device;

determine whether the wireless device is possibly covered by the second wireless network based, at least in part, on the coverage information; and

transmit a handoff request to the second wireless network based, at least in part, on a determination that the wireless device is possibly covered by the second wireless network.

27. A computer program product according to claim 26, further comprising instructions to cause the logic to receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

28. A computer program product according to claim 26, wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

29. A computer program product according to claim 28, wherein the coverage information further includes mapping information of one or more locations for which the second wireless network has had coverage in the past, the one or more locations to include the location of the wireless device.

30. A computer program product according to claim 29, wherein the mapping information of one or more locations for which the second wireless has had coverage in the past comprises a map generated based on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network detection of a detectable signal from the second wireless network to the one or more wireless devices.

31. A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

32. A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

ABSTRACT

Examples are disclosed for a wireless device handoff between a first wireless network and a second wireless network.

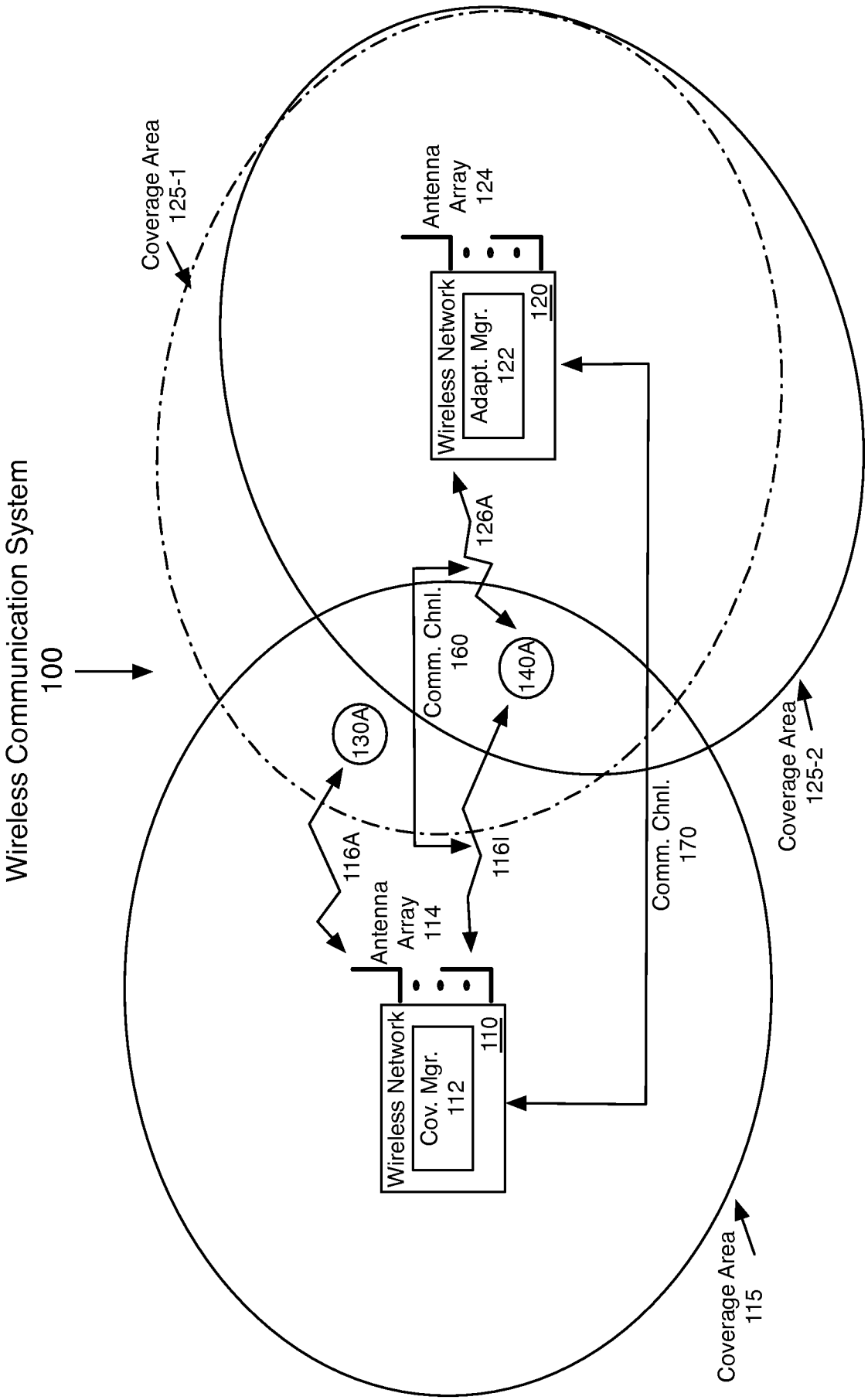

Wireless Communication System
100
Coverage Area
125-1
Antenna
Array
124
Wireless Network
Adapt. Mgr.
122
120
126A
Comm. Chnl.
160
140A
130A
116A
Antenna
Array
114
116I
Wireless Network
Cov. Mgr.
112
110
Comm. Chnl.
170
Coverage Area
125-2
Coverage Area
115

FIG. 1A

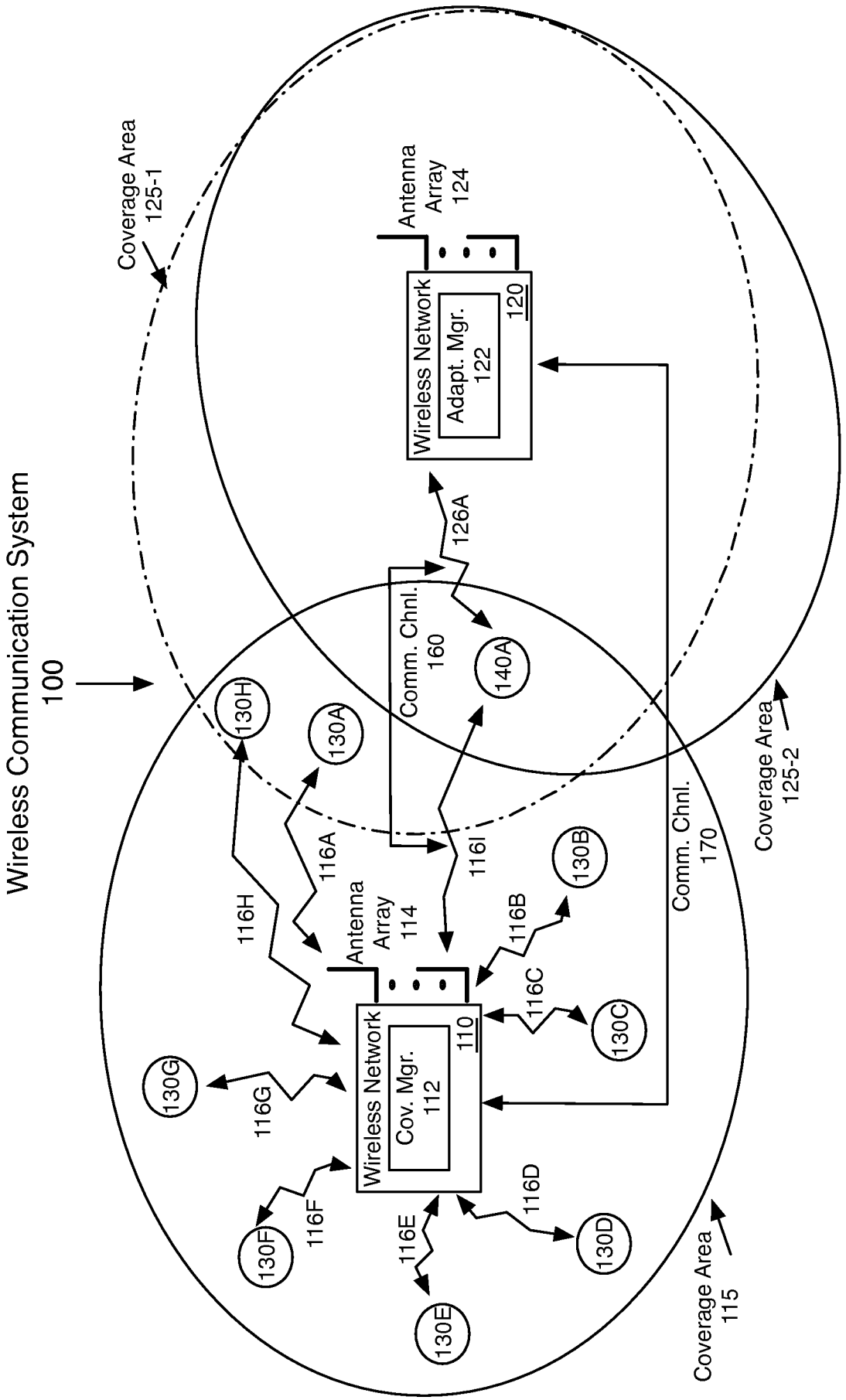

Wireless Communication System
100
Coverage Area
125-1
Coverage Area
125-2
Coverage Area
115
Antenna
Array
124
Wireless Network
120
Adapt. Mgr.
122
126A
Comm. Chnl.
160
140A
130H
130A
116H
116A
Antenna
Array
114
116I
Comm. Chnl.
170
130B
116B
116C
130C
Wireless Network
110
Cov. Mgr.
112
130G
116G
116F
130F
116E
130E
116D
130D

FIG. 1B

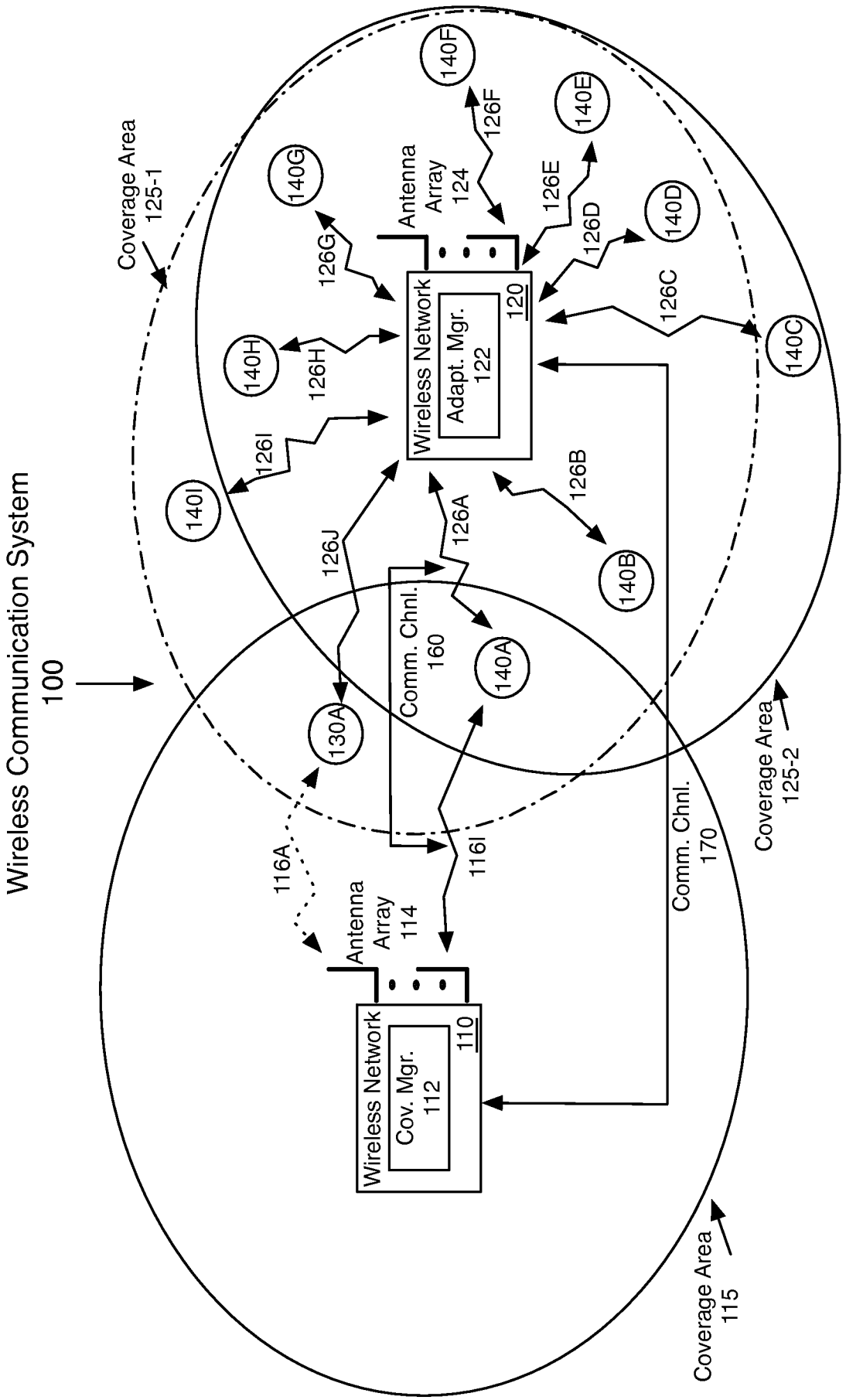

Wireless Communication System
100
Coverage Area
125-1
Coverage Area
125-2
Coverage Area
115
Wireless Network
Adapt. Mgr.
122
120
Antenna
Array
124
Wireless Network
Cov. Mgr.
112
110
Antenna
Array
114
Comm. Chnl.
160
Comm. Chnl.
170
126A
126B
126C
126D
126E
126F
126G
126H
126I
126J
116A
116I
130A
140A
140B
140C
140D
140E
140F
140G
140H
140I

FIG. 1C

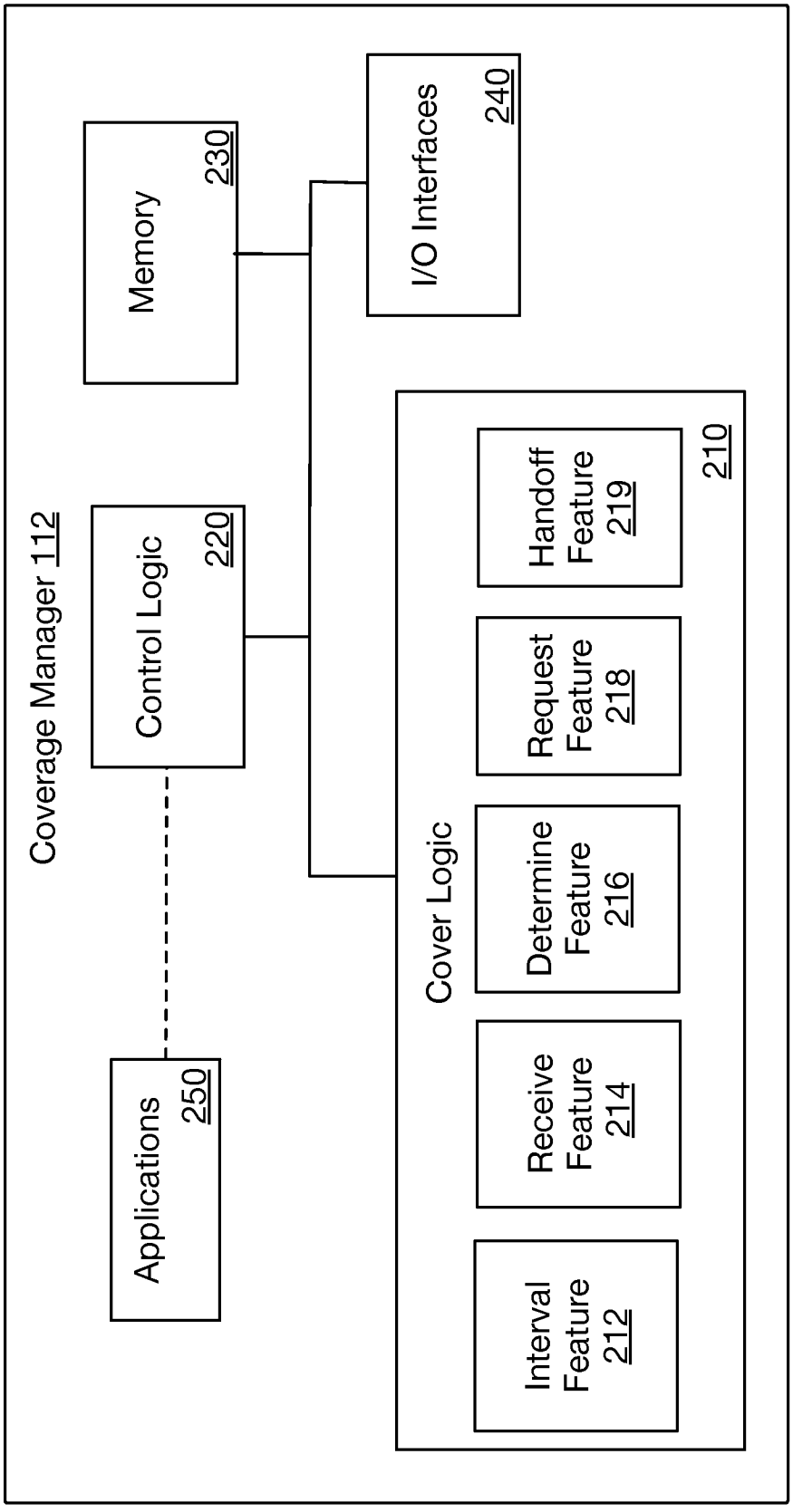

Coverage Manager 112
Memory 230
I/O Interfaces 240
Control Logic 220
Applications 250
Cover Logic
210
Interval Feature 212
Receive Feature 214
Determine Feature 216
Request Feature 218
Handoff Feature 219

FIG. 2

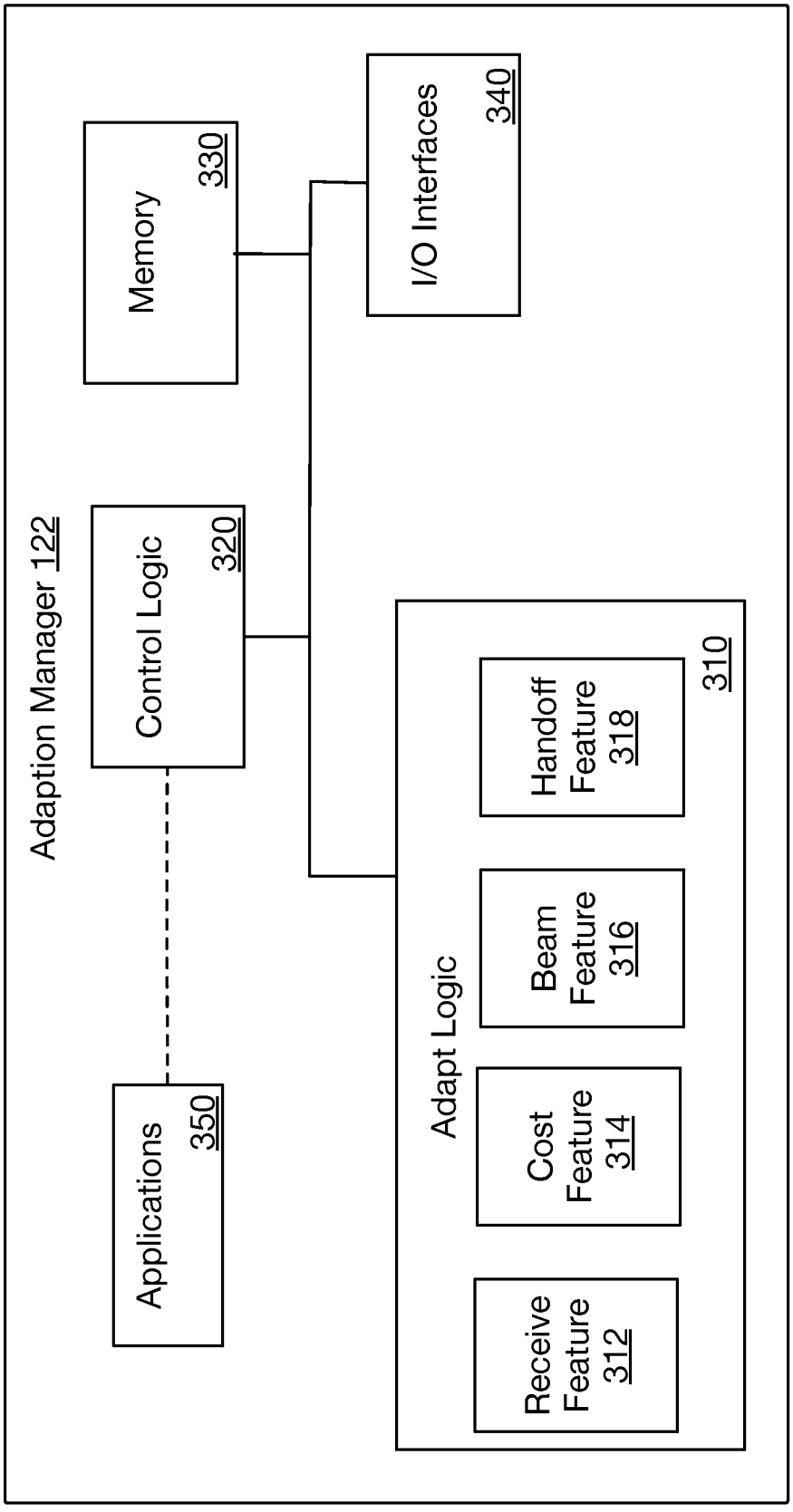

Adaption Manager 122
Memory 330
I/O Interfaces 340
Control Logic 320
Applications 350
Adapt Logic
310
Handoff Feature 318
Beam Feature 316
Cost Feature 314
Receive Feature 312

FIG. 3

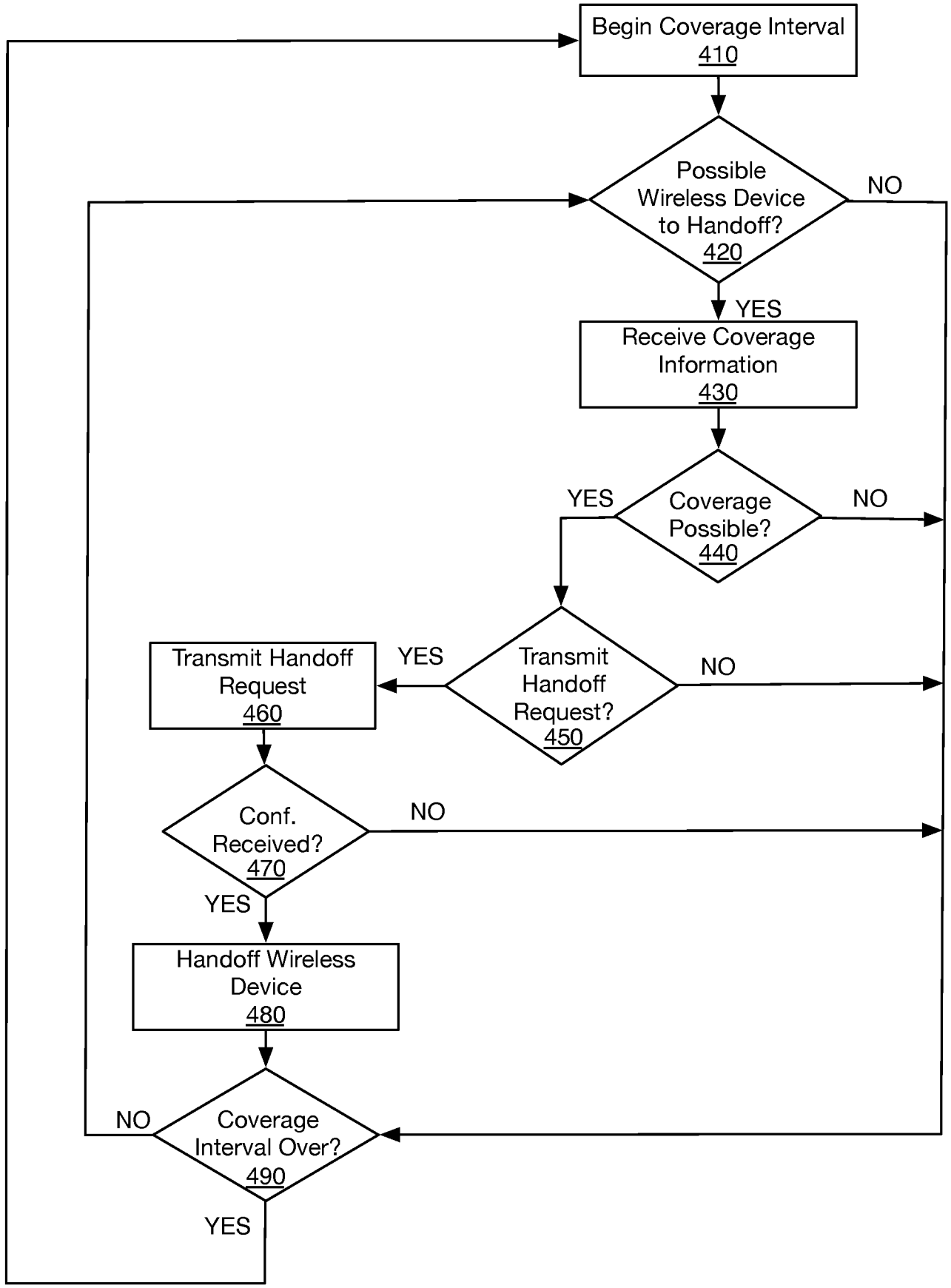

Begin Coverage Interval
410
Possible Wireless Device to Handoff?
420
NO
YES
Receive Coverage Information
430
YES
Coverage Possible?
440
NO
Transmit Handoff Request?
450
YES
NO
Transmit Handoff Request
460
Conf. Received?
470
NO
YES
Handoff Wireless Device
480
NO
Coverage Interval Over?
490
YES

FIG.4

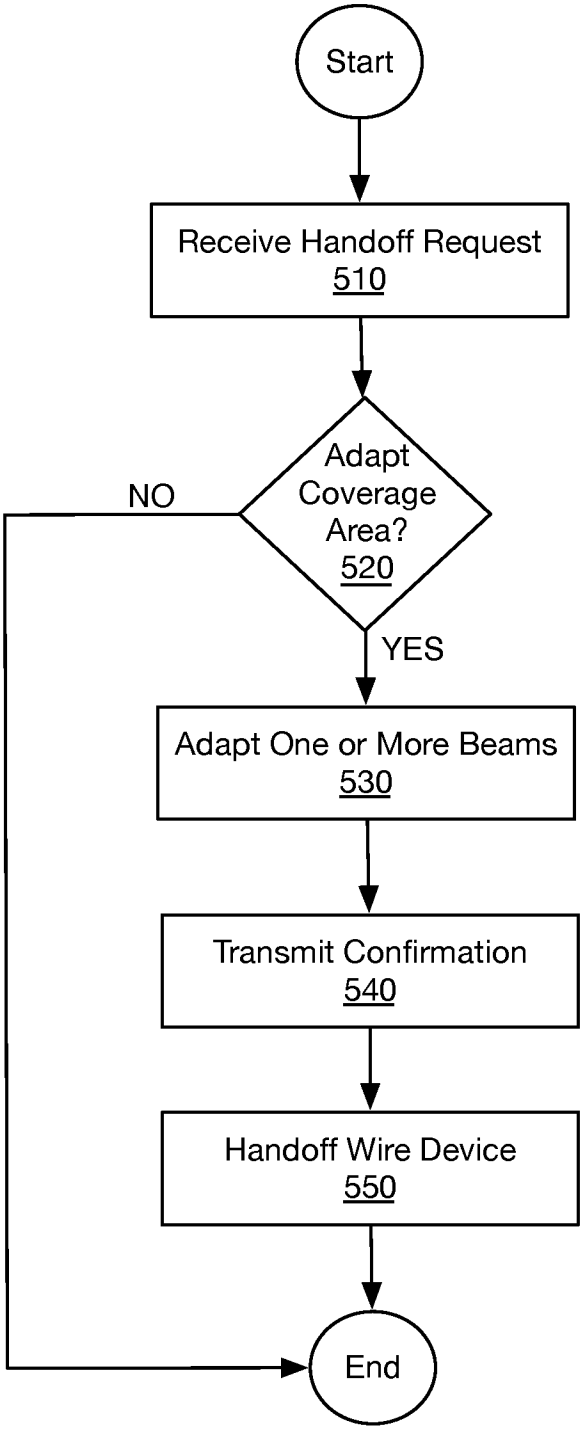

Start
Receive Handoff Request
510
Adapt
Coverage
Area?
520
NO
YES
Adapt One or More Beams
530
Transmit Confirmation
540
Handoff Wire Device
550
End

FIG.5

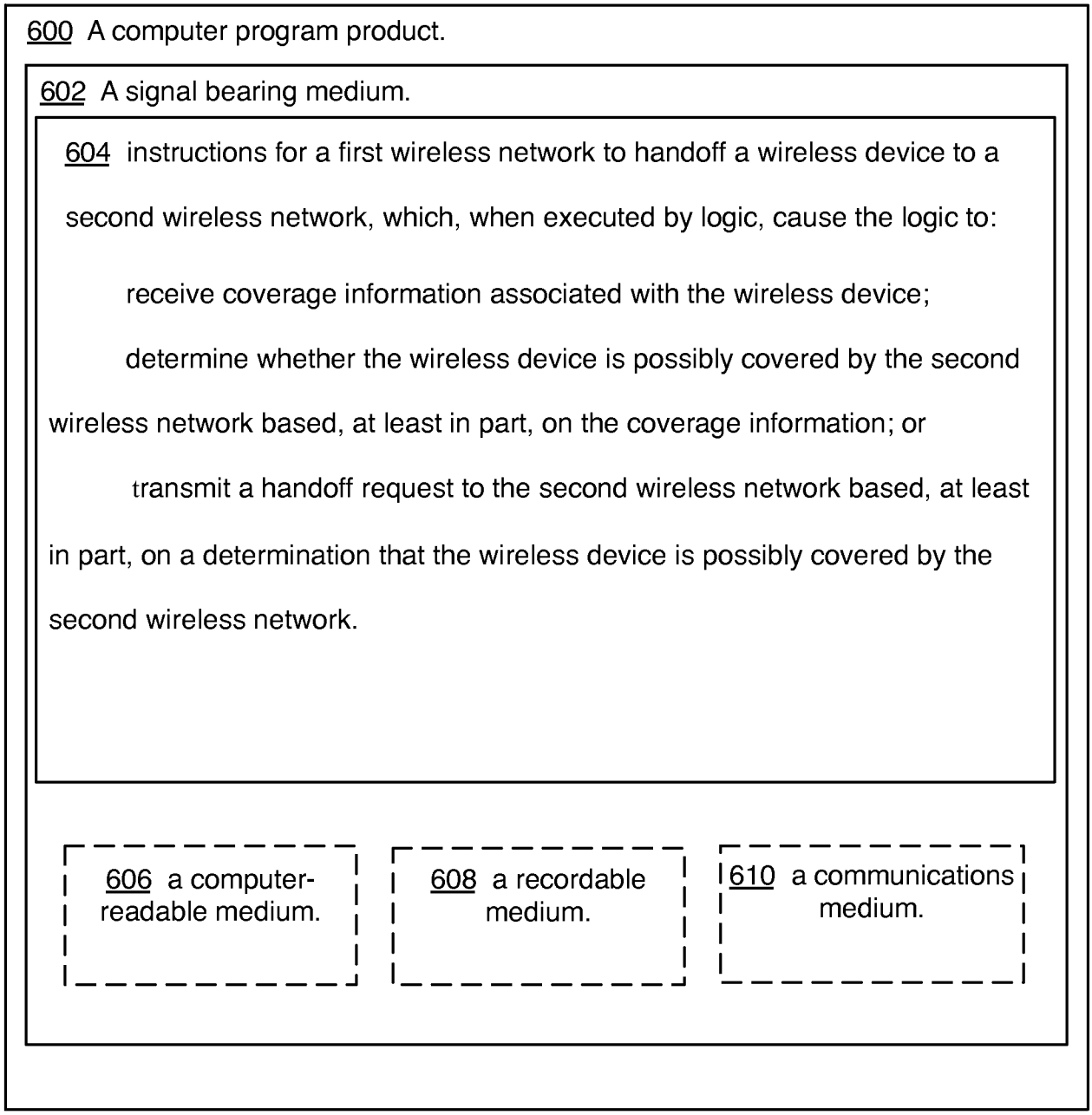

600 A computer program product.
602 A signal bearing medium.
604 instructions for a first wireless network to handoff a wireless device to a second wireless network, which, when executed by logic, cause the logic to:
receive coverage information associated with the wireless device;
determine whether the wireless device is possibly covered by the second wireless network based, at least in part, on the coverage information; or
transmit a handoff request to the second wireless network based, at least in part, on a determination that the wireless device is possibly covered by the second wireless network.
606 a computer-readable medium.
608 a recordable medium.
610 a communications medium.

FIG. 6

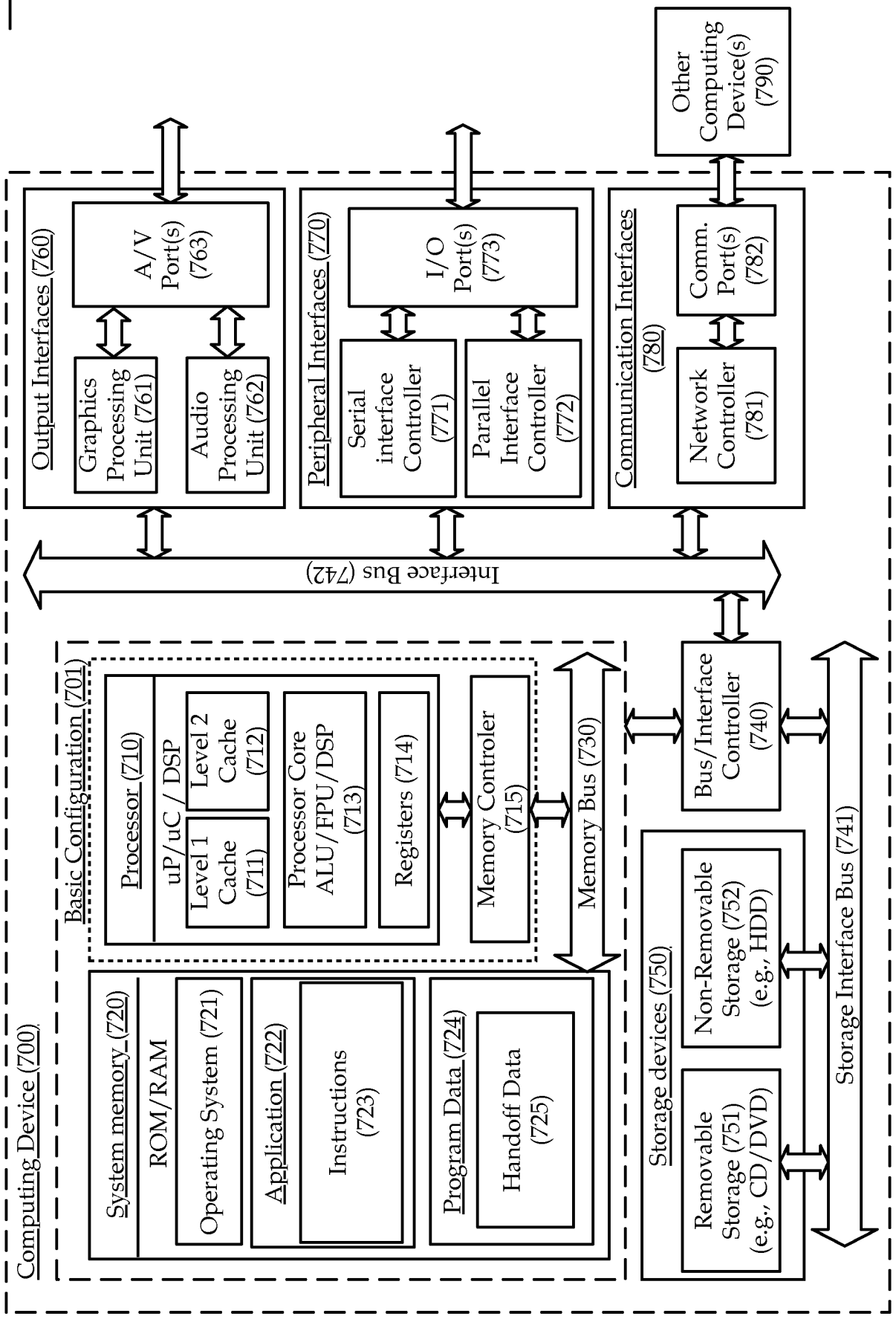

Computing Device (700)
Basic Configuration (701)
System memory (720)
ROM/RAM
Operating System (721)
Application (722)
Instructions (723)
Program Data (724)
Handoff Data (725)
Processor (710)
uP/uC / DSP
Level 1 Cache (711)
Level 2 Cache (712)
Processor Core ALU/FPU/DSP (713)
Registers (714)
Memory Controler (715)
Memory Bus (730)
Bus/Interface Controller (740)
Storage Interface Bus (741)
Storage devices (750)
Removable Storage (751) (e.g., CD/DVD)
Non-Removable Storage (752) (e.g., HDD)
Interface Bus (742)
Output Interfaces (760)
Graphics Processing Unit (761)
Audio Processing Unit (762)
A/V Port(s) (763)
Peripheral Interfaces (770)
Serial interface Controller (771)
Parallel Interface Controller (772)
I/O Port(s) (773)
Communication Interfaces (780)
Network Controller (781)
Comm. Port(s) (782)
Other Computing Device(s) (790)

FIG. 7

This sheet is not part of and does not count as a sheet of the international application.

PCT

FEE CALCULATION SHEET

Annex to the Request

For receiving Office use only

International Application No.

Date stamp of the receiving Office

Applicant's or agent's file reference 006.PCT078

Applicant

Empire Technology Development LLC

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE . . . . . $240.00 [T]

2. SEARCH FEE . . . . . $1,837.00 [S]

International search to be carried out by AU

(If two or more International Searching Authorities are competent to carry out the international search, indicate the name of the Authority which is chosen to carry out the international search.)

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6. FEE FOR EARLIER SEARCH DOCUMENTS *(if applicable)* . . . . . [ES]

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- ☐ bank transfer
- ☐ revenue stamps
- ☐ other *(specify):*

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(This mode of payment may not be available at all receiving Offices)

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- ☐ *(This check-box may be marked only if the conditions for deposit or current accounts of the receiving Office so permit)* Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.
- ☐ Authorization to charge the fee for priority document.

Receiving Office: RO/ _____

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Date: _____

Name: _____

Signature: _____

Electronic Acknowledgement Receipt

EFS ID:	12731468
Application Number:	13263835
International Application Number:	
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel KRUGLICK
Customer Number:	65638
Filer:	Blayne Donnis Green/Lindsey Hunt
Filer Authorized By:	Blayne Donnis Green
Attorney Docket Number:	006.P078
Receipt Date:	08-MAY-2012
Filing Date:	
Time Stamp:	17:04:41
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	Transmittal Letter	Transmittal_Letter_006_P078.pdf	242181 3673c66857a957d185ac01c9513f85fdbf9cae39	no	4

Warnings:	
Information:	

2	Documents submitted with 371 Applications	Copy_of_International_Application_006_PCT078.pdf	4906691 05d02d04eab5ee600dca06cd67e54aacfda22e31	no	61

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Information:

Total Files Size (in bytes):	5148872

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.

PTO-1390 (09-11)
Approved for use through 4/30/2013. OMB 0651-0021
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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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	U.S. APPLICATION NO. (If known, see 37 CFR 1.5)
006.P078	13/263,835

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/US2011/034470	4/29/2011	4/29/2011

TITLE OF INVENTION
WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

APPLICANT(S) FOR DO/EO/US
Ezekiel Kruglick

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.**

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
13/263,835	PCT/US2011/034470	006.P078

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**	$	
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**	$	
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**	$	
TOTAL OF 21, 22 and 23 =		

☐ 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)).
The fee is **$310** for each additional 50 sheets of paper or fraction thereof.

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round **up** to a whole number)	RATE	
- 100 =	/50 =		x $**310**	$

Surcharge of **$130.00** for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h)).	$	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	$	
Total claims	- 20 =		x $ **60**	$	
Independent claims	- 3 =		x **$250**	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$450**	$	
			TOTAL OF ABOVE CALCULATIONS =	$	
☐ Applicant claims small entity status. See 37 CFR 1.27. Fees above are reduced by ½.					
			SUBTOTAL =	$	
Processing fee of **$130.00** for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)). +				$	
			TOTAL NATIONAL FEE =	$	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$	
			TOTAL FEES ENCLOSED =	$	
			Amount to be refunded:	$	
			Amount to be charged	$	

Samsung Ex. 1002, Page 106 of 615

a. ☐ A check in the amount of $ _____ to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees.

c. ☐ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. _____.

d. ☑ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038. The PTO-2038 should only be mailed or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO.

ADVISORY: If filing by EFS-Web, do **NOT** attach the PTO-2038 form as a PDF along with your EFS-Web submission. Please be advised that this is **not** recommended and by doing so your **credit card information may be displayed via PAIR**. To protect your information, it is recommended paying fees online by using the electronic payment method.

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

SEND ALL CORRESPONDENCE TO:

Omikron IP Law Group
Attn: Blayne D. Green
16325 Boones Ferry Road Suite 204
Lake Oswego, OR 97035

/Blayne D. Green/
SIGNATURE

Blayne D. Green
NAME

56,198
REGISTRATION NUMBER

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
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.

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U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
13/263,835	Ezekiel Kruglick	006.P078

65638
OMIKRON IP LAW GROUP
16325 Boones Ferry Rd.
SUITE 204
LAKE OSWEGO, OR 97035

INTERNATIONAL APPLICATION NO.	
PCT/US2011/034470	
I.A. FILING DATE	PRIORITY DATE
04/29/2011	

CONFIRMATION NO. 1463
371 ACCEPTANCE LETTER

OC000000055413659

Date Mailed: 07/18/2012

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:

05/08/2012	05/08/2012
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 05/08/2012
- Copy of the International Search Report filed on 10/10/2011
- Copy of IPE Report filed on 10/10/2011
- Information Disclosure Statements filed on 10/10/2011
- Oath or Declaration filed on 10/10/2011
- Request for Immediate Examination filed on 10/10/2011
- U.S. Basic National Fees filed on 10/10/2011
- Power of Attorney filed on 10/10/2011

FORM PCT/DO/EO/903 (371 Acceptance Notice)

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)

WINSTON M ALVARADO

Telephone: (703) 756-1466

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
13/263,835	05/08/2012		2340	006.P078	32	5

CONFIRMATION NO. 1463

65638
OMIKRON IP LAW GROUP
16325 Boones Ferry Rd.
SUITE 204
LAKE OSWEGO, OR 97035

FILING RECEIPT



Date Mailed: 07/18/2012

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)

Ezekiel Kruglick, Poway, CA;

Assignment For Published Patent Application

EMPIRE TECHNOLOGY DEVELOPMENT LLC, Wilmington, DE

Power of Attorney: The patent practitioners associated with Customer Number 65638

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/US2011/034470 04/29/2011

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.)

If Required, Foreign Filing License Granted: 07/16/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/263,835**

Projected Publication Date: 11/01/2012

Non-Publication Request: No

Early Publication Request: No

Title

WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

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.

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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).

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/263,835

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))	32 minus 20 =	* 12			OR	x 60 =	720
INDEPENDENT CLAIMS (37 CFR 1.16(h))	5 minus 3 =	* 2				x 250 =	500
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	2340

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	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
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
13263835	

Applicant(s) Ezekiel KRUGLICK

* 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					
2		1				
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8		1				
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Total Indep	5		0		0	
Total Depend	27	↵	0	↵	0	↵
Total Claims	32		0		0	

CLAIMS	*		*		*	
	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.
13/263,835	Ezekiel Kruglick	006.P078

65638
OMIKRON IP LAW GROUP
16325 Boones Ferry Rd.
SUITE 204
LAKE OSWEGO, OR 97035

INTERNATIONAL APPLICATION NO.	
PCT/US2011/034470	
I.A. FILING DATE	PRIORITY DATE
04/29/2011	

CONFIRMATION NO. 1463
371 WITHDRAWAL NOTICE

OC000000056755335

Date Mailed: 09/27/2012

Letter Regarding a New Notice and/or the Status of the Application

If a new notice or Filing Receipt is enclosed, applicant may disregard the previous notice mailed on 07/18/2012. The time period for reply runs from the mail date of the new notice. Within the time period for reply, applicant is required to file a reply in compliance with the requirements set forth in the new notice to avoid abandonment of the application.

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web. https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

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

If the reply is not filed electronically via EFS-Web, the reply must be accompanied by a copy of the new notice.

If the Office previously granted a petition to withdraw the holding of abandonment or a petition to revive under 37 CFR 1.137, the status of the application has been returned to pending status.

WINSTON M ALVARADO

Telephone: (703) 756-1466

FORM PCT/DO/EO/WITH (371 Withdrawal Notice)

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
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U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
13/263,835	Ezekiel Kruglick	006.P078

65638
OMIKRON IP LAW GROUP
16325 Boones Ferry Rd.
SUITE 204
LAKE OSWEGO, OR 97035

INTERNATIONAL APPLICATION NO.	
PCT/US2011/034470	
I.A. FILING DATE	PRIORITY DATE
04/29/2011	

CONFIRMATION NO. 1463
371 ACCEPTANCE LETTER

OC000000056755409

Date Mailed: 09/27/2012

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:

10/10/2011	10/10/2011
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 10/10/2011
- Copy of the International Search Report filed on 10/10/2011
- Copy of IPE Report filed on 10/10/2011
- Information Disclosure Statements filed on 10/10/2011
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- Request for Immediate Examination filed on 10/10/2011
- U.S. Basic National Fees filed on 10/10/2011
- Power of Attorney filed on 10/10/2011

FORM PCT/DO/EO/903 (371 Acceptance Notice)

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WINSTON M ALVARADO

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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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
13/263,835	10/10/2011	2617	2340	006.P078	32	5

CONFIRMATION NO. 1463

65638
OMIKRON IP LAW GROUP
16325 Boones Ferry Rd.
SUITE 204
LAKE OSWEGO, OR 97035

FILING RECEIPT



Date Mailed: 09/27/2012

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Inventor(s)
Ezekiel Kruglick, Poway, CA;

Applicant(s)
Ezekiel Kruglick, Poway, CA;

Assignment For Published Patent Application
EMPIRE TECHNOLOGY DEVELOPMENT LLC, Wilmington, DE

Power of Attorney: The patent practitioners associated with Customer Number 65638

Domestic Priority data as claimed by applicant
This application is a 371 of PCT/US2011/034470 04/29/2011

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.)

If Required, Foreign Filing License Granted: 07/16/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/263,835**

Projected Publication Date: 11/01/2012

Non-Publication Request: No

Early Publication Request: No

Title

WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

Preliminary Class

455

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

GRANTED

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NOT GRANTED

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/263,835

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))	32 minus 20 =	* 12			OR	x 60 =	720
INDEPENDENT CLAIMS (37 CFR 1.16(h))	5 minus 3 =	* 2				x 250 =	500
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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	2340

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	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
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.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/263,835	10/10/2011	Ezekiel Kruglick	006.P078

CONFIRMATION NO. 1463

65638
OMIKRON IP LAW GROUP
16325 Boones Ferry Rd.
SUITE 204
LAKE OSWEGO, OR 97035

PUBLICATION NOTICE

OC000000057385484

Title:WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

Publication No.US-2012-0276901-A1
Publication Date:11/01/2012

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/.

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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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	006.P078	1463

65638 7590 06/19/2013

OMIKRON IP LAW GROUP
5895 Jean Road
LAKE OSWEGO, OR 97035

EXAMINER	
BEAMER, TEMICA M	

ART UNIT	PAPER NUMBER
2646	

MAIL DATE	DELIVERY MODE
06/19/2013	PAPER

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

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

Office Action Summary	Application No. 13/263,835	Applicant(s) KRUGLICK, EZEKIEL	
	Examiner TEMICA M. BEAMER	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 *10 October 2011*.

☐ 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) *1-32* 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) *1-32* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

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

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

Claim Rejections - 35 USC § 102

1. 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 –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Siomina et al. (Siomina), U.S. Patent Pub. No. 2012/0149430.

Regarding claims 1, 10, 14, 22 and 26, Siomina discloses a method implemented at a first wireless network to handoff a wireless device to a second wireless network, the method comprising: receiving coverage information associated with the wireless device; determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information; and transmitting a handoffrequest to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network (0047).

Regarding claims 2, 15 and 27, Siomina discloses a method further comprising: receiving a confirmation that the handoff request has been accepted by the second

wireless network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network (0055).

Regarding claims 3, 16 and 28, Siomina discloses a method wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network (0065).

Regarding claims 4, 17 and 29, Siomina discloses a method wherein the coverage information further includes mapping information of one or more locations for which the second wireless network has previously had coverage, the one or more locations to indicate the location of the wireless device (0064, 0065).

Regarding claims 5, 18 and 30, Siomina discloses a method wherein the mapping information of one or more locations for which the second wireless has previously had coverage comprises a map generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the one or more wireless devices (0064, 0065).

Regarding claims 6 and 19, Siomina discloses a method wherein transmitting the handoff request comprises transmitting a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted, or whether the wireless device is a mobile wireless device (0047).

Regarding claims 7, 11, 20, 23 and 31, Siomina discloses a method wherein transmitting the handoff request comprises transmitting a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network (0047).

Regarding claims 8, 12, 21, 24 and 3, Siomina discloses a method wherein transmitting the handoff request comprises transmitting a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network (figure 1).

Regarding claim 9, Siomina discloses a method according to claim 1, wherein the first wireless network is a different type of wireless network than the second wireless network (0027).

Regarding claims 13 and 25, Siomina discloses a method wherein adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load (the system has knowledge of the available resources) placed on the first network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network (0047).

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Diachina et al., U.S. Patent Pub. No. 2013/0107865, discloses a system and method of supporting packet-switched handover.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TEMICA M. BEAMER whose telephone number is (571)272-7797. The examiner can normally be reached on Monday-Thursday (alternate Fridays) 9:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lester Kincaid can be reached on (571) 272-7922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

Notice of References Cited	Application/Control No. 13/263,835	Applicant(s)/Patent Under Reexamination KRUGLICK, EZEKIEL	
	Examiner TEMICA M. BEAMER	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-2013/0107865	05-2013	Diachina et al.	370/331
*	B	US-2012/0149430	06-2012	Siomina et al.	455/525
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	Art Unit
	TEMICA M BEAMER	2646

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
455	436-443	6/17/2013	TMB

SEARCH NOTES		
Search Notes	Date	Examiner
WEST	6/17/2013	TMB

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

PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	2011-10-10
First Named Inventor	Ezekiel Kruglick
Art Unit	
Examiner Name	
Attorney Docket Number	006.P078

U.S.PATENTS Remove

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	6438389	B1	2002-08-20	SANDHU et al.	Whole document
	2	6829481		2004-12-07	SOUISSI	

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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
	1	20020187780	A1	2002-12-12	SOUISSI	Abstract, paras [0011],[0040],[0055], [0087],[0089],]0090]-[0092], [0099]; Fig. 8
	2	20080273506	A1	2008-11-06	KEZYS	Abstract, paras [0004],[0016],[0032]
	3	20080310371	A1	2008-12-18	RUSSELL	Whole document
	4	20080076430	A1	2008-03-27	OLSON	Whole document

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.B./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	
	Examiner Name	
	Attorney Docket Number	006.P078

	5	20070021119	A1	2007-01-25	LEE et al.	Whole document
	6	20060148451	A1	2006-07-06	NARASIMHA	Whole document

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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							☐

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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	AUSTRALIA PATENT OFFICE, International Search Report and Written Opinion of the International Searching Authority for PCT/US2011/034470, prepared on July 27, 2011, Australia.	☐
	2	CHENG, Sheng-Tzong et al., IPv6-based dynamic coordinated call admission control mechanism over integrated wireless networks, IEEE Journal on Selected Areas in Communications 23, no. 11 (11, 2005): pp. 2093-2103.	☐
	3	MOHANTY, S. et al., A cross-layer (layer 2+ 3) handoff management protocol for next-generation wireless systems, IEEE Transactions on Mobile Computing 5, no. 10 (2006): 1347-1360.	☐
	4	FERRUS, R., Vertical handover support in coordinated heterogeneous radio access networks, Proceedings of the 14th IST Mobile and Wireless Communications Summit, June 2005, Dresden, Germany, accessed online via http://www.eurasip.org/Proceedings/Ext/IST05/papers/430.pdf on October 10, 2011	☐

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	
	Examiner Name	
	Attorney Docket Number	006.P078

EXAMINER SIGNATURE			
Examiner Signature	/Temica Beamer/	Date Considered	06/17/2013

*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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	
	Examiner Name	
	Attorney Docket Number	006.P078

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.

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

☒ A certification statement is not submitted herewith.

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	/Ted A. Crawford/	Date (YYYY-MM-DD)	2011-10-10
Name/Print	Ted A. Crawford	Registration Number	50610

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.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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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BIB DATA SHEET

CONFIRMATION NO. 1463

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/263,835	10/10/2011	455	2646	006.P078

APPLICANTS
Ezekiel Kruglick, Poway, CA;

**** CONTINUING DATA ***************************
This application is a 371 of PCT/US2011/034470 04/29/2011

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

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
07/16/2012

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /TEMICA M BEAMER/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		CA	9	32	5

ADDRESS
OMIKRON IP LAW GROUP
5895 Jean Road
LAKE OSWEGO, OR 97035
UNITED STATES

TITLE
WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

FILING FEE RECEIVED		
2340	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

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	Art Unit
	TEMICA M BEAMER	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	06/17/2013								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
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	32	✓								

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

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

I hereby appoint:

☑ Practitioners associated with the Customer Number: 86636

OR

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

Name	Registration Number	Name	Registration Number

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

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

☑ The address associated with Customer Number: 86636

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

Empire Technology Development LLC
2711 Centerville Road, Suite 400
Wilmington, Delaware 19808

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

SIGNATURE of Assignee of Record

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

Signature			Date 12-9-2011
Name		JEROME HEWLETT	Telephone
Title		Authorized Person	

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Electronic Acknowledgement Receipt

EFS ID:	16165685
Application Number:	13263835
International Application Number:	
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Customer Number:	65638
Filer:	David S. Lee/Nora Colston
Filer Authorized By:	David S. Lee
Attorney Docket Number:	006.P078
Receipt Date:	26-JUN-2013
Filing Date:	10-OCT-2011
Time Stamp:	18:59:31
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	Assignee showing of ownership per 37 CFR 3.73.	2796_373statement.pdf	427553 03cc04631a0e7fae9b0794074388b41620da41ab	no	2

Warnings:	
Information:	

2	Power of Attorney	2796_PoA.pdf	133176 3f92c3c78141763e307d737f20b64e7914421616	no	1

Warnings:	
Information:	
Total Files Size (in bytes):	560729

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.

PTO/SB/96 (06-09)
Approved for use through 07/31/2009. 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 displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Empire Technology Development LLC

Application No./Patent No.: 13/263,835 Filed/Issue Date: 10/10/2011

Titled: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

Empire Technology Development LLC , a Limited Liability Company

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

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is _____ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

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

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

OR

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

1. From: Ezekiel Kruglick To: Ardent Research Corporation

The document was recorded in the United States Patent and Trademark Office at
Reel 026203 , Frame 0993 , or for which a copy thereof is attached.

2. From: Ardent Research Corporation To: Empire Technology Development LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 026204 , Frame 0004 , or for which a copy thereof is attached.

3. From: _____ To: _____

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

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

☒ As required by 37 CFR 3.73(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.

/David S. Lee/ June 26, 2013

Signature Date

David S. Lee, Reg. No.: 38,222 Patent Attorney for Applicant

Printed or Typed Name Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The **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:

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

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/263,835	10/10/2011	Ezekiel Kruglick	006.P078

CONFIRMATION NO. 1463

86636
BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

POA ACCEPTANCE LETTER

OC000000062339010

Date Mailed: 07/09/2013

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/26/2013.

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.

/atesfai/

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

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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/263,835	10/10/2011	Ezekiel Kruglick	006.P078

CONFIRMATION NO. 1463

POWER OF ATTORNEY NOTICE

65638
OMIKRON IP LAW GROUP
5895 Jean Road
LAKE OSWEGO, OR 97035

OC000000062338983

Date Mailed: 07/09/2013

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/26/2013.

- 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).

/atesfai/

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 13/263,835
Filing Date ..... October 10, 2011
Confirmation No. 1463
Inventorship ..... Ezekiel Kruglick
Group Art Unit 2646
Examiner ..... Temica M. Beamer
Attorney Docket No. 2796.737BS
Title: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

RESPONSE TO NON-FINAL OFFICE ACTION OF JUNE 19, 2013 AND STATEMENT OF SUBSTANCE OF INTERVIEW

To: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

From: David S. Lee
Customer No. 86636
Brundidge & Stanger, PC
2318 Mill Road, Suite 1020
Alexandria, VA 22314

Madam:

In response to the Non-Final Office Action dated June 19, 2013, for which the three-month shortened statutory period for response is set to expire on September 19, 2013, the following amendments and remarks are respectfully submitted. Favorable consideration is respectfully requested.

The Commissioner is hereby authorized to charge any deficiency of fees and credit any overpayments to Deposit Account Number 50-4888.

INTRODUCTORY COMMENTS

The Claims section begins on page 3.

Remarks section begins on page 12.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims pending:

- At time of the Action: Claims 1 – 32.
- After this Reply: Claims 1 – 3, 5 – 16, 18 – 28 and 30 – 32.

Currently Canceled or Withdrawn Claims: Claims 4, 17 and 29.

Currently Amended Claims: Claims 1, 2, 5, 8, 10, 12, 14, 18, 26 and 30.

New Claims: None

1. (**Currently Amended**) A method implemented at a first wireless network to handoff a mobile wireless device to a second wireless network, the method comprising:

receiving coverage information associated with the wireless device;

determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information; and

transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

2. (**Currently Amended**) A method according to claim 1, further comprising:

receiving a confirmation from the second wireless network that the handoff request has been accepted by the second wireless network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network.

3. (**Original**) A method according to claim 1, wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

4. (**Canceled**)

5. (**Currently Amended**) A method according to claim ~~4~~1, wherein the mapping information of one or more locations for which the second wireless network has previously had coverage comprises a map generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the one or more wireless devices.

6. (**Original**) A method according to claim 1, wherein transmitting the handoff request comprises transmitting a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted, or whether the wireless device is a mobile wireless device.

7. (**Original**) A method according to claim 1, wherein transmitting the handoff request comprises transmitting a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

8. (**Currently Amended**) A method according to claim 1, wherein transmitting the handoff request comprises transmitting a handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the ~~other~~ another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

9. (**Original**) A method according to claim 1, wherein the first wireless network is a different type of wireless network than the second wireless network.

10. (**Currently Amended**) A method implemented at a first wireless network for a mobile wireless device handoff between a second wireless network and the first wireless network, the method comprising:

receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless device but is capable of being covered by the first wireless network;

based, at least in part, on the handoff request, adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network; and

transmitting a confirmation from the first wireless network to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

11. (**Original**) A method according to claim 10, wherein receiving the handoff request comprises receiving the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

12. (**Currently Amended**) A method according to claim 10, wherein receiving the handoff request comprises receiving the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the ~~other~~ another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

13. (**Original**) A method according to claim 10, wherein adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load

placed on the first network due to the handoff of the wireless device or an effect of adapting one or

more beams on other wireless devices currently communicatively coupled to the first wireless network.

14. (**Currently Amended**) An apparatus for a first wireless network to handoff a wireless device to a second wireless network, the apparatus comprising:

a coverage manager having logic, the logic configured to:

receive coverage information associated with the wireless device;

determine whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the coverage information; and

transmit a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more

locations of the wireless device for which the second wireless network has previously had coverage.

15. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to:

receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

16. (**Original**) An apparatus according to claim 14, wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

17. (**Canceled**)

18. (**Currently Amended**) An apparatus according to claim ~~17~~14, wherein the logic is further configured to generate the mapping information based, at least in part, on information received from wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the wireless devices.

19. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted, or whether the wireless device is a mobile wireless device.

20. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

21. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

22. (**Original**) A system for a wireless device handoff between a first wireless network and a second wireless network, the system comprising:

an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network; and

an adaption manager having logic, the logic configured to:

receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network;

cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network; and

transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

23. (**Original**) A system according to claim 22, wherein to receive the handoff request comprises to receive a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

24. (**Original**) A system according to claim 22, wherein to receive the handoff request comprises to receive a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

25. (**Original**) A system according to claim 22, wherein to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first network due to the handoff of the wireless device or an impact of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

26. (**Currently Amended**) A computer program product comprising a non-transitory medium having instructions for a first wireless network to handoff a wireless device to a second wireless network, which, when executed by logic, cause the logic to:

receive coverage information associated with the wireless device;

determine whether the wireless device is possibly covered by the second wireless network based, at least in part, on the coverage information; and

transmit a handoff request to the second wireless network based, at least in part, on a determination that the wireless device is possibly covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

27. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

28. (**Original**) A computer program product according to claim 26, wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

29. (**Canceled**)

30. (**Currently Amended**) A computer program product according to claim ~~29~~26, wherein the mapping information of one or more locations for which the second wireless has had coverage in the past comprises a map generated based on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network detection of a detectable signal from the second wireless network to the one or more wireless devices.

31. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

32. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via another wireless device that is

configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

Samsung Ex. 1002, Page 157 of 615

REMARKS

Reconsideration and allowance in view of the foregoing amendments and the following remarks are respectfully requested.

Claims 1 – 32 are pending. **Claims 1 – 32** were rejected under 35 U.S.C. § **102(e).** Upon entry of the amendment, **Claims 1, 2, 5, 8, 10, 12, 14, 18, 26 and 30** are currently amended. Support for the amendments to independent **Claims 1, 10, 14 and 26** can be found, at least at, paragraphs **0023 and 0056** of the specification. No new matter is added. Favorable consideration is respectfully requested.

CLAIM REJECTION - 35 U.S.C. § 102(e)

Claims 1 – 32 are rejected under 35 U.S.C. § 102(e) as being anticipated by Siomina et al. (U.S. Publication No. 2012/0149430; hereinafter "Siomina"). Applicant respectfully traverses the rejectinos.

Without conceding the propriety of the rejections and in the interest of expediting allowance of the present application, Applicant hereby amends independent **Claims 1, 10, 14 and 26** to refine the definition of the claimed subject matter. Correspondingly, **Claims 4, 17 and 29** are canceled, and **Claims 2, 5, 8, 12, 18 and 30** are amended.

As **Claims 1, 14 and 26** are amended to recite features similar to those recited in now-canceled **Claims 4, 17 and 29**, respectively, the rejections of **Claims 4, 17 and 29** are addressed below in the discussion of allowability of **Claims 1, 14 and 26**.

In the rejections of **Claims 4, 17 and 29**, the Office took the following position with respect to Siomina (see Office Action, page 3):

> Regarding claims 4, 17, and 29, Siomina discloses a method wherein the coverage information further includes mapping information of one or more locations for which the second wireless network has previously had coverage, the one or more locations to indicate the location of the wireless device (0064, 0065).

The cited passages of Siomina, as published, are provided below.

> **[0064]** Step **405**. The user equipment **10** may check, after the cell change process is performed, that the second cell **14** is in the received positioning assistance data. Thus, the user equipment **10** may check whether the new serving cell is still in the available assistance data.
>
> **[0065]** Step **406**. The user equipment **10** may then send, when the second cell **14** is not in the positioning assistance data, a request for the positioning assistance data of the second cell **14** only to the positioning node **17**. Hence, at handover (HO), the user equipment **10** actually receives the PCI and earfcn of the new cell in the handover command. So, according to some embodiments, the user equipment **10** may be able to know whether it should request new positioning assistance data or not. When the new serving cell is not in the previous positioning assistance data provided, the user equipment **10** may request new assistance data and the message used may be the normal assistance data request.

Applicant submits that the cited passages provide no explicit description of any mapping information of one or more locations of the wireless device, *e.g.,* user equipment 10 of Siomina, for which the second wireless network, *e.g.*, the second cell 14 of Siomina, has previously had coverage. More so, there is no inherency in the description provided by Siomina of receiving coverage information that includes mapping information of one or more locations of user equipment 10 for which the second cell 14 has previously had coverage.

Even assuming *arguendo*, to which the Applicant does not agree, that the "positioning assistance data" described in [0064] and [0065] of Siomina could somehow be analogized to the "coverage information" recited in amended **Claims 1, 14 and 26**, the "positioning assistance data" described in Siomina is not the same as or equivalent to the "coverage information" recited in amended **Claims 1, 14 and 26**.

Siomina describes the "positioning assistance data" as follows:

> [0032] Then, the positioning node 17 generates a message comprising positioning assistance data, which positioning assistance data comprises

> information associated with the at least one cell. The information may be represented by the at least one cell, e.g. cell identity, or other information identifying the at least one cell. ... The positioning assistance data may also be referred to as assistance data and enable the user equipment 10 to perform positioning measurements. Furthermore, the positioning node 17 transmits the message to the user equipment 10 to be used for positioning the user equipment 10.
>
> [0038] The positioning assistance data may comprise system or measurement bandwidth of the second cell 14, bandwidth of a Positioning Reference Signal (PRS) of the second cell 14, periodicity of the PRS in the second cell 14, expected Reference Signal Time Difference (RSTD), RSTD uncertainty, and other information relating to the positioning involving the second cell 14. The positioning assistance data may be used to assist when measuring time difference of arrival of different reference signals of the cells comprised in the positioning assistance data.
>
> [0063] Step 404. The user equipment 10 may receive positioning assistance data from a positioning node 17. The positioning assistance data and a system frame number of at least one cell in the positioning assistance data is to be used when to perform a positioning measurement. The positioning assistance data may comprise an indication of a cell serving the user equipment 10.
>
> [0099] In some of the previous embodiments the positioning node 17 may have means to include indicator of the cell serving the user equipment 10 and its related information in the positioning assistance data. The positioning assistance data is signalled by the positioning node 17 to the user equipment 10 for performing the positioning measurements.

Thus, according to Siomina, the "positioning assistance data" is not even relevant to coverage information that includes mapping information of one or more locations of the wireless device, *e.g.*, user equipment 10 of Siomina, for which the second wireless network, *e.g.*, the second cell 14 of Siomina, has previously had coverage.

Moreover, the "positioning assistance data" described in Siomina is received by user equipment 10 from positioning node 17. In contrast, in **Claims 1, 14 and 26**, the "coverage information" is not received by the wireless device, which appears to be analogized to the "user equipment 10" in the Office Action.

Therefore, Siomina at least fails to disclose, among other features, "wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage," as recited in amended **Claims 1, 14 and 26**.

Therefore, Applicant respectfully requests that the rejection of independent **Claims 1, 14 and 26** under 35 U.S.C. § 102(e) be withdrawn.

Regarding independent **Claims 10 and 22** (as well as **Claims 1, 14 and 26**), the rejection alleges the following position with respect to Siomina (see Office Action, page 2):

> Regarding claims 1, 10, 14, 22, and 26, Siomina discloses a method implemented at a first wireless network to handoff a wireless device to a second wireless network, the method comprising: receiving coverage information associated with the wireless device; determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information; and transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network (0047).
>
> Siomina {0047] states:
>
> [0047] Step 302. Each radio base station 12, 13, 15 broadcasts and transmits reference signals carrying system information (SI) or similar providing radio coverage over geographical areas. The user equipment 10 is served in the first cell 11 but moves towards the second cell 14, and continuously measures signal strengths of received reference signals. This step corresponds to step 201 in FIG. 2. Signal strengths difference may be reported to the network, *e.g.,* the first radio base station 12 or second radio base station 13, and when decision in the network is made *e.g.,* the first and second radio base stations 12, 13 decide based on signal strengths difference and available resources, a handover command may be sent to the user equipment 10.

However, Siomina at [0041] and[0055] are the only passages thereof that even reference any kind of confirmation.

> [0041] Step 206. The user equipment 10 may finalize the handover by sending a handover confirmation. The handover confirmation may be forwarded to the MME 18.

> [0055] Step 309. The user equipment 10 connects to the second cell 14 and transmits a handover confirmation to the MME 18.

Thus, according to Siomina, a handover confirmation is sent, or transmitted, from user equipment 10 to MME 18.

In contrast, **Claim 10** requires "transmitting a confirmation from the first wireless network to the second wireless network". Similarly, according to **Claim 22**, it is the adaption manager of a system, not the wireless device, that transmits a confirmation to the second wireless network.

Therefore, Siomina at least fails to disclose, among other features, "transmitting a confirmation from the first wireless network to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network," as recited in amended **Claim 10**. Additionally, Siomina at least fails to disclose, among other features, an adaption manager having logic configured to "transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network," as recited in **Claim 22**.

Therefore, Applicant respectfully requests that the rejection of independent **Claims 10 and 22** under 35 U.S.C. § 102(e) be withdrawn.

Further, it is respectfully submitted that **Claims 2, 3, 5 – 9, 11 – 13, 15, 16, 18 – 21, 23 – 25, 27, 28 and 30 – 32** should also be allowable over the cited art, including Siomina, because of at least their ultimate dependency from an allowable base claim, and also for the additional features that each of **Claims 2, 3, 5 – 9, 11 – 13, 15, 16, 18 – 21, 23 – 25, 27, 28 and 30 – 32** recites.

For example, **Claims 3, 16 and 28** require the confirmation information to also include "an indication that the wireless device does not detect a signal from the second wireless network." In contrast, there is no description in Siomina that the "positioning assistance data" includes such

indication.

As another example, **Claims 5, 18 and 30** require a map or mapping information generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network. In contrast, there is no description in Siomina of generating a map or mapping information based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network (e.g., the first cell 11) and covered by the second wireless network (e.g., the second cell 14).

As a further example, **Claims 8 and 12** recite another wireless device, which is a mobile wireless device, serving as a relay between the first wireless network and the second wireless network. In contrast, Figure 1 of Siomina shows base station 13 and/or base station 15 may serve as a relay. However, neither base station 13 nor base station 15 of Siomina is a mobile wireless device.

Moreover, the rejections of **Claims 4, 17 and 29** are rendered moot by the cancellation thereof.

Accordingly, Applicant respectfully requests that the rejection of **Claims 2 – 9, 11 – 13, 15 – 21, 23 – 25 and 27 – 32** under 35 U.S.C. § 102(e) be withdrawn.

CONCLUSION

It should also be noted that although arguments have been presented with respect to certain claims herein, the recited subject matter as well as various other subject matter and/or combinations of subject matter may be patentable for other reasons. Further, the failure to address any statement by the Examiner herein should not be interpreted as acquiescence or agreement with such statement. Applicants expressly reserve the right to set forth additional and/or alternative reasons for patentability and/or allowance with the present Application or in any other future proceeding, and to rebut any statement presented by the Examiner in this or other papers during prosecution of the present Application.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance, and therefore early and forthright issuance of a Notice to that effect is earnestly solicited.

Respectfully submitted,

Brundidge & Stanger, PC

Dated: September 19, 2013

/David S. Lee/
David S. Lee
Reg. No. 38,222

Electronic Acknowledgement Receipt

EFS ID:	16896843
Application Number:	13263835
International Application Number:	
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Customer Number:	86636
Filer:	David S. Lee/Nora Colston
Filer Authorized By:	David S. Lee
Attorney Docket Number:	2796.737BS
Receipt Date:	19-SEP-2013
Filing Date:	10-OCT-2011
Time Stamp:	15:20:20
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	Amendment/Req. Reconsideration-After Non-Final Reject	2796_20130917_OAResponse.pdf	491504 0d48db4e87fc5c6b035fd693621d3e7bad4422e6	no	18

Warnings:	
Information:	

Total Files Size (in bytes):	491504

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.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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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 13/263,835	Filing Date 10/10/2011	☐ 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

09/19/2013	(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))	* 29	Minus	** 32	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 5	Minus	***5	= 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
/CHARLENE /. HERBERT/

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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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

86636 7590 01/03/2014

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER	
BEAMER, TEMICA M	
ART UNIT	PAPER NUMBER
2646	
MAIL DATE	DELIVERY MODE
01/03/2014	PAPER

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

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

Office Action Summary	Application No. 13/263,835	Applicant(s) KRUGLICK, EZEKIEL	
	Examiner TEMICA M. BEAMER	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* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☒ Responsive to communication(s) filed on *9/19/2013*.

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

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

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

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

Disposition of Claims*

5)☒ Claim(s) *1-3,5-16,18-28 and 30-32* 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) *1-3, 5-16, 18-28 and 30-32* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

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

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp 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 _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

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

4) ☐ Other: _____.

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

DETAILED ACTION

Response to Arguments

2. Applicant's arguments filed 6/19/2013 have been fully considered but they are not persuasive. Applicant argues that Siomina fails to disclose wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage. The examiner, however disagrees.

Siomina discloses a method wherein a user device is handed over from one cell to another cell. Siomina further discloses wherein a user device requests positioning assistance data when performing a handover. This data is used to determine if the second network in which the user device is trying to handover to has been previously in the positioning assistance data. If it has been determined that the data was not previously provided, the mobile device determines that the second wireless network did not have previous coverage (0065). The positioning assistance data is only known/provided for a wireless network, if that network has provided coverage to that user device in the past (0066, 0067). Therefore, Siomina does disclose the mapping limitation claimed.

The applicant further argues that Siomina fails to disclose receiving a handoff confirmation from the second wireless network. However, the claim language says that the confirmation is based in part whether or not the mobile device is handed off to the

second wireless network. Since Siomina discloses that the mobile device has been handed off to the second network, this limitation is met as well.

Based on the above remarks, the examiner maintains that Siomina reads on the invention as presently claimed.

Claim Rejections - 35 USC § 102

3. 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 –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-3, 5-16, 18-28 and 30-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Siomina et al. (Siomina), U.S. Patent Pub. No. 2012/0149430.

Regarding claims 1, 10, 14, 22 and 26, Siomina discloses a method implemented at a first wireless network to handoff a wireless device to a second wireless network, the method comprising: receiving coverage information associated with the wireless device; determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information; and transmitting a handoffrequest to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second

wireless network (0047), wherein the coverage information further includes mapping information of one or more locations for which the second wireless network has previously had coverage (0064, 0065). .

Regarding claims 2, 15 and 27, Siomina discloses a method further comprising: receiving a confirmation from the second wireless network that the handoff request has been accepted by the second wireless network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network (0055).

Regarding claims 3, 16 and 28, Siomina discloses a method wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network (0065).

Regarding claims 5, 18 and 30, Siomina discloses a method wherein the mapping information of one or more locations for which the second wireless has previously had coverage comprises a map generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the one or more wireless devices (0064, 0065).

Regarding claims 6 and 19, Siomina discloses a method wherein transmitting the handoff request comprises transmitting a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location

of the wireless device if the handoff request is accepted, or whether the wireless device is a mobile wireless device (0047).

Regarding claims 7, 11, 20, 23 and 31, Siomina discloses a method wherein transmitting the handoff request comprises transmitting a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network (0047).

Regarding claims 8, 12, 21, 24 and 3, Siomina discloses a method wherein transmitting the handoff request comprises transmitting a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network (figure 1).

Regarding claim 9, Siomina discloses a method according to claim 1, wherein the first wireless network is a different type of wireless network than the second wireless network (0027).

Regarding claims 13 and 25, Siomina discloses a method wherein adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load (the system has knowledge of the available resources) placed on the first network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network (0047).

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TEMICA M. BEAMER whose telephone number is (571)272-7797. The examiner can normally be reached on Monday-Thursday (alternate Fridays) 9:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lester Kincaid can be reached on (571) 272-7922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	Art Unit
	TEMICA M BEAMER	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	06/17/2013	12/30/2013							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	-							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	✓	✓							
	17	✓	-							
	18	✓	✓							
	19	✓	✓							
	20	✓	✓							
	21	✓	✓							
	22	✓	✓							
	23	✓	✓							
	24	✓	✓							
	25	✓	✓							
	26	✓	✓							
	27	✓	✓							
	28	✓	✓							
	29	✓	-							
	30	✓	✓							
	31	✓	✓							
	32	✓	✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	Art Unit
	TEMICA M BEAMER	2646

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
455	436-443	6/17/2013	TMB
	updated search	12/30/2013	TMB

SEARCH NOTES		
Search Notes	Date	Examiner
WEST	6/17/2013	TMB

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

Doc Code: A.NE.AFCP
Document Description: After Final Consideration Pilot Program Request

PTO/SB/434 (05-13)

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0

Practitioner Docket No.:	Application No.:	Filing Date:
2796.737BS	13/263,835	October 10, 2011
First Named Inventor:	**Title:**	
Ezekiel KRUGLICK	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS	

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.

1. The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (*e.g.*, a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c).
2. The above-identified application contains an outstanding final rejection.
3. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect.
4. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection.
5. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response.
6. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web).
7. Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.]
8. By filing this certification and request, applicant acknowledges the following:
   - Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0.
   - The examiner will verify that the AFCP 2.0 submission is compliant, *i.e.*, that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions:
     - The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, by mailing an advisory action.
     - If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview.
       - The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate.
       - If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116.

Signature	Date
/David S. Lee/	February 14, 2014
Name (Print/Typed) David S. Lee	**Practitioner Registration No.** 38,222

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.*

☐ * Total of _____ forms are submitted.

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 13/263,835
Filing Date ..... October 10, 2011
Confirmation No. 1463
Inventorship ..... Ezekiel Kruglick
Group Art Unit 2646
Examiner ..... Temica M. Beamer
Attorney Docket No. 2796.737BS
Title: ..... WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

RESPONSE TO FINAL OFFICE ACTION OF JANUARY 3, 2014 AND AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 REQUEST

To: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

From: David S. Lee
Customer No. 86636
Brundidge & Stanger, PC
2318 Mill Road, Suite 1020
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Madam:

In response to the Final Office Action dated January 3, 2014, for which the three-month shortened statutory period for response is set to expire on April 3, 2014, the following amendments and remarks are respectfully submitted. Further, an After Final Consideration Pilot Program 2.0 Request and PTO/SB/434 form are submitted herewith. Favorable consideration is respectfully requested.

The Commissioner is hereby authorized to charge any deficiency of fees and credit any overpayments to Deposit Account Number 50-4888.

INTRODUCTORY COMMENTS

The Listing of the Claims section begins on page 3.

Remarks section begins on page 12.

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LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims pending:

- At time of the Action: Claims 1-3, 5-16, 18-28 and 30-32
- After this Reply: Claims 1-3, 5-16, 18-28 and 30-32

Currently Canceled or Withdrawn Claims: None

Currently Amended Claims: Claims 6, 10, 13, 25, and 30

New Claims: None

1. (**Previously Presented**) A method implemented at a first wireless network to handoff a mobile wireless device to a second wireless network, the method comprising:

receiving coverage information associated with the wireless device;

determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information; and

transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

2. (**Previously Presented**) A method according to claim 1, further comprising:

receiving a confirmation from the second wireless network that the handoff request has been accepted by the second wireless network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network.

3. (**Original**) A method according to claim 1, wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

4. (**Canceled**)

5. (**Previously Presented**) A method according to claim 1, wherein the mapping information of one or more locations for which the second wireless network has previously had coverage comprises a map generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the one or more wireless devices.

6. (**Currently Amended**) A method according to claim 1, wherein transmitting the handoff request comprises transmitting a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted~~, or whether the wireless device is a mobile wireless device~~.

7. (**Original**) A method according to claim 1, wherein transmitting the handoff request comprises transmitting a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

8. (**Previously Presented**) A method according to claim 1, wherein transmitting the handoff request comprises transmitting a handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

9. (**Original**) A method according to claim 1, wherein the first wireless network is a different type of wireless network than the second wireless network.

10. (**Currently Amended**) A method implemented at a first wireless network for a mobile wireless device handoff between a second wireless network and the first wireless network, the method comprising:

receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless ~~device~~ network but is capable of being covered by the first wireless network;

based, at least in part, on the handoff request, adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network; and

transmitting a confirmation from the first wireless network to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

11. (**Original**) A method according to claim 10, wherein receiving the handoff request comprises receiving the handoff request via a wireless or a wired communication link that communicatively

couples the first wireless network to the second wireless network.

12. (**Previously Presented**) A method according to claim 10, wherein receiving the handoff request comprises receiving the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

13. (**Currently Amended**) A method according to claim 10, wherein adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load placed on the first wireless network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

14. (**Previously Presented**) An apparatus for a first wireless network to handoff a wireless device to a second wireless network, the apparatus comprising:

a coverage manager having logic, the logic configured to:

receive coverage information associated with the wireless device;

determine whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the coverage information; and

transmit a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more

locations of the wireless device for which the second wireless network has previously had coverage.

15. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to:

receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

16. (**Original**) An apparatus according to claim 14, wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

17. (**Canceled**)

18. (**Previously Presented**) An apparatus according to claim 14, wherein the logic is further configured to generate the mapping information based, at least in part, on information received from wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the wireless devices.

19. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted, or whether the wireless device is a mobile wireless device.

20. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

21. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

22. (**Original**) A system for a wireless device handoff between a first wireless network and a second wireless network, the system comprising:

an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network; and

an adaption manager having logic, the logic configured to:

receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network;

cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network; and

transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

23. (**Original**) A system according to claim 22, wherein to receive the handoff request comprises to receive a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

24. (**Original**) A system according to claim 22, wherein to receive the handoff request comprises to receive a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

25. (**Currently Amended**) A system according to claim 22, wherein to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first wireless network due to the handoff of the wireless device or an impact of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

26. (**Previously Presented**) A computer program product comprising a non-transitory medium having instructions for a first wireless network to handoff a wireless device to a second wireless network, which, when executed by logic, cause the logic to:

receive coverage information associated with the wireless device;

determine whether the wireless device is possibly covered by the second wireless network based, at least in part, on the coverage information; and

transmit a handoff request to the second wireless network based, at least in part, on a determination that the wireless device is possibly covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

27. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

28. (**Original**) A computer program product according to claim 26, wherein coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

29. (**Canceled**)

30. (**Currently Amended**) A computer program product according to claim 26, wherein the mapping information of one or more locations for which the second wireless network has had coverage in the past comprises a map generated based on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network detection of a detectable signal from the second wireless network to the one or more wireless devices.

31. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

32. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

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REMARKS

Reconsideration and allowance in view of the foregoing amendments and the following remarks are respectfully requested.

CLAIM REJECTION UNDER 35 U.S.C. § 102(e)

Claims 1-3, 5-16, 18-28 and 30-32 *are rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Siomina et al., (U.S. Publication No. 2012/0149430; hereafter "Siomina").*

Applicant respectfully traverses rejection, and further requests that the rejection be reconsidered and withdrawn.

Independent Claims 1, 14, and 26

Since **Claims 1, 14, and 26** are rejected under the same rationale, Applicant will discuss **Claim 1** as being representative, but only to the extent that similar features are recited in all three independent claims. Applicant submits that the scope and features of the independent claims are not identical.

Applicant respectfully submits that Siomina fails to teach or suggest all of the elements of independent **Claim 1**, which recites (emphasis added):

> A method implemented at a first wireless network to handoff a mobile wireless device to a second wireless network, the method comprising:
>
> receiving coverage information associated with the wireless device;
>
> **determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information;** and
>
> transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,
>
> **wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.**

In the rejection of **Claim 1**, paragraphs [0047] and [0064]-[0067] of Siomina are cited for its

alleged teaching of "wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage," as recited in **Claim 1.** The rejection states:

> Siomina discloses a method wherein a user device is handed over from one cell to another cell. Siomina further discloses wherein a user device requests positioning assistance data when performing a handover. This data is used to determine if the second network in which the user device is trying to handover to has been previously in the positioning assistance data, if it has been determined that the data was not previously provided, the mobile device determines that the second wireless network did not have previous coverage [0065]. The positioning assistance data is only known/provided for a wireless network, if that network has provided coverage to that user device in the past [0066] and [0067]. Therefore, Siomina does disclose the mapping limitation claimed.

(Office Action, page 2). Applicant respectfully disagrees.

Paragraphs [0065]-[0067] of Siomina state:

> [0065] Step 406. The user equipment 10 may then send, when the second cell 14 is not in the positioning assistance data, a request for the positioning assistance data of the second cell 14 only to the positioning node 17. Hence, at handover (HO), the user equipment 10 actually receives the PCI and earfcn of the new cell in the handover command. So, according to some embodiments, the user equipment 10 may be able to know whether it should request new positioning assistance data or not. When the new serving cell is not in the previous positioning assistance data provided, the user equipment 10 may request new assistance data and the message used may be the normal assistance data request.
>
> [0066] Step 407. The user equipment 10 may check, after the cell change process is performed, that the indication in the received positioning assistance data indicates the second cell 14 as the cell serving the user equipment 10.
>
> [0067] Step 408. The user equipment 10 may send, when the second cell 14 is not indicated in the positioning assistance data as the cell serving the user equipment 10, a serving indication indicating that the second cell 14 is the cell serving the user equipment 10 to the positioning node 17.

Applicant submits that Siomina describes "the user equipment 10," that sends "a serving cell

indication to the positioning node17," thereby "the positioning node 17 is informed about the cause and may conclude how much and which parts of the positioning assistance data need to be updated or whether another positioning method may be selected" (Siomina, [0068]). However, Siomina fails to teach or suggest ***"determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information," and "wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage,"*** as recited in **Claim 1.**

Further, the cited portions of Siomina state "when decision in the network is made e.g. the first and second radio stations 12, 13 decide based on signal strengths difference and available resources, a handover command may be sent to the user equipment 10." (Siomina, [0047]). Although Siomina describes making a decision to send the handover command by "the first and second radio stations 12, 13" (Siomina, [0047]), Siomina fails to teach or suggest ***"a method implemented at a first wireless network***... *comprising* (in part)*:*

> determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information,

as recited in **Claim 1.**

For at least the same reasons that **Claim 1** is patentable over the cited references, it is respectfully submitted that **Claims 14 and 26** are also patentable, to the extent that **Claims 14 and 26** recite similar features as **Claim 1.** Applicant, therefore respectfully requests that the corresponding rejections under 35 U.S.C. §102(e) be reconsidered and withdrawn.

Independent Claims 10 and 22

Applicant respectfully submits that Siomina fails to teach or suggest all of the elements of independent **Claim 10 and 22**, which recites (emphasis added):

[Claim 10] A method implemented at a first wireless network for a mobile wireless device handoff between a second wireless network and the first wireless network, the method comprising:

receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network;

based, at least in part, on the handoff request, adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network; and

transmitting a confirmation from the first wireless network to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

[Claim 22] A system for a wireless device handoff between a first wireless network and a second wireless network, the system comprising:

an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network; and

an adaption manager having logic, the logic configured to:

receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network;

cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network; and

transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

Applicant submits that as discussed above in the rejection of Claim 1, paragraph [0047] of Siomina describes making a decision to send the handover command by "the first and second radio stations 12, 13" (Siomina, [0047]). However, Siomina fails to teach or suggest ***"receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network,"*** as recited in **Claim 10,** and ***"receive a handoff request from the second wireless network, the handoff request based, at***

least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network," as recited in **Claim 22.**

For at least reasons above, **Claim 14 and 26** are patentable over the cited references, and Applicant, therefore respectfully requests that the corresponding rejections under 35 U.S.C. §102(e) be reconsidered and withdrawn.

Claims 2, 3, 5 – 9, 11 – 13, 15, 16, 18 – 21, 23 – 25, 27, 28 and 30 – 32

Claims 2, 3, 5 – 9, 11 – 13, 15, 16, 18 – 21, 23 – 25, 27, 28 and 30 – 32 variously depend, directly or indirectly, from independent **Claims 1, 10, 14, 22, and 26**. Therefore, Applicant submits that Claims **2, 3, 5 – 9, 11 – 13, 15, 16, 18 – 21, 23 – 25, 27, 28 and 30 – 32** are patentable over the reference at least by virtue of their dependency, as well as the other features recited therein. Applicant, therefore respectfully requests the reconsideration and withdrawal of rejection under 35 U.S.C. §102(e).

CONCLUSION

The remaining references of record have been studied. It is respectfully submitted that they do not compensate for the deficiencies of the references utilized in rejecting the pending claims.

It should also be noted that although arguments have been presented with respect to certain claims herein, the recited subject matter as well as various other subject matter and/or combinations of subject matter may be patentable for other reasons. Further, the failure to address any statement by the Examiner herein should not be interpreted as acquiescence or agreement with such statement. Applicants expressly reserve the right to set forth additional and/or alternative reasons for patentability and/or allowance with the present Application or in any other future proceeding, and to rebut any statement presented by the Examiner in this or other papers during prosecution of the present Application.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance, and therefore early and forthright issuance of a Notice to that effect is earnestly solicited.

Respectfully submitted,

Brundidge & Stanger, PC

Dated: February 14, 2014

/David S. Lee/
David S. Lee
Reg. No. 38,222

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Electronic Acknowledgement Receipt

EFS ID:	18206049
Application Number:	13263835
International Application Number:	
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Customer Number:	86636
Filer:	David S. Lee/Nora Colston
Filer Authorized By:	David S. Lee
Attorney Docket Number:	2796.737BS
Receipt Date:	14-FEB-2014
Filing Date:	10-OCT-2011
Time Stamp:	14:15:41
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	After Final Consideration Program Request	2796_20140214_AFCPPR.pdf	226378 5d1d0148ffcbbf0cd50adb8c181bd265cc927a06	no	2

Warnings:	
Information:	

2	Response After Final Action	2796_20140214_Response.pdf	598576 8521a4c445046ee9f684d396a99671c5bc1e3a48	no	17

Warnings:	
Information:	
Total Files Size (in bytes):	824954

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.

PTO/SB/06 (09-11)
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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 13/263,835	Filing Date 10/10/2011	☐ 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	02/14/2014	(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))	* 29	Minus	** 32	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 5	Minus	***5	= 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
/KIMBERLY PANNELL/

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

86636 7590 03/18/2014
BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER
BEAMER, TEMICA M

ART UNIT	PAPER NUMBER
2646	

DATE MAILED: 03/18/2014

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

TITLE OF INVENTION: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	06/18/2014

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)

86636 7590 03/18/2014
BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

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.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

TITLE OF INVENTION: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	06/18/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
BEAMER, TEMICA M	2646	455-436000

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 credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29
  NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ 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: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Samsung Ex. 1002, Page 201 of 615

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

86636 7590 03/18/2014

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER	
BEAMER, TEMICA M	

ART UNIT	PAPER NUMBER
2646	

DATE MAILED: 03/18/2014

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

The Patent Term Adjustment to date is 191 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 191 day(s).

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

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

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

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/263,835	Applicant(s) KRUGLICK, EZEKIEL	
	Examiner TEMICA M. BEAMER	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 *amendment filed 2/14/2014*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-3, 5-16, 18-28 and 30-32 (renumbered as claims 1-29)*. 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 _____.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

OK TO ENTER: /T.B./

03/16/2014

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 13/263,835
Filing Date ..... October 10, 2011
Confirmation No. 1463
Inventorship ..... Ezekiel Kruglick
Group Art Unit 2646
Examiner ..... Temica M. Beamer
Attorney Docket No. 2796.737BS
Title: ..... WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

RESPONSE TO FINAL OFFICE ACTION OF JANUARY 3, 2014 AND AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 REQUEST

To: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

From: David S. Lee
Customer No. 86636
Brundidge & Stanger, PC
2318 Mill Road, Suite 1020
Alexandria, VA 22314

Madam:

In response to the Final Office Action dated January 3, 2014, for which the three-month shortened statutory period for response is set to expire on April 3, 2014, the following amendments and remarks are respectfully submitted. Further, an After Final Consideration Pilot Program 2.0 Request and PTO/SB/434 form are submitted herewith. Favorable consideration is respectfully requested.

The Commissioner is hereby authorized to charge any deficiency of fees and credit any overpayments to Deposit Account Number 50-4888.

INTRODUCTORY COMMENTS

The Listing of the Claims section begins on page 3.

Remarks section begins on page 12.

Samsung Ex. 1002, Page 206 of 615

WEST Search History for Application 13263835

Creation Date: 2014031623:39

Interference Searches

Query	DB	Op.	Plur.	Thes.	Date
(coverage and information and (handoff or handover) and mapping and previous $ 2 and confirmation).clm.	PGPB	OR	YES		03-16-2014

Prior Art Searches

Query	DB	Op.	Plur.	Thes.	Date
455/$.ccls. or 370/$.ccls.	PGPB, USPT	OR	YES		03-16-2014
(handoff or handover) same coverage same available near5 resources	PGPB, USPT	OR	YES		03-16-2014
((handoff or handover) same coverage same available near5 resources) and (handoff or handover) near5 request$3	PGPB, USPT	OR	YES		03-16-2014
(20020187780 20080273506).pn.	PGPB, USPT	OR	YES		03-16-2014
((handoff or handover) same coverage same available near5 resources and (handoff or handover) near5 request$3) and (confirmation or ack$12) same (handoff or handover)	PGPB, USPT	OR	YES		03-16-2014
(availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover)	PGPB, USPT	OR	YES		03-16-2014
((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover)) and (455/$.ccls. or 370/$.ccls.)	PGPB, USPT	OR	YES		03-16-2014
((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover) and 455/$.ccls. or 370/$.ccls.) and coverage near10 map$4	PGPB, USPT	OR	YES		03-16-2014
((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover) and 455/$.ccls. or 370/$.ccls. and coverage near10 map$4) and (previous or prior) near12 (location or position or area or coverage)	PGPB, USPT	OR	YES		03-16-2014
		OR	YES		03-16-2014

((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover)) and predict$3 same (handoff or handover) same history	PGPB, USPT				

Samsung Ex. 1002, Page 208 of 615

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	**Art Unit**
	TEMICA M BEAMER	2646

CPC

Symbol				Type	Version
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CPC Combination Sets

Symbol				Type	Set	Ranking	Version
			/				
			/				

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 29	
/TEMICA M BEAMER/ Primary Examiner.Art Unit 2646 (Primary Examiner)	3/16/2014 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 4

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	**Art Unit**
	TEMICA M BEAMER	2646

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
455	436	H	0	4	M	30 / 00						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											
455	440	442	67.11	226.2								

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	29	
/TEMICA M BEAMER/ Primary Examiner.Art Unit 2646	3/16/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	**Art Unit**
	TEMICA M BEAMER	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
1	1	-	17												
2	2	16	18												
3	3	17	19												
-	4	18	20												
4	5	19	21												
5	6	20	22												
6	7	21	23												
7	8	22	24												
8	9	23	25												
9	10	24	26												
10	11	25	27												
11	12	26	28												
12	13	-	29												
13	14	27	30												
14	15	28	31												
15	16	29	32												

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	29	
/TEMICA M BEAMER/ Primary Examiner.Art Unit 2646	3/16/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	Art Unit
	TEMICA M BEAMER	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	06/17/2013	12/30/2013	03/16/2014						
1	1	✓	✓	=						
2	2	✓	✓	=						
3	3	✓	✓	=						
-	4	✓	-	-						
4	5	✓	✓	=						
5	6	✓	✓	=						
6	7	✓	✓	=						
7	8	✓	✓	=						
8	9	✓	✓	=						
9	10	✓	✓	=						
10	11	✓	✓	=						
11	12	✓	✓	=						
12	13	✓	✓	=						
13	14	✓	✓	=						
14	15	✓	✓	=						
15	16	✓	✓	=						
-	17	✓	-	-						
16	18	✓	✓	=						
17	19	✓	✓	=						
18	20	✓	✓	=						
19	21	✓	✓	=						
20	22	✓	✓	=						
21	23	✓	✓	=						
22	24	✓	✓	=						
23	25	✓	✓	=						
24	26	✓	✓	=						
25	27	✓	✓	=						
26	28	✓	✓	=						
-	29	✓	-	-						
27	30	✓	✓	=						
28	31	✓	✓	=						
29	32	✓	✓	=						

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	Art Unit
	TEMICA M BEAMER	2646

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
455	436-443, 67.11, 226.2	6/17/2013	TMB
	updated search	12/30/2013	TMB
	updated search	3/16/2014	TMB

SEARCH NOTES		
Search Notes	Date	Examiner
WEST	6/17/2013	TMB
WEST	3/16/2014	TMB

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
455	436, 440, 442, 67.11, 226.2	3/16/2014	TMB
	PGPUB search	3/16/2014	TMB

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)

86636 7590 03/18/2014
BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

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.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

TITLE OF INVENTION: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	06/18/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
BEAMER, TEMICA M	2646	455-436000

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 Brundidge & Stanger, P.C.
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: Empire Technology Development LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Wilmington, Delaware

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 credits any overpayment, to Deposit Account Number 50-4888 (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 forms 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: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /David S. Lee/ Date June 6, 2014

Typed or printed name David S. Lee Registration No. 38,222

Samsung Ex. 1002, Page 214 of 615

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 13/263,835
Filing Date ..... October 10, 2011
Confirmation No. 1463
Inventorship ..... Ezekiel Kruglick
Group Art Unit 2646
Examiner ..... Temica M. Beamer
Attorney Docket No. 2796.737BS
Title: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

AMENDMENT UNDER 37 C.F.R. § 1.312

To: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

From: David S. Lee
Customer No. 86636
Brundidge & Stanger, PC
2318 Mill Road, Suite 1020
Alexandria, VA 22314

Madam:

Subsequent to the Notice of Allowance dated March 18, 2014, in connection with the above-identified application, the following amendments and remarks are respectfully submitted. An explanation regarding the propriety of the Amendment is included within the Remarks section. Favorable consideration is respectfully requested.

Fees will be paid by credit card through the EFS Web; however the Commissioner is hereby authorized to charge any deficiency of fees and credit any overpayments to Deposit Account Number 50-4888.

INTRODUCTORY COMMENTS

Amendment to the Drawings begins on page 3.

The Claims section begins on page 4.

Remarks section begins on page 13.

Samsung Ex. 1002, Page 216 of 615

AMENDMENT TO THE DRAWINGS

Please substitute the drawings as originally filed with the attached replacement sheet of drawings. The replacement sheet of drawings does not introduce any new matter.

In the replacement sheet of drawings, Figure 7 is amended as follows:

- In Figure 7, processor (710) includes "μP/μC/DSP"

Attached: Replacement Sheet of Drawings

Samsung Ex. 1002, Page 217 of 615

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims pending:

- At time of the Action: Claims 1-3, 5-16, 18-28 and 30-32
- After this Reply: Claims 1-3, 5-16, 18-28 and 30-32

Currently Canceled or Withdrawn Claims: None

Currently Amended Claims: Claims 3, 6-8, 11-13, 16, 23, 24, and 28

New Claims: None

1. (**Previously Presented**) A method implemented at a first wireless network to handoff a mobile wireless device to a second wireless network, the method comprising:

receiving coverage information associated with the wireless device;

determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information; and

transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

2. (**Previously Presented**) A method according to claim 1, further comprising:

receiving a confirmation from the second wireless network that the handoff request has been accepted by the second wireless network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network.

3. (**Currently Amended**) A method according to claim 1, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

4. (**Canceled**)

5. (**Previously Presented**) A method according to claim 1, wherein the mapping information of one or more locations for which the second wireless network has previously had coverage comprises a map generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the one or more wireless devices.

6. (**Currently Amended**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting ~~a~~ the handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted.

7. (**Currently Amended**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting ~~a~~ the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

8. (**Currently Amended**) A method according to claim 1, wherein the transmitting the handoff

request comprises transmitting ~~a~~ the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

9. (**Original**) A method according to claim 1, wherein the first wireless network is a different type of wireless network than the second wireless network.

10. (**Previously Presented**) A method implemented at a first wireless network for a mobile wireless device handoff between a second wireless network and the first wireless network, the method comprising:

receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network;

based, at least in part, on the handoff request, adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network; and

transmitting a confirmation from the first wireless network to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

11. (**Currently Amended**) A method according to claim 10, wherein the receiving the handoff request comprises receiving the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

12. (**Currently Amended**) A method according to claim 10, wherein the receiving the handoff request comprises receiving the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

13. (**Currently Amended**) A method according to claim 10, wherein the adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load placed on the first wireless network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

14. (**Previously Presented**) An apparatus for a first wireless network to handoff a wireless device to a second wireless network, the apparatus comprising:

a coverage manager having logic, the logic configured to:

receive coverage information associated with the wireless device;

determine whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the coverage information; and

transmit a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

15. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to:

receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

16. (**Currently Amended**) An apparatus according to claim 14, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

17. (**Canceled**)

18. (**Previously Presented**) An apparatus according to claim 14, wherein the logic is further configured to generate the mapping information based, at least in part, on information received from wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the wireless devices.

19. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted, or whether the wireless device is a mobile wireless device.

20. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to

transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

21. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

22. (**Original**) A system for a wireless device handoff between a first wireless network and a second wireless network, the system comprising:

an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network; and

an adaption manager having logic, the logic configured to:

receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network;

cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network; and

transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

23. (**Currently Amended**) A system according to claim 22, wherein to receive the handoff request comprises to receive ~~a~~ the handoff request via a wireless or a wired communication link that

communicatively couples the first wireless network to the second wireless network.

24. (**Currently Amended**) A system according to claim 22, wherein to receive the handoff request comprises to receive ~~a~~ the handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

25. (**Previously Presented**) A system according to claim 22, wherein to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first wireless network due to the handoff of the wireless device or an impact of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

26. (**Previously Presented**) A computer program product comprising a non-transitory medium having instructions for a first wireless network to handoff a wireless device to a second wireless network, which, when executed by logic, cause the logic to:

receive coverage information associated with the wireless device;

determine whether the wireless device is possibly covered by the second wireless network based, at least in part, on the coverage information; and

transmit a handoff request to the second wireless network based, at least in part, on a determination that the wireless device is possibly covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

27. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

28. (**Currently Amended**) A computer program product according to claim 26, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

29. (**Canceled**)

30. (**Previously Presented**) A computer program product according to claim 26, wherein the mapping information of one or more locations for which the second wireless network has had coverage in the past comprises a map generated based on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network detection of a detectable signal from the second wireless network to the one or more wireless devices.

31. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

32. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via another wireless device that is

configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

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REMARKS

Claims 1-3, 5-16, 18-28 and 30-32 are currently allowed. **Claims 3, 6-8, 11-13, 16, 23, 24, and 28** and the **Drawings** are currently editorially amended to correct for minor typographical errors or to provide proper antecedent basis for the recited features. The scope of the amended claims has not changed and no additional search or examination is required. No new matter is added. Therefore, entry and favorable consideration of **Claims 1-3, 5-16, 18-28 and 30-32** and the **Drawings** are respectfully requested.

Respectfully Submitted,

BRUNDIDGE & STANGER, PC

Dated: June 6, 2014

By: /David S. Lee/
David S. Lee
Reg. No. 38,222

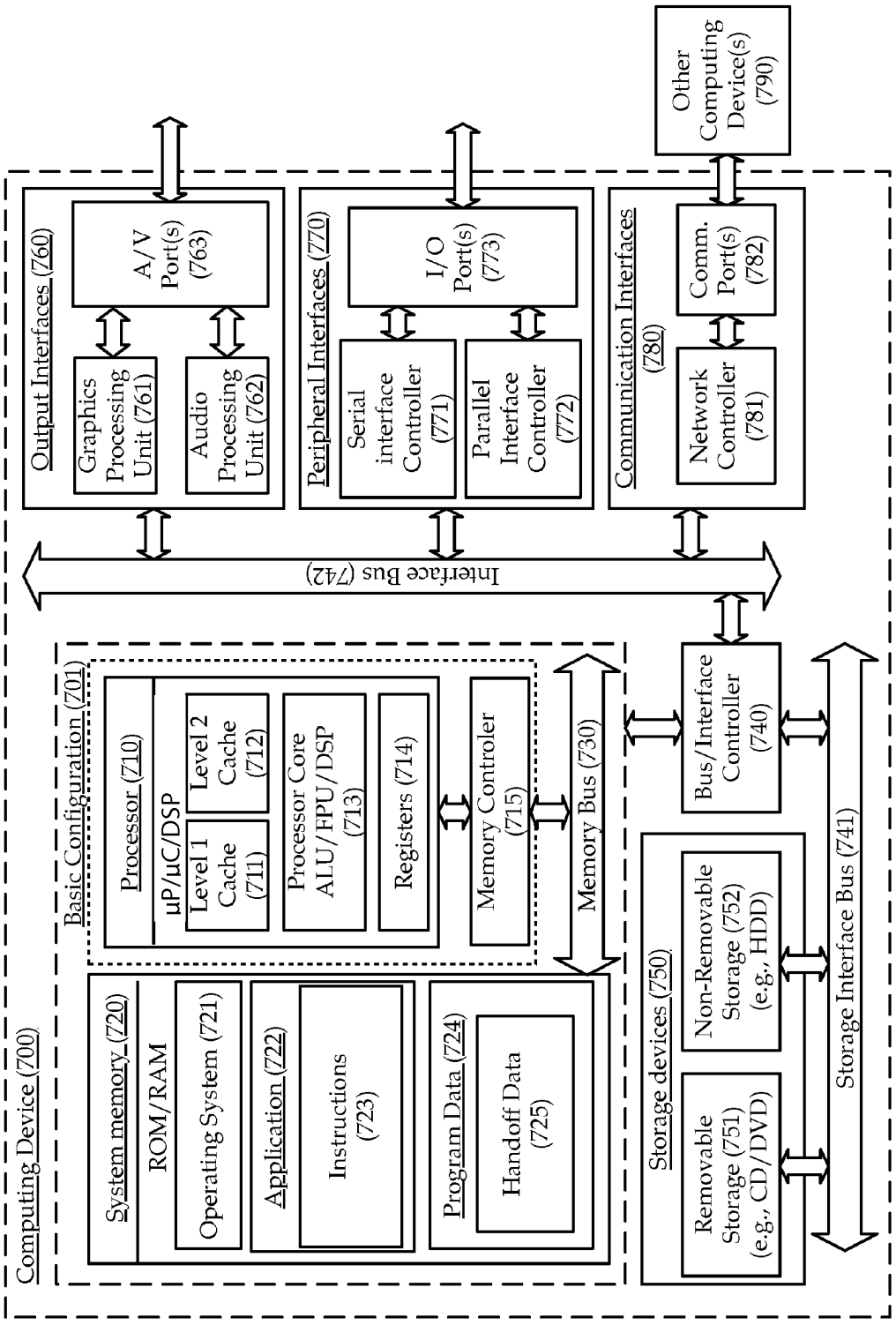

Computing Device (700)
Basic Configuration (701)
Processor (710)
μP/μC/DSP
Level 1 Cache (711)
Level 2 Cache (712)
Processor Core ALU/FPU/DSP (713)
Registers (714)
Memory Controler (715)
Memory Bus (730)
System memory (720)
ROM/RAM
Operating System (721)
Application (722)
Instructions (723)
Program Data (724)
Handoff Data (725)
Storage devices (750)
Removable Storage (751) (e.g., CD/DVD)
Non-Removable Storage (752) (e.g., HDD)
Storage Interface Bus (741)
Bus/Interface Controller (740)
Interface Bus (742)
Output Interfaces (760)
Graphics Processing Unit (761)
Audio Processing Unit (762)
A/V Port(s) (763)
Peripheral Interfaces (770)
Serial interface Controller (771)
Parallel Interface Controller (772)
I/O Port(s) (773)
Communication Interfaces (780)
Network Controller (781)
Comm. Port(s) (782)
Other Computing Device(s) (790)

FIG. 7

Electronic Patent Application Fee Transmittal

Application Number:	13263835
Filing Date:	10-Oct-2011
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Filer:	David S. Lee/Brittany Sears
Attorney Docket Number:	2796.737BS

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:	19232321
Application Number:	13263835
International Application Number:	
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Customer Number:	86636
Filer:	David S. Lee/Brittany Sears
Filer Authorized By:	David S. Lee
Attorney Docket Number:	2796.737BS
Receipt Date:	06-JUN-2014
Filing Date:	10-OCT-2011
Time Stamp:	13:21:42
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$960
RAM confirmation Number	12688
Deposit Account	504888
Authorized User	BRUNDIDGE, CARL I.

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

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

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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)	2796_20140606_IF-Transmittal.pdf	1084624 4cab77ddfb279b65483ee2cc2a5c22568359239e	no	1
Warnings:					
Information:					
2	Amendment after Notice of Allowance (Rule 312)	2796_20140606_312.pdf	86879 d6e2fcf17e03d774e1fe771085709892d995bfe8	no	13
Warnings:					
Information:					
3	Drawings-only black and white line drawings	2796_20140606_Replacement.pdf	1053411 c95f2381bc9619a2536664debd5c82d9f0597757	no	1
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30298 4aaedb938df1f939e580b699e7452133b73a7681	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	2255212		

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

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

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

OK TO ENTER: /T.B./

06/14/2014

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No..... 13/263,835
Filing Date ..... October 10, 2011
Confirmation No. 1463
Inventorship ..... Ezekiel Kruglick
Group Art Unit..... 2646
Examiner .....Temica M. Beamer
Attorney Docket No. 2796.737BS
Title: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

AMENDMENT UNDER 37 C.F.R. § 1.312

To: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

From: David S. Lee
Customer No. 86636
Brundidge & Stanger, PC
2318 Mill Road, Suite 1020
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

86636 7590 06/18/2014

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER	
BEAMER, TEMICA M	
ART UNIT	PAPER NUMBER
2646	
MAIL DATE	DELIVERY MODE
06/18/2014	PAPER

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P.O. Box 1450
Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/263,835	10 October, 2011	KRUGLICK, EZEKIEL	2796.737BS

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER	
TEMICA M. BEAMER	
ART UNIT	PAPER
2646	20140614

DATE MAILED:

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

Commissioner for Patents

The 312 amendment filed 6/6/2014 has been reviewed and accepted.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

PTO-90C (Rev.04-03)

Response to Rule 312 Communication	Application No.	Applicant(s)
	13/263,835	KRUGLICK, EZEKIEL
	Examiner	Art Unit
	TEMICA M. BEAMER	2646

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

1. ☒ The amendment filed on *06 June 2014* under 37 CFR 1.312 has been considered, and has been:

a) ☒ entered.

b) ☐ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

86636 7590 08/21/2014

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER	
BEAMER, TEMICA M	
ART UNIT	PAPER NUMBER
2646	
MAIL DATE	DELIVERY MODE
08/21/2014	PAPER

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

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

Examiner-Initiated Interview Summary	Application No.	Applicant(s)	
	13/263,835	KRUGLICK, EZEKIEL	
	Examiner	Art Unit	
	TEMICA M. BEAMER	2646	

All participants (applicant, applicant's representative, PTO personnel):

(1) *Temica M. Beamer*. (3)_____.

(2) *Misung Lee*. (4)_____.

Date of Interview: *08 August 2014*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *All*.

Identification of prior art discussed: *Souissi, U.S. Patent Pub. No. 2002/0187780*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

The present application was previously allowed. However, the examiner informed the applicant that the Souissi reference was reviewed again and reads on the present claims. Possible amendments were discussed, however, the applicant wants a rejection on record using the Souissi reference. Prosecution will be reopened and an office action is forthcoming .

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/TEMICA M. BEAMER/ Primary Examiner, Art Unit 2646	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	**Art Unit**
	TEMICA M BEAMER	2646

CPC						
Symbol					**Type**	**Version**
H04W		36	/	32	F	2013-01-01
H04W		16	/	28	A	2013-01-01
H04W		36	/	0055	A	2013-01-01
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			/			

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

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	29	
/TEMICA M BEAMER/ Primary Examiner.Art Unit 2646	3/16/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	**Art Unit**
	TEMICA M BEAMER	2646

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
455	436	H	0	4	W	36 / 00 (2009.01.01)						

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
455	440	442	67.11	226.2	

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	29	
/TEMICA M BEAMER/ Primary Examiner.Art Unit 2646	3/16/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	**Art Unit**
	TEMICA M BEAMER	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
1	1	-	17												
2	2	16	18												
3	3	17	19												
-	4	18	20												
4	5	19	21												
5	6	20	22												
6	7	21	23												
7	8	22	24												
8	9	23	25												
9	10	24	26												
10	11	25	27												
11	12	26	28												
12	13	-	29												
13	14	27	30												
14	15	28	31												
15	16	29	32												

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	29	
/TEMICA M BEAMER/ Primary Examiner.Art Unit 2646	3/16/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

86636 7590 09/05/2014

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER	
BEAMER, TEMICA M	

ART UNIT	PAPER NUMBER
2646	

MAIL DATE	DELIVERY MODE
09/05/2014	PAPER

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

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

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BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA VA 22314

In re Application of	:	
Kruglick, Ezekiel	:	NOTICE OF WITHDRAWAL
Application No. 13/263835	:	FROM ISSUE
Filed: October 10, 2011	:	UNDER 37 CFR 1.313
Attorney Docket No. 2796.737BS		

The above-identified application is withdrawn from issue after payment of the issue due to unpatentability of one or more claims. See 37 CFR 1.313(b) (3).

The above identified application is hereby withdrawn from issue.

The issue fee is refundable upon written request. If, however, the application is again found allowable, the issue fee can be applied toward payment of the issue fee in the amount identified on the new Notice of Allowance and Issue Fee Due upon written request. This request and any balance due must be received on or before the due date noted in the new Notice of Allowance in order to prevent abandonment of the application.

Telephone inquiries should be directed to SPE Les Kincaid at (571) 272-7922.

The above-identified application is being forwarded to the examiner for prompt appropriate action, including notifying applicant of the new status of this application.

David Wiley, Director
Technology Center 2600

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

86636 7590 09/16/2014

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER	
BEAMER, TEMICA M	
ART UNIT	PAPER NUMBER
2646	
MAIL DATE	DELIVERY MODE
09/16/2014	PAPER

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

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

Office Action Summary	Application No. 13/263,835	Applicant(s) KRUGLICK, EZEKIEL	
	Examiner TEMICA M. BEAMER	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 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☒ Responsive to communication(s) filed on *6/18/2014*.

☐ 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) *1-3,5-16,18-28 and 30-32* is/are pending in the application.

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

6)☒ Claim(s) *10-13 and 22-25* is/are allowed.

7)☒ Claim(s) *1-3,5-9,14-16,18-21,26-28 and 30-32* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

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

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp 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 _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

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

4) ☐ Other: _____.

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

DETAILED ACTION

Allowable Subject Matter

2. Applicant is advised that the Notice of Allowance mailed is vacated. If the issue fee has already been paid, applicant may request a refund or request that the fee be credited to a deposit account. However, applicant may wait until the application is either found allowable or held abandoned. If allowed, upon receipt of a new Notice of Allowance, applicant may request that the previously submitted issue fee be applied. If abandoned, applicant may request refund or credit to a specified Deposit Account.

3. The indicated allowability of claims 1-3, 5-9, 14-16, 18-21, 26-28 and 30-32 is withdrawn in view of the newly discovered reference(s) to Souissi, U.S. Patent Pub. No. 2002/0187780, Agashe et al. (Agashe), U.S. Patent Pub. No. 2010/0093354 and Zhang et al. (Zhang), U.S. Patent Pub. No. 2014/0169267. Rejections based on the newly cited reference(s) follow.

4. Claims 10-13 and 22-25 are allowed.

Claim Rejections - 35 USC § 102

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

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

6. Claims 1, 3, 5-7, 9, 14, 16, 18-20, 26, 28 and 30-32 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Souissi.

Regarding claims 1, 14 and 26, Souissi discloses a method implemented at a first wireless network to handoff a mobile wireless device to a second wireless network, the method comprising: receiving coverage information associated with the wireless device (steps 802-803; figure 8); determining whether the wireless device is capable of being covered by the second wireless network (preferred network) based, at least in part, on the received coverage information (step 803; figure 8); and transmitting a handoff request (inherent to handoff) to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network, wherein the coverage information includes mapping information (roaming table) of one or more locations of the wireless device for which the second wireless network has previously had coverage (0089-0091).

Regarding claims 3, 16 and 28, Souissi discloses a method wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network (0082, 0085, 0090, 0091).

Regarding claims 5, 18 and 30, Souissi discloses a method according to claim 1, wherein the mapping information of one or more locations for which the second wireless network has previously had coverage comprises a map generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the one or more wireless devices (0070-0078; figure 8).

Regarding claims 6, 19 and 31, Souissi discloses a method wherein the transmitting the handoff request comprises transmitting-a the handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted (0054, 0055, 0083-0086).

Regarding claims 7, 20 and 32, Souissi discloses a method wherein the transmitting the handoff request comprises transmitting the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network (0024, 0056-0060; figures 3-5).

Regarding claim 9, Souissi discloses a method according to claim 1, wherein the first wireless network is a different type of wireless network than the second wireless network (figure 3).

Claim Rejections - 35 USC § 103

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

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

8. Claims 2, 25 and 27 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Souissi in view of Agashe.

Regarding claims 2, 15 and 27, Souissi discloses a method according to claims 1, 14 and 26 as described above. Souissi, however, fails to specifically disclose receiving a confirmation from the second wireless network that the handoff request has been accepted by the second wireless network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network.

In a similar field of endeavor, Agashe discloses a system and method to utilize pre-assigned resources to support handoff of a mobile station from a macro base station to a femto base station. Agashe further discloses receiving a confirmation from a second wireless network that a handoff request has been accepted by the second wireless network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network (0065-0067).

At the time of invention, it would have been obvious to a person of ordinary skill in the art, to modify Souissi with the teachings of Agashe for the purpose of ensuring that the wireless device can communicate in the system.

9. Claims 8 and 21 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Souissi in view of Zhang.

Regarding claims 8 and 21, Souissi discloses a method according to claims 1 and 14 as described above. Souissi, however, fails to disclose, wherein the transmitting the handoff request comprises transmitting the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

In a similar field of endeavor, Zhang discloses a distributed ARQ for a wireless communication. Zhang further discloses mobile relay stations that communicate messages between base stations and mobile stations (0024).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to modify Souissi with the teachings of Zhang for the purpose of increasing system coverage.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TEMICA M. BEAMER whose telephone number is (571)272-7797. The examiner can normally be reached on Monday-Thursday (alternate Fridays) 9:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lester Kincaid can be reached on (571) 272-7922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

Notice of References Cited	Application/Control No. 13/263,835	Applicant(s)/Patent Under Reexamination KRUGLICK, EZEKIEL	
	Examiner TEMICA M. BEAMER	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-2010/0093354	04-2010	Agashe et al.	455/436
*	B	US-2014/0169267	06-2014	Zhang et al.	370/315
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	Art Unit
	TEMICA M BEAMER	2646

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
455	436-443, 67.11, 226.2	6/17/2013	TMB
	updated search	12/30/2013	TMB
	updated search	3/16/2014	TMB
	updated search	9/11/2014	TMB

SEARCH NOTES		
Search Notes	Date	Examiner
WEST	6/17/2013	TMB
WEST	3/16/2014	TMB
WEST	9/11/2014	TMB

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
455	436, 440, 442, 67.11, 226.2	3/16/2014	TMB
	PGPUB search	3/16/2014	TMB

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	**Art Unit**
	TEMICA M BEAMER	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	06/17/2013	12/30/2013	03/16/2014	09/12/2014					
1	1	✓	✓	=	✓					
2	2	✓	✓	=	✓					
3	3	✓	✓	=	✓					
-	4	✓	-	-	-					
4	5	✓	✓	=	✓					
5	6	✓	✓	=	✓					
6	7	✓	✓	=	✓					
7	8	✓	✓	=	✓					
8	9	✓	✓	=	✓					
9	10	✓	✓	=	=					
10	11	✓	✓	=	=					
11	12	✓	✓	=	=					
12	13	✓	✓	=	=					
13	14	✓	✓	=	✓					
14	15	✓	✓	=	✓					
15	16	✓	✓	=	✓					
-	17	✓	-	-	✓					
16	18	✓	✓	=	✓					
17	19	✓	✓	=	-					
18	20	✓	✓	=	✓					
19	21	✓	✓	=	✓					
20	22	✓	✓	=	=					
21	23	✓	✓	=	=					
22	24	✓	✓	=	=					
23	25	✓	✓	=	=					
24	26	✓	✓	=	✓					
25	27	✓	✓	=	✓					
26	28	✓	✓	=	✓					
-	29	✓	-	-	-					
27	30	✓	✓	=	✓					
28	31	✓	✓	=	✓					
29	32	✓	✓	=	✓					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 13/263,835
Filing Date ..... October 10, 2011
Confirmation No. 1463
Inventorship ..... Ezekiel Kruglick
Group Art Unit 2646
Examiner ..... BEAMER, TEMICA M
Attorney Docket No. 2796.737BS
Title: ..... WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

RESPONSE TO NON-FINAL OFFICE ACTION OF SEPTEMBER 16. 2014 AND STATEMENT OF SUBSTANCE OF INTERVIEWS OF AUGUST 8, 2014 AND DECEMBER 11, 2014

To: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

From: David S. Lee
Customer No. 86636
Brundidge & Stanger, PC
2318 Mill Road, Suite 1020
Alexandria, VA 22314

Madam:

In response to the Non-Final Office Action dated September 16, 2014, for which the three-month shortened statutory period for response is set to expire on December 16, 2014, and subsequent to the Examiner Interviews conducted on August 8, 2014 and December 11, 2014, the following amendments and remarks are respectfully submitted. Applicant also submits a Statement of Substance of Interview under 37 C.F.R. § 1.133(b). Favorable consideration is respectfully requested.

The Commissioner is hereby authorized to charge any deficiency of fees and credit any overpayments to Deposit Account Number 50-4888.

INTRODUCTORY COMMENTS

Statement of Substance of Interview begins on page 3.

The Listing of the Claims section begins on page 4.

Remarks section begins on page 13.

STATEMENT OF SUBSTANCE OF INTERVIEW OF AUGUST 8, 2014 AND DECEMBER 11, 2014

(A) Exhibit shown: None.

(B) Identification of the claims discussed: Claims 1, 14, and 26

(C) Identification of cited references discussed: Souissi (U.S. Publication No. 2002/0187780; hereafter "Souissi").

(D) Identification of the proposed amendments discussed: Claims 1, 14, and 26

(E) Identification of arguments discussed: See below

(F) Other matters discussed: See below

(G) Outcome of the interview: 1) After receiving Notice of Allowance of March 18, 2014, Examiner initiated the interview on August 8, 2014, to inform Applicant that the allowance would be withdrawn. In particular, the Examiner informed Applicant's representative of a possible rejection over Souissi (which was not cited in the previous Office Action). Examiner and Applicant's Representative discussed distinguishable features of pending claims over Souissi and possible claim amendments. No agreement was reached. Applicant's Representative requested an Office Action to reopen the prosecution.

2) After receiving the Office Action, Applicant initiated the interview on December 11, 2014. Examiner and Applicant's Representative discussed the proposed amendments and Examiner indicated that the proposed amendments appear to overcome Souissi, pending further search and consideration.

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LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims pending:

- At time of the Action: Claims 1-3, 5-16, 18-28 and 30-32
- After this Reply: Claims 1-3, 5-16, 18-28 and 30-32

Currently Canceled or Withdrawn Claims: None

Currently Amended Claims: Claims 1, 14, 22 and 26

New Claims: None

1. (**Currently Amended**) A method implemented at a first wireless network to handoff a mobile wireless device to a second wireless network, the method comprising:

receiving coverage information associated with the wireless device;

determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information, wherein the determining includes determining that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network; and

transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

2. (**Previously Presented**) A method according to claim 1, further comprising:

receiving a confirmation from the second wireless network that the handoff request has been accepted by the second wireless network, wherein based, at least in part, on the received

confirmation, the wireless device is handed off to the second wireless network.

3. (**Original**) A method according to claim 1, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

4. (**Canceled**)

5. (**Previously Presented**) A method according to claim 1, wherein the mapping information of one or more locations for which the second wireless network has previously had coverage comprises a map generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the one or more wireless devices.

6. (**Previously Presented**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting the handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted.

7. (**Previously Presented**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

8. (**Previously Presented**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

9. (**Original**) A method according to claim 1, wherein the first wireless network is a different type of wireless network than the second wireless network.

10. (**Previously Presented**) A method implemented at a first wireless network for a mobile wireless device handoff between a second wireless network and the first wireless network, the method comprising:

receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network;

based, at least in part, on the handoff request, adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network; and

transmitting a confirmation from the first wireless network to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

11. (**Previously Presented**) A method according to claim 10, wherein the receiving the handoff request comprises receiving the handoff request via a wireless or a wired communication link that

communicatively couples the first wireless network to the second wireless network.

12. (**Previously Presented**) A method according to claim 10, wherein the receiving the handoff request comprises receiving the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

13. (**Previously Presented**) A method according to claim 10, wherein the adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load placed on the first wireless network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

14. (**Currently Amended**) An apparatus for a first wireless network to handoff a wireless device to a second wireless network, the apparatus comprising:

a coverage manager having logic, the logic configured to:

receive coverage information associated with the wireless device;

determine whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the coverage information, wherein the logic is further configured to determine that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network; and

transmit a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

15. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to:

receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

16. (**Original**) An apparatus according to claim 14, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

17. (**Canceled**)

18. (**Previously Presented**) An apparatus according to claim 14, wherein the logic is further configured to generate the mapping information based, at least in part, on information received from wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the wireless devices.

19. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted, or whether the wireless device is a mobile wireless device.

20. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

21. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

22. (**Currently Amended**) A system for a wireless device handoff between a first wireless network and a second wireless network, the system comprising:

an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network; and

an adaption manager having logic, the logic configured to:

receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network[[;]]

cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network[[;]] and

transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

23. (**Previously Presented**) A system according to claim 22, wherein to receive the handoff request comprises to receive the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

24. (**Previously Presented**) A system according to claim 22, wherein to receive the handoff request comprises to receive the handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

25. (**Previously Presented**) A system according to claim 22, wherein to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first wireless network due to the handoff of the wireless device or an impact of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

26. (**Currently Amended**) A computer program product comprising a non-transitory medium having instructions for a first wireless network to handoff a wireless device to a second wireless network, which, when executed by logic, cause the logic to:

receive coverage information associated with the wireless device;

determine whether the wireless device is ~~possibly~~capable of being covered by the second wireless network based, at least in part, on the coverage information, wherein to determine comprises to determine that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network; and

transmit a handoff request to the second wireless network based, at least in part, on a determination that the wireless device is ~~possibly~~ capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

27. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

28. (**Original**) A computer program product according to claim 26, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

29. (**Canceled**)

30. (**Previously Presented**) A computer program product according to claim 26, wherein the mapping information of one or more locations for which the second wireless network has had coverage in the past comprises a map generated based on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network detection of a detectable signal from the second wireless network to the one or more wireless devices.

31. (**Original**) A computer program product according to claim 26, further comprising

instructions to cause the logic to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

32. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the other wireless device serves as a relay between the first wireless network and the second wireless network.

REMARKS

Applicant wishes to thank Examiner Beamer for the courtesy and cooperation extended to the Applicant's representative during the interview of August 8, 2014, which was initiated by the Examiner to inform Applicant that the allowance would be withdrawn, and the interview of December 11, 2014, which was initiated by the Applicant's representative.

Reconsideration and allowance in view of the foregoing amendments and the following remarks are respectfully requested.

Claims 1-3, 5-16, 18-28 and 30-32 are pending. **Claims 1, 3, 5-7, 9, 14, 16, 18-20, 26, 28 and 30-32** were rejected under 35 U.S.C. § 102(b). **Claims 2, 8, 21, 25 and 27** were rejected under 35 U.S.C. § 103(a). Upon entry of the amendment, **Claims 1, 14, and 26** are currently amended. Support for the amendments to independent **Claims 1, 14, and 26** can be found, at least at, paragraphs [0028] and [0029] of the U.S. Patent Application Publication. No new matter is added. Favorable consideration is respectfully requested.

ALLOWABLE SUBJECT MATTER

Applicant thanks the Examiner for the indication that **Claims 10-13 and 22-25** are allowable.

CLAIM REJECTION UNDER 35 U.S.C. § 102(b)

Claims 1, 3, 5-7, 9, 14, 16, 18-20, 26, 28 and 30-32 *are rejected under pre-AIA 35 U.S.C. § 102(b) as allegedly being anticipated by Souissi (U.S. Publication No. 2002/0187780; hereafter "Souissi").*

Independent Claims 1, 14, and 26

Since **Claims 1, 14, and 26** are rejected under the same rationale, Applicant will discuss **Claim 1** as being representative, but only to the extent that similar features are recited in all three independent claims. Applicant submits that the scope and features of the independent claims are not identical.

Applicant respectfully traverses the rejection, and further requests that the rejection be reconsidered and withdrawn. In particular, in view of the current amendments to independent **Claims 1, 14, and 26**, it is respectfully submitted that none of the cited references teach or suggest all of the claimed features.

Currently Amended **Claim 1** recites, in part (*emphasis added*):

> determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information, **wherein the determining includes determining that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network**; and
>
> transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network...

Claim 1 is currently amended to more clearly indicate that the determining includes determining that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network. Support for the current amendments can be found at, at least, paragraphs [0028] and [0029] of the specification of the present application. Nowhere of Souissi teaches or suggests the above features.

In the rejection of previously recited **Claim 1**, step 803 in Fig. 8 of Souissi is cited for its alleged teaching of "determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information," (Office Action, page 3).

However, with regard to amended **Claim 1**, the cited portions of Souissi fail to teach or suggest that "determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information, wherein the determining includes determining that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network," as recited in amended **Claim 1.**

Based on the description at paragraphs [0088]-[0091], Fig. 8 of Souissi shows an example

process of roaming from a non-preferred network to a preferred network using a positioner. Souissi further describes that:

- The mobile device's location is determined by exploiting a positioner...(Step 802, paragraph [0088])
- The mobile device seeks the availability of a preferred network using a roaming table that includes position information for various networks...(Step 803, paragraph [0089])
- The mobile device, through a periodic and continuous search for a preferred network, calculates the distance between the mobile device and the nearest preferred network...(Step 804, paragraph [0089])
- A proximity determination by resort to comparison with a pre-determined threshold value (distance value) ...(Step 810); and if the proximity threshold determination fails, the multi-mode station will remain camped onto the non-preferred network channel ...(Step 806, paragraph [0090]).
- If the threshold distance comparison criterion is met, then the network controller orders the mobile to background scan for the preferred network (Step 805); and if the background scan discovers an available preferred network channel in step 807, the mobile acquires the preferred network channel (Step 808) but if no preferred network channel is immediately discovered in step 807, scanning continuous in the background until an interruption to the algorithm occurs or a preferred network channel is found (Step 809, paragraph [0091]).

In step 803 of Souissi, the mobile device seeks the availability of a preferred network using a roaming table that includes position information for various networks. But Souissi fails to teach or suggest "determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information, **wherein the determining includes determining that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network**," as recited in amended **Claim 1.** Furthermore, since Souissi fails to teach or suggest the above emphasized features in amended **Claim 1**, Souissi further fails to teach or suggest "*transmitting a handoff request to the second wireless network* ***based, at least in part, on the determination*** *that the wireless device is capable of being covered by the second wireless network,"* as recited in **Claim 1.**

For at least the same reasons that **Claim 1** is patentable over Souissi, it is respectfully submitted that **Claims 14 and 26** are also patentable, to the extent that **Claims 14 and 26** recite similar features as **Claim 1.** Accordingly, at least in view of the current amendments to the independent claims, it is

respectfully submitted that rejection under 35 U.S.C. § 102(b) should be withdrawn.

Claims 3, 5-7, 9, 16, 18-20, 28, and 30-32

Claims 3, 5-7, 9, 16, 18-20, 28, and 30-32, variously depend, directly or indirectly, from independent **Claims 1, 14, and 26**. Souissi is deficient with respect to independent **Claims 1, 14, and 26,** for at least the reasons stated above. Therefore, Applicant submits that **Claims 3, 5-7, 9, 16, 18-20, 28, and 30-32** are patentable over Souissi at least by virtue of their dependency, as well as the other features recited therein. Applicant, therefore respectfully requests the reconsideration and withdrawal of rejection under 35 U.S.C. § 102(b).

CLAIM REJECTION UNDER 35 U.S.C. § 103(a)

The outstanding Office Action includes the following rejections under 35 U.S.C. § 103(a):

a) ***Claims 2, 25 and 27*** *are rejected as allegedly being unpatentable over Souissi, in view of Agashe (U.S. Publication No. 2010/0093354; hereafter "Agashe").*

b) ***Claims 8 and 21*** *are rejected as allegedly being unpatentable over Souissi, in view of Zhang (U.S. Publication No. 2014/0169267; hereafter "Zhang").*

Applicant respectfully traverses the rejection, and further requests that the rejection be reconsidered and withdrawn.

Claims 2, 8, 21, 25, and 27, variously depend, directly or indirectly, from independent **Claims 1, 14, and 26**. Souissi is deficient with respect to independent **Claims 1, 14, and 26,** for at least the reasons stated above in regard to the rejection under 35 U.S.C. § 102(b). Therefore, Applicant submits that **Claims 2, 8, 21, 25, and 27** are patentable over Souissi at least by virtue of their dependency, as well as the other features recited therein. None of the other cited references, including Agashe and Zhang, compensates for such deficiencies, relative to the amended independent claims, nor were these

secondary references cited for that purpose. Accordingly, at least in view of the current amendments to the independent claims, it is respectfully submitted that rejections a) – b) under 35 U.S.C. § 103(a) should be withdrawn.

CONCLUSION

The remaining references of record have been studied. It is respectfully submitted that they do not compensate for the deficiencies of the references utilized in rejecting the pending claims.

It should also be noted that although arguments have been presented with respect to certain claims herein, the recited subject matter as well as various other subject matter and/or combinations of subject matter may be patentable for other reasons. Further, the failure to address any statement by the Examiner herein should not be interpreted as acquiescence or agreement with such statement. Applicant expressly reserves the right to set forth additional and/or alternative reasons for patentability and/or allowance with the present Application or in any other future proceeding, and to rebut any statement presented by the Examiner in this or other papers during prosecution of the present Application.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance, and therefore early and forthright issuance of a Notice to that effect is earnestly solicited.

Respectfully submitted,

Brundidge & Stanger, PC

Dated: December 15, 2014

/David S. Lee/
David S. Lee
Reg. No. 38,222

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CLAIMS

[Claim(s)]
[Claim 1]
In a base station device which measures electric power which received and acquired an electric wave from a surrounding base station device during communication with a mobile station, creates communication quality information for the aforementioned mobile station to perform band OBA to a base station device of the aforementioned periphery, and transmits to the aforementioned mobile station,
An antenna which receives an electric wave from the aforementioned mobile station and a surrounding base station device,
A directive variable means into which the directivity of the aforementioned antenna is changed,
A selection means which selects the directivity of the aforementioned antenna which changes the directivity of an antenna by the aforementioned directive variable means, and becomes good [communication quality] to a mobile station under communication,
A power measurement means to measure electric power of a base station device of the aforementioned periphery with the aforementioned antenna made into directivity selected by the aforementioned selection means,
A communication-quality-information preparing means which creates communication quality information for every base station device of the aforementioned periphery based on electric power of a base station device of the aforementioned periphery measured by the aforementioned power measurement means,
A means to transmit communication quality information for every base station device of the aforementioned periphery created by the aforementioned communication-quality-information preparing means to the aforementioned mobile station under aforementioned communication
A providing base station device.
[Claim 2]
In a base station device which measures electric power which received and acquired an electric wave from a surrounding base station device during communication with a mobile station, creates communication quality information for the aforementioned mobile station to perform band OBA to a base station device of the aforementioned periphery, and transmits to the aforementioned mobile station,
An antenna which receives an electric wave from the aforementioned mobile station and a surrounding base station device,
A directive variable means into which the directivity of the aforementioned antenna is made to change,
A means by which the directivity of an antenna is changed by the aforementioned directive variable means, and communication quality chooses first directivity that becomes good, and indirectional second directivity to a mobile station under communication,
A first power measurement means to measure electric power of a base station device of the aforementioned periphery with the aforementioned antenna made into first directivity chosen [aforementioned],
A second power measurement means to measure electric power of a base station device of the

aforementioned periphery with the aforementioned antenna made into second directivity chosen [aforementioned],
A communication-quality-information preparing means which creates communication quality information for every base station device of the aforementioned periphery based on electric power of a base station device of the aforementioned periphery measured, respectively by said first power measurement means and a second power measurement means,
A means to transmit communication quality information for every base station device of the aforementioned periphery created by the aforementioned communication-quality-information preparing means to the aforementioned mobile station under aforementioned communication
A providing base station device.
[Claim 3]
In a base station device of Claim 1, and 2 any 1 descriptions,
It has a traffic measurement means to measure traffic of a base station device of the aforementioned periphery,
The aforementioned communication-quality-information preparing means,
A base station device creating communication quality information for every base station device of the aforementioned periphery based on electric power of a base station device of the aforementioned periphery measured by the aforementioned power measurement means, and traffic of a base station device of the aforementioned periphery measured by the aforementioned traffic measurement means.
[Claim 4]
In a base station device of Claim 1, and 2 any 1 descriptions,
It has a means to acquire a communication history of a base station device connected to the past which the aforementioned mobile station created from the aforementioned mobile station,
The aforementioned communication-quality-information preparing means,
A base station device creating communication quality information for every base station device of the aforementioned periphery based on a communication history received from electric power and the aforementioned mobile station of a base station device of the aforementioned periphery measured by the aforementioned power measurement means.
[Claim 5]
In a base station device of Claim 1, and 2 any 1 descriptions,
It has a means to receive an acquisition request of communication quality information transmitted from the aforementioned mobile station,
The aforementioned communication-quality-information preparing means,
A base station device creating communication quality information for every base station device of the aforementioned periphery when an acquisition request of communication quality information is received from the aforementioned mobile station.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
The present invention relates to the base station device used for the wireless communication system etc. which communicate while a mobile station performs a handover.
[Background of the Invention]
[0002]
It consists of two or more base stations and one or more mobile stations, and in the wireless communication system which attains desired communication by connecting with any one of the at least two or more base stations, each mobile station becomes indispensable [a handover], in order that a mobile station may maintain good communication quality.
[0003]
The function of a handover comprises two processings of processing in which compare the processing which generally searches a different base station from the base station under connection with the searched base station and the base station connected now, and communication quality chooses a good base station. About the processing which searches the 1st base station between these two processings, when a base station transmits the list of peripheral base stations to a mobile station, it is known that that processing will be reducible.
[0004]
In order for a base station to acquire the information on a peripheral base station, there are a method of installing a base station intentionally previously, for example, and inputting mutual information, a method of investigating mutual positional relationship by exchanging information in base stations, etc. The method of investigating a peripheral base station is also known by asking him to teach the history of the base station connected to the past from a mobile station.
[0005]
In a base station [in / as this kind of advanced technology / a cell method radiotelephone system], By transmitting the information on other base stations to a mobile station on the assumption that the information on other surrounding base stations is perceived, the handover point candidate of a mobile station is limited and the technology which simplifies handover processing is already devised (for example, see Patent Document 1).
[0006]
About how to acquire the information on a surrounding base station, the method of investigating the information on a peripheral base station is known by receiving the history of the base station connected to the past from a mobile station (for example, see Patent Document 2).
[Patent document 1] JP,H6-77888,A
[Patent document 2] JP,2003-258900,A
[Description of the Invention]
[Problem to be solved by the invention]
[0007]
However, the incorrect notice which transmits the peripheral base station where the method of a gap to describe above is also placed at the south of a base station to the mobile station which is

placed, for example at the north of a base station from the information on a direction not being included in the information on a peripheral base station as a handover point candidate may take place.
In this case, a mobile station will perform processing which evaluates communication quality to a handover point candidate's notified base station, i.e., the base station which cannot serve as the handover point, and had the problem of consuming useless electric power.
[0008]
It was made in order that the present invention might solve such problem, and it aims at providing the base station device which can reduce the power consumption of a mobile station.
[Means for solving problem]
[0009]
In order that the present invention may solve the above-mentioned problem, the base station device of the present invention, Electric power which received and acquired an electric wave from a surrounding base station device during communication with a mobile station is measured, and a base station device which creates communication quality information for the aforementioned mobile station to perform band OBA to a base station device of the aforementioned periphery, and transmits to the aforementioned mobile station is characterized by comprising the following:
An antenna which receives an electric wave from the aforementioned mobile station and a surrounding base station device.
A directive variable means into which the directivity of the aforementioned antenna is changed.
A selection means which selects the directivity of the aforementioned antenna which changes the directivity of an antenna by the aforementioned directive variable means, and becomes good [communication quality] to a mobile station under communication.
A power measurement means to measure the electric power of the base station device of the aforementioned periphery with the aforementioned antenna made into the directivity selected by the aforementioned selection means, A communication-quality-information preparing means which creates communication quality information for every base station device of the aforementioned periphery based on electric power of a base station device of the aforementioned periphery measured by the aforementioned power measurement means, A means to transmit communication quality information for every base station device of the aforementioned periphery created by the aforementioned communication-quality-information preparing means to the aforementioned mobile station under aforementioned communication.

[0010]
The present invention measures again the electric power obtained by the base station device of the present invention receiving the electric wave from a surrounding base station device during communication with a mobile station, A base station device which creates communication quality information for the aforementioned mobile station to perform band OBA to a base station device of the aforementioned periphery, and transmits to the aforementioned mobile station is characterized by comprising:
An antenna which receives an electric wave from the aforementioned mobile station and a surrounding base station device.
A directive variable means into which the directivity of the aforementioned antenna is made to change.
A means by which the directivity of an antenna is changed by the aforementioned directive variable means, and communication quality chooses first directivity that becomes good, and indirectional second directivity to a mobile station under communication.
A first power measurement means to measure the electric power of the base station device of the aforementioned periphery with the aforementioned antenna made into the first directivity chosen [aforementioned], A second power measurement means to measure electric power of a base station device of the aforementioned periphery with the aforementioned antenna made into second directivity chosen [aforementioned], A communication-quality-information preparing means which creates communication quality information for every base station device of the

aforementioned periphery based on electric power of a base station device of the aforementioned periphery measured, respectively by above-mentioned first power measurement means and a second power measurement means, A means to transmit communication quality information for every base station device of the aforementioned periphery created by the aforementioned communication-quality-information preparing means to the aforementioned mobile station under aforementioned communication.

[0011]
In the present invention, a mobile station and the base station device under communication, Since the directivity of an antenna is changed so that communication quality may become good to the mobile station under communication, the information on the peripheral base station which considered the direction of a peripheral base station for every mobile station is put on a base station list and it transmits to a mobile station, The mobile station can perform a handover now to the base station of the direction for which it was suitable as the handover point, and needs to cease to perform vainly processing which evaluates communication quality to the base station of a wrong direction, i.e., the base station which cannot serve as the handover point. As a result, the mobile station can perform now a base station and communication suitable for communication efficiently.
[Effect of the Invention]
[0012]
As described above, according to the present invention, the power consumption of a mobile station can be reduced.
[Best Mode of Carrying Out the Invention]
[0013]
Hereafter, it describes in detail about this embodiment, referring to Drawings.
First, it describes about the composition of the wireless communication system concerning the present invention. The figure in which Fig.1 shows the composition of the wireless communication system of this embodiment, the figure in which Fig.2 shows the composition of the base station of the wireless communication system of Fig.1, the figure in which Fig.3 shows the composition of the base station list creation machine of a base station, and Fig.4 are the figures showing a base station list.
[0014]
As shown in Fig.1, the wireless communication system of this embodiment, At least one peripheral base station (the peripheral base station 3, the peripheral base station 4) arranged by being dotted around the base station 1 and this base station 1 as a base station device, It comprises the mobile station 2 which performs processing which evaluates communication quality the base station 1 and during communication to the handover point candidate (the peripheral base station 3 or the peripheral base station 4) notified from the base station 1, and performs a handover to the good handover point of communication quality rather than the present.
[0015]
The base station 1 is provided with the following.
The antenna 21 which receives an electric wave from the mobile station 2, the peripheral base station 3, and the peripheral base station 4 as shown in Fig.2.
Two or more wireless sections 22 which receive a signal through the antenna 21, respectively.
The analog-to-digital converter 23 (analog-to-digital codec: call ADC23 below) which converts an input signal of an analog received by these wireless sections 22, respectively to a digital signal.
The antenna pattern selector 24 which chooses an antenna pattern from the signal from these ADC23, Two or more multipliers 25 to which weight is applied to a signal received by each antenna 21, The antenna pattern change machine 26 which controls each multiplier 25 to switch to an antenna pattern with the selected antenna pattern selector 24, The adding machine 27 adding a signal input from two or more multipliers 25, and the demodulator 28, The base station history acquisition machine 29, the receiving base station judging device 30, and the power

measurement machine 31, The wireless section 36 which transmits the traffic measurement machine 32, the base station Liszt creation machine 33, the modulator 34, the digital-analog converter 35 (digital one / analog codec: call DAC35 below), and an analog signal for transmission converted by this DAC35 through the antenna 37.
It is the composition substantially same about other peripheral base stations 3 and 4 as the above.
[0016]
To the mobile station 2 under communication, a communicating state calculates the weight which becomes good and outputs the antenna pattern selector 24. The selection of an antenna pattern performed by the antenna pattern selector 24 is calculating the above-mentioned weight. As a way a communicating state calculates the weight which becomes good, the maximum ratio synthesis etc. are used to the mobile station 2 under communication, for example. In this way, the calculated weight is outputted to the antenna pattern change machine 26. When generating an indirectional antenna pattern, one of two or more antennas 21 is made indirectivity, and all weight corresponding to antennas other than this one antenna is realized by using 0.
[0017]
That is, the antenna pattern selector 24 functions as a selection means from which the antenna pattern change machine 26 selects the antenna pattern which is the directivity of the antenna 21 which changes the directivity of the antenna 21 and becomes good [communication quality] to the mobile station under communication.
[0018]
The antenna pattern change machine 26 outputs the weight received from the antenna pattern selector 24 to the multiplier 25. The antenna pattern change machine 26 is switching the weight outputted to each multiplier 25, and changes variously the antenna pattern of the signal input into the demodulator 28. The signal by which multiplication was carried out in weight is input into the adding machine 27.
[0019]
The adding machine 27 changes an antenna pattern by carrying out addition synthesis of the signal input from each multiplier 25. That is, the antenna pattern change machine 26, the multiplier 25, and the adding machine 27 function as a directive variable means into which the antenna pattern which is the directivity of the antenna 21 is changed.
[0020]
The power measurement machine 31 measures signal power by taking the square sum of the signal outputted from the adding machine 27. That is, the power measurement machine 31 functions as a power measurement means to measure the electric power of the peripheral base stations 3 and 4 with the antenna 21 made into the directivity selected by the antenna pattern selector 24.
[0021]
A first power measurement means to measure the electric power of the peripheral base stations 3 and 4 with the antenna 21 which made the power measurement machine 31 the first directivity generated by the directive variable means, It functions as a second power measurement means to measure the electric power of the peripheral base stations 3 and 4 with the antenna 21 made into the second directivity generated by the directive variable means.
[0022]
The traffic measurement machine 32 carries out fixed time monitoring of the electric power outputted from the power measurement machine 31, is searching for the ratio of time for electric power to exceed the predetermined threshold value set up previously, and measures traffic.
[0023]
The base station Liszt creation machine 33 performs correlation with the base station where the electric power measured with the power measurement machine 31 and its electric power were measured. The base station Liszt creation machine 33 judges the thing corresponding to which base station the traffic measured with the traffic measurement machine 32 is. The base station Liszt creation machine 33 functions based on the electric power of the peripheral base stations 3 and 4 measured with the power measurement machine 31 as the peripheral base stations 3 and

a communication-quality-information preparing means which creates the communication quality information in every four.
[0024]
The base station history acquisition machine 29 extracts and outputs the communication history data (base station history) which the mobile station 2 connected with the base station in the past out of the data (data received from the mobile station 2) input from the demodulator 28. It is embedded into the data which communicates between the mobile station 2 and the base station 1, and is transmitted from the mobile station 2, and a base station history is received in the base station 1.
[0025]
The receiving base station judging device 30 functions as judging of which base station the signal received now is a thing as a base station identification means. To some data of the signal which the base station received, the information corresponding to the base station which transmitted this is included, and the receiving base station judging device 30 identifies a base station by taking out this information. the base station identified here -- the base station Liszt creation machine 33 -- an output -- by things, it can be identified the things corresponding to which base station data, such as electric power and traffic, is.
[0026]
As shown in Fig.3, the base station Liszt creation machine 33 The switch 40 and two or more quality calculating means (the 1st quality calculation machine 41, the 2nd quality calculation machine 42, the 3rd quality calculation machine 43, the 4th quality calculation machine 44), The multiplier 45 which carries out the multiplication of the result of having computed communication quality with the electric power input into the 2nd quality calculation machine 42, and the weighting value alpha, The multiplier 46 which carries out the multiplication of the result of having computed communication quality by the traffic input into the 3rd quality calculation machine 43, and the weighting value beta, The multiplier 47 which carries out the multiplication of the result of having computed communication quality by the base station history input into the 4th quality calculation machine 44, and weighting value gamma, It has the memory 48 which saves base station Liszt who is a table of a communication quality computed result with each peripheral base station, and the Liszt creation machine 49 which reads and outputs base station Liszt from this memory 48.
[0027]
A power signal is input into the switch 40. When the antenna pattern notified from the antenna pattern change machine 26 is a thing corresponding to indirectivity, the switch 40 outputs a power signal to the 1st quality calculation machine 41 to the 2nd quality calculation machine 42, when that is not right.
The 1st quality calculation machine 41 computes communication quality based on the input power signal. The 2nd quality calculation machine 42 computes communication quality based on the input power signal. The 3rd quality calculation machine 43 computes communication quality based on the traffic of the peripheral base stations 3 and 4. The 3rd quality calculation machine 43 functions as a traffic measurement means to measure the traffic of the peripheral base stations 3 and 4. The 4th quality calculation machine 44 computes communication quality based on the base station history received from the mobile station 2. The above-mentioned antenna 21, the wireless section 22, ADC23, the base station history acquisition machine 29, the 4th quality calculation machine 44, etc. function as a means to acquire the communication history of the base station connected to the past which the mobile station 2 created from the mobile station 2.
[0028]
The memory 48 for saving base station Liszt is provided by the base station Liszt creation machine 33. In this memory 48, the information for identifying the peripheral base stations 3 and 4 and the information which shows the quality of those base stations 3 and 4 are matched and saved.
[0029]
If information, including electric power, traffic, and a base station history, is input, a base

station Liszt creation machine 33, in the base station Liszt creation machine 33, with the quality calculation machines 41–44 corresponding to each, it will convert to quality information and the memory 48 will memorize.

[0030]

About the quality outputted from the quality calculation machines 42 other than 1st quality calculation machine 41 –, i.e., the 2nd quality calculation machine, and the 4th quality calculation machine 44, it is considered as the result to which weighting value alpha, beta, and gamma were applied, respectively. By doing in this way, the weighting according to importance can be performed to the quality outputted from each quality calculation machine 41–44.

[0031]

Simultaneously with such quality information, the information for identifying a receiving base station is also input into the memory 48. When this base station is included in the memory 48, the quality corresponding to that base station is updated. When this base station is not included in the memory 48, a base station is newly registered. The data in the memory 48 for base station list preservation is updated as mentioned above.

[0032]

The list creation machine 49 takes out all the data in the memory 48 for base station list preservation, or the data of an upper level part, generates a list, and sends this data to the modulator 34. After modulating with the modulator 34, this data is converted to an analog signal by DAC35, and is transmitted to the mobile station 2 by the wireless section 36 and the antenna 37. That is, the modulator 34, DAC35, the wireless section 36, and the antenna 37 function as a means to transmit the created base station list 50 (refer to Fig.4) to the mobile station 2 under communication.

[0033]

As shown in Fig.4, base station Liszt 50 is the communication quality management table which can receive an electric wave from a local station and in which each communication quality information was memorized for every base station. With base station specific information, timing information required for peculiar ID, such as an IP address, a MAC Address, and base station identification information (BSSID), the frequency information currently used, spread code, and synchronization which are used etc. are raised, for example. This base station specific information is acquired in accordance with, when the base station 1 measures the electric power of the peripheral base stations 3 and 4.

[0034]

The information compressed when the measured power value could be used for communication quality information as it is and it thinned out a value may be used, and the value which shows the turn of the superiority or inferiority of communication quality may be used.

[0035]

Then, operation of this wireless communication system is described with reference to Fig.5. Fig.5 is a flow chart which shows the example of the 1st operation of this wireless communication system.

[0036]

By applying weight with the multiplier 25 in the base station 1 based on the signal received with two or more antennas 21, Communication quality selects the antenna pattern which becomes good to the mobile station 2 under communication by measuring the electric power of the signal received from the mobile station 2, changing the directivity response pattern (henceforth an antenna pattern) of the antenna 21.

[0037]

That is, in the base station 1, the antenna pattern selector 24 determines the directivity (antenna pattern) of the suitable antenna 21 for the mobile station 2 under communication (S101 of Fig.5), The antenna pattern change machine 26 is changing the weight of the multiplier 25 so that it may become the determined antenna pattern, and the directivity of the antenna 21 is switched.

[0038]

As a method of switching an antenna pattern, The method of performing by carrying out

weighting synthesis of the input signal from two or more antennas 21 like this example, etc. There are a method of performing by [which have directivity in antenna 21 the very thing] carrying out thing two or more preparation, and switching this, the method of performing by preparing one thing which has directivity in antenna 21 the very thing, and changing direction of this antenna 21 physically, etc.

[0039]

When two or more antenna patterns are switched and communication quality compares communication quality to the mobile station 2 under communication as a method of choosing the antenna pattern which becomes good, there is a method of finding out the best pattern.

[0040]

In carrying out the weighting synthesis of the input signal from two or more antennas 21, communication quality chooses the antenna pattern which becomes good by calculating a weight so that the receiving characteristic of the signal after a weighting synthesis may become good using the signal received from each antenna 21 (selection). As a method of calculating a weight so that a receiving characteristic may become good, technology, such as the maximum ratio synthesis, is used, for example.

[0041]

Thus, the antenna pattern selector 24 of the base station 1 determines a suitable antenna pattern to the mobile station 2 under communication, If it switches to the antenna pattern in which the antenna pattern change machine 26 changed the weight to each multiplier 25 into, and determined the directivity of the antenna 21, the power measurement machine 31 will measure the electric power of the peripheral base stations 3 and 4 in the antenna pattern next (S102).

[0042]

Generally the base station 1 carries out broadcast communication of the information of control information to the total displacement office 2 linked to a local station (this base station 1). For example, a beacon packet is broadcast in the wireless LAN of 802.11. The channel of CPICH is broadcast in W-CDMA. The power measurement machine 31 measures the electric power of the peripheral base stations 3 and 4 by receiving such information broadcast from the peripheral base stations 3 and 4.

[0043]

When a peripheral base station differs from a carrier frequency, the electric power of a peripheral base station is measured by receiving by switching frequency. A carrier frequency is the same as a peripheral base station, when code division multiplexing is carried out, it receives without switching frequency, digital signal processing separates the signal from a peripheral base station, and electric power is measured.

[0044]

Thus, since the electric power of the measured peripheral base stations 3 and 4 is the electric power measured where an antenna pattern is turned to the mobile station 2 under communication, electric power with a higher peripheral base station nearer to this mobile station 2 is observed. For example, in Fig.1, the base station 1 chooses the antenna pattern 1 to the mobile station 2 under communication, and measures the electric power of the peripheral base station 3 and the peripheral base station 4 using this antenna pattern 1. In the example of Fig.1, since it has turned to the direction of the mobile station 2 while the antenna pattern 1 is communicating, it is expected that the electric power of the peripheral base station 3 is highly observed rather than the peripheral base station 4. Base station Liszt 50 (refer to Fig.4) is created combining the data measured here and the information which specifies the base station 1 (S103).

[0045]

Thus, base station Liszt 50 created with the base station Liszt creation machine 33, After the internal memory 48 memorizes, it is read to predetermined timing with the Liszt creation machine 49, is sent to order called the modulator 34, DAC35, the wireless section 36, and the antenna 37 from the base station Liszt creation machine 33, and is transmitted to the mobile station 2 under communication from the base station 1 (S104).

[0046]

When the transmission section for exclusive use which transmits base station Liszt 50 may be used as a means to transmit base station Liszt 50 and other data and control information are sent in the usual means of communication, it may transmit with these pieces of information. The timing which transmits base station Liszt 50 may be periodical, and the time of judging with the communication quality with the mobile station 2 having been deteriorated, as a result of the power measurement machine 31 performing power measurement may be sufficient as it. The timing which updates base station Liszt 50 of the memory 48 is desirable just before transmitting base station Liszt 50, but when this is not made, it may create base station Liszt 50 a priori.

[0047]

If the mobile station 2 receives base station Liszt 50, the mobile station 2 will try a handover based on this base station Liszt 50 (S105). A handover may be tried to all the base stations which base station Liszt 50 has, and a handover may be tried only to the base station of upper level some based on communication quality information. Anyway, based on base station Liszt's 50 received communication quality information, a handover is tried sequentially from the good thing of communication quality.

[0048]

The timing to which the mobile station 2 tries a handover may be, immediately after receiving the base station list 50, and the time of it being detected that the communication quality with the base station 1 under present connection was deteriorated may be sufficient as it.

[0049]

Thus, according to this example of the 1st operation, the peripheral base station 3 which considered and created the direction from the base station 1 to the mobile station 2, and the base station list 50 which is the communication quality information in every four are sent, The mobile station 2 which received this base station list 50, It can be lost that a possibility of becoming the handover point about the high peripheral base station 3 of communication quality since a handover is tried as a candidate of the handover point tries a handover about the low peripheral base station 4, a handover can be performed efficiently, and power consumption reduction of the mobile station 2 can be performed. The precise base station list 50 can be created by communication with the mobile station 2, without cooperating with the peripheral base stations 3 and 4 by using a smart antenna etc. in the base station 1.

That is, the mobile station 2 is performing a handover based on the base station list 50 received from the base station 1, can reduce the processings in connection with a handover, and, as a result, can realize power consumption reduction.

[0050]

Next, with reference to Fig.6, it describes about the example of the 2nd operation of this wireless communication system. Fig.6 is a flow chart which shows the example of the 2nd operation of this wireless communication system.

[0051]

In this example of the 2nd operation, in the base station 1, the antenna pattern change machine 26 and the antenna pattern selector 24, First, the existing suitable directive antenna pattern is determined to the mobile station 2 under communication (S201 of Fig.6), and the directivity of the antenna 21 is switched to the antenna pattern. The power measurement machine 31 measures the electric power of the peripheral base stations 3 and 4 using this antenna pattern (S202). Electric power measured here is made to call it the peripheral base station electric power for individual mobile stations in order to distinguish from the electric power measured later.

[0052]

Next, the antenna pattern change machine 26 and the antenna pattern selector 24 are switched to the antenna pattern which made the directivity of the antenna 21 indirectivity, and the power measurement machine 31 measures the electric power of the peripheral base stations 3 and 4 in an indirectional antenna pattern (S203). The electric power measured here will be called the peripheral base station electric power for total displacement offices. The antenna in which the gain to all the directions is substantially the same, or the antenna in which the gain which are the 360 level surface is substantially the same is indicated to be an omnidirectional antenna pattern.

[0053]
The base station Liszt creation machine 33 creates communication quality information from the peripheral base station electric power for individual mobile stations which was carried out in this way and acquired, and the peripheral base station electric power for total displacement offices (S204). In the peripheral base station electric power for individual mobile stations, since it is the electric power measured where an antenna pattern is turned to the mobile station 2 under communication, electric power high in about three peripheral base station near this mobile station 2 is observed.
[0054]
That is, the antenna pattern change machine 26 and the antenna pattern selector 24, Change the directivity of the antenna 21, and communication quality generates the first directivity that becomes good, and indirectional second directivity to the mobile station under communication, and them the power measurement machine 31, Measuring two electric power of the peripheral base stations 3 and 4 with each directivity, the base station Liszt creation machine 33 creates base station Liszt who is the peripheral base station 3 and the communication quality information in every four based on two power measurement results.
[0055]
However, even if it is a base station which exists in the direction which the antenna pattern has not turned to, it may be closely alike in distance and electric power may look strong about a certain thing. On the other hand, with the peripheral base station electric power for total displacement offices, since there is no directivity in an antenna pattern, it can judge that the possibility that distance is near is so high that electric power is large.
[0056]
That is, when two or more base stations where the peripheral base station electric power for individual mobile stations serves as the same value exist, a possibility that the direction of the small base station of the peripheral base station electric power for total displacement offices exists near the mobile station 2 will be high.
[0057]
First of all based on such a decided result, setting out of the value of communication quality information or ranking setting out is performed based on the peripheral base station electric power for individual mobile stations, The value of communication quality information with the smaller peripheral base station electric power for total displacement offices about that out of which a difference did not come here is raised, or how to raise ranking can be considered.
[0058]
What was otherwise pulled from the peripheral base station electric power for individual mobile stations having applied the weight to the peripheral base station electric power for total displacement offices is treated as a new power value, and how to build communication quality information based on this can be considered. Also in this case, a new power value may be used as communication quality information as it is, the information compressed by thinning out a value may be used, and the value which shows the turn of the superiority or inferiority of communication quality may be used. Thus, base station Liszt 50 is created combining the created communication quality information and the information which specifies a base station.
[0059]
Thus, base station Liszt 50 who created is transmitted to the mobile station 2 from the base station 1 (S205).
The mobile station 2 tries a handover based on the base station list 50 received from the base station 1 (S206).
[0060]
Thus, according to this example of the 2nd operation, the antenna pattern change machine 26 and the antenna pattern selector 24, Change the directivity of the antenna 21, and communication quality generates the first directivity that becomes good, and indirectional second directivity to the mobile station under communication, and them the power measurement machine 31, With each directivity, measure two electric power of the peripheral base stations 3 and 4, and the base station list creation machine 33, By creating the base station list, it is

the peripheral base station 3 and the communication quality information in every four based on two power measurement results, Since the identification accuracy of the direction difference of the peripheral base stations 3 and 4 and the mobile station 2 improves and the still more accurate base station list 50 can be created compared with the example of the 1st operation, a handover can be performed efficiently and power consumption reduction of the mobile station 2 can be performed.

[0061]

Next, it describes about the example of the 3rd operation of this wireless communication system. Fig.7 is a flow chart which shows the example of the 3rd operation of this wireless communication system.

[0062]

In the case of this example of the 3rd operation, in the base station 1 the antenna pattern change machine 26 and the antenna pattern selector 24, First, like the example of the 1st operation, a suitable antenna pattern is determined to the mobile station 2 under communication (S301 of Fig.7), and the power measurement machine 31 measures the electric power of the peripheral base stations 3 and 4 using this antenna pattern (S302).

[0063]

wait -- in the base station 1, the 3rd quality calculation machine 43 measures the traffic of the peripheral base stations 3 and 4 (S303). If the method of measuring the traffic of the peripheral base stations 3 and 4 is a system by which Time Division Multiplexing is carried out, for example, traffic can be presumed by measuring the ratio that see in time and electric power becomes strong. If it is the system by which Frequency Division Multiplexing is carried out, traffic can be presumed because electric power measures the ratio of the zone which is strong among all the zones.

The base station list creation machine 33 creates communication quality information from the electric power of a peripheral base station which was carried out in this way and acquired, and the traffic of a peripheral base station (S304).

[0064]

Generally, as for the mobile station 2, it is desirable for electric power to connect with the base station which becomes strong. However, since the zone which can occupy this mobile station narrows when there is much traffic of the base station whose electric power becomes strong, the direction which traffic connects with few base stations depending on the case even if electric power is somewhat small may be able to improve communication quality.

[0065]

On the assumption that such a case the base station list creation machine 33, Based on the electric power of the peripheral base stations 3 and 4 measured with the power measurement machine 31, setting out of the value of the communication quality information of the base station list 50 or ranking setting out is performed, A difference is taken out by the method of raising the value of the communication quality information of small Ho of traffic about what a difference did not produce here, or raising ranking.

[0066]

What was otherwise deducted from the electric power of the peripheral base stations 3 and 4 having applied the weight to the size of traffic is treated as a new power value, and how to make communication quality information based on this can be considered. Also in this case, a new power value may be used as communication quality information as it is, the information compressed by thinning out a value may be used, and the value which shows the turn of the superiority or inferiority of communication quality may be used.

[0067]

Thus, the base station list 50 is created combining the created communication quality information and the information which specifies a base station.

Thus, from the base station list creation machine 33, the base station list 50 which the base station list creation machine 33 created is sent to order called the modulator 34, DAC35, and the wireless section 36, and is transmitted to the mobile station 2 (S305).

The mobile station 2 tries a handover based on the received base station list 50 (S306).

[0068]
Thus, according to this example of the 3rd operation, have the 3rd quality calculation machine 43 as a traffic measurement means to measure the traffic of the peripheral base stations 3 and 4, and the base station list creation machine 33, Since the peripheral base station 3 and the communication quality information in every four are created based on the electric power of the peripheral base stations 3 and 4 measured with the power measurement machine 31, and the traffic of the peripheral base stations 3 and 4 measured with the 3rd quality calculation machine 43, Since the case where communication quality does not become good can be avoided and the still more accurate base station list 50 can be created compared with the example of the 1st operation because there is much traffic even if near in distance, a handover can be performed efficiently and power consumption reduction of the mobile station 2 can be performed.
[0069]
Next, with reference to Fig.8 and Fig.9, it describes about the example of the 4th operation of this wireless communication system.The flow chart with which Fig.8 shows the example of the 4th operation of this wireless communication system, and Fig.9 are the figures showing the base station history management table set as the memory 48.
[0070]
In this example of the 4th operation, when the mobile station 2 connects to the base station 1, this mobile station 2 transmits to the base station 1 which connects the information on the connection history of the base stations 1, 3, and 4 connected in the past etc. after this (S401 of Fig.8).
In the base station 1, it saves at the base station history management table 71 of the memory 48 by making into a base station history the connection history which the base station history acquisition machine 29 received and acquired from the mobile station 2.
[0071]
As shown in Fig.9, the base station history management table 71 is a table for summarizing the information from all the mobile stations 2 linked to the base station 1 to one, and managing it, and means how much the mobile station had connected with the base station as a past communication history.
[0072]
For example, if it is having connected with other base stations before two rather than this when a certain mobile station 2 connects with this base station 1, one "□□2" of the base station history management table 71 will be incremented. The base station hysteresis information of the base station history management table 71 may be reset periodically, specifies a buffer, and it may be made to eliminate it sequentially from an old thing about the information exceeding this.
[0073]
Thus, the base station hysteresis information of the created base station history management table 71 shows the high peripheral base station of a possibility of carrying out a handover to the base station 1. For example, when the course in which a possibility of following when the mobile station which moves in this carries out a handover from geographical conditions, such as a road and an obstacle, is high exists, this can be presumed by referring to the base station history management table 71.
[0074]
When the mobile station 2 connects with the base station 1, like the example of the 1st operation in the base station 1, The antenna pattern selector 24 and the antenna pattern change machine 26 determine a suitable antenna pattern to the mobile station 2 under communication (S402), and the power measurement machine 31 measures the electric power of the peripheral base stations 3 and 4 in this antenna pattern (S403).
[0075]
The base station list creation machine 33 creates communication quality information from the electric power of the peripheral base stations 3 and 4 and the base station hysteresis information of the base station history management table 71 which were carried out in this way and acquired (S404). In this case, the base station list creation machine 33 performs setting out of the value of communication quality information, or ranking setting, based on the base sta

power of the peripheral base stations 3 and 4 first, A difference is taken out with the method of raising the value of the communication quality information of the base station of Ho with the large number of times of connection of 1-time Saki of base station hysteresis information about that out of which a difference did not come here, or raising ranking. What was otherwise added to the electric power of the peripheral base station having applied the weight to the number of times of connection of 1-time Saki of base station hysteresis information is treated as a new power value, and how to make communication quality information based on this etc. can be considered.

[0076]

Also in this case, a new power value may be used as communication quality information as it is, the information compressed by thinning out a value may be used, and the value which shows the turn of the superiority or inferiority of communication quality may be used. Thus, base station Liszt 50 is created combining the created communication quality information and the information which specifies a base station.

Thus, from the base station Liszt creation machine 33, base station Liszt 50 created with the base station Liszt creation machine 33 is seen off in order called the modulator 34, DAC35, and a wireless section, and is transmitted to the mobile station 2 (S405).

The mobile station 2 tries a handover based on base station Liszt 50 who received (S406).

[0077]

Thus, according to this example of the 4th operation, the base station 1, Have the base station history acquisition machine 29 as a means to acquire the communication history of the base station connected to the past which the mobile station 2 created from the mobile station 2, and the base station Liszt creation machine 33, Since the peripheral base station 3 and base station Liszt 50 that is the communication quality information in every four are created based on the communication history received from the electric power and the mobile station 2 of the peripheral base stations 3 and 4 measured with the power measurement machine 31, For example, the peripheral base stations 3 and 4 which serve as a handover candidate easily on geographical conditions etc. can be specified, and by using this communication history, the base station 1 can create higher-precision base station Liszt 50, and can see him off in the mobile station 2. That is, since still more accurate base station Liszt 50 can be created compared with the example of the 1st operation, a handover can be performed efficiently and power consumption reduction of the mobile station 2 can be performed.

[0078]

Next, with reference to Fig.10, it describes about the example of the 5th operation of this wireless communication system. Fig.10 is a flow chart which shows the example of the 5th operation of this wireless communication system.

[0079]

In this example of the 5th operation, the mobile station 2 requires transmission of base station Liszt 50 from the base station 1 (S501). This timing may be periodical and the time of being detected may be convenient for the communication quality with the base station 1 having been deteriorated.

The base station 1 reception of the Request to Send of base station Liszt from the mobile station 2 will judge whether the Liszt creation machine 49 of the base station 1 has base station Liszt 50 who created recently in the memory 48 with checking the memory 48 (S502).

[0080]

When base station Liszt 50 who created recently exists as a result of this judgment (□es of S502), the Liszt creation machine 49 reads that base station Liszt 50 from the memory 48, and transmits to the mobile station 1 (S506).

The mobile station 1 tries a handover based on the base station list 50 transmitted from the base station 1 (S507).

[0081]

On the other hand, when the base station list 50 created recently does not exist in the memory 48 (No of S502), like the example of the 1st operation in the base station 1, The antenna pattern selector 24 determines a suitable antenna pattern to the mobile station 2 on communication

(S503), and the antenna pattern change machine 26 switches the directivity of the antenna 21 so that it may become the antenna pattern.
The power measurement machine 31 measures the electric power of the signal of the peripheral base stations 3 and 4 received in the switched antenna pattern (S504), and sends a power measurement result to the base station list creation machine 33.
[0082]
The base station list creation machine 33 creates the base station list 50 based on the electric power of the power measurement result 3 and 4 received from the power measurement machine 31, i.e., peripheral base stations, (S505), and transmits this base station list 50 to the mobile station 2 (S506). The mobile station 2 tries a handover based on the base station list 50 received from the base station 1 (S507).
[0083]
Thus, according to this example of the 5th operation, the mobile station 2 transmits a base station list Request to Send to the base station 1 spontaneously, and a handover is performed based on the base station list 50 sent from the base station 1 in the form which responds to this demand. That is, since the base station list 50 is read from creation or a memory in the base station 1 and it sends to the mobile station 2 when the mobile station 2 needs the handover, a wireless communication with the base station 1 decreases further, and a handover can be performed more efficiently. That is, since the base station list 50 is created and it transmits only when there is a demand from the mobile station 2 side, unnecessary communications can be reduced and power consumption reduction of the mobile station 2 can be performed.
[0084]
The present invention is not limited to the above-mentioned embodiment as it is, and in an execution phase, in the range which does not deviate from the summary, a component is deformed and shape can be taken. □arious invention can be formed with a proper combination of two or more components currently disclosed in the above-mentioned embodiment. For example, some components may be deleted from all the components shown in an embodiment. The component covering a different embodiment may be combined suitably.
[Brief Description of the Drawings]
[0085]
[Drawing 1]The block diagram showing the composition of the wireless communication system of an embodiment of the invention.
[Drawing 2]The composition **** figure of the base station of the wireless communication system of Fig.1.
[Drawing 3]The figure showing the composition of the base station list creation machine of the base station of Fig.2.
[Drawing 4]The figure showing a base station list.
[Drawing 5]The flow chart which shows the example of the 1st operation of this wireless communication system.
[Drawing 6]The flow chart which shows the example of the 2nd operation of this wireless communication system.
[Drawing 7]The flow chart which shows the example of the 3rd operation of this wireless communication system.
[Drawing 8]The flow chart which shows the example of the 4th operation of this wireless communication system.
[Drawing 9]The figure showing a base station history management table.
[Drawing 10]The flow chart which shows the example of the 5th operation of this wireless communication system.
[Explanations of letters or numerals]
[0086]
1 -- base station, 2 -- mobile station, 3 -- peripheral base station, 4 -- peripheral base station, 21 -- antenna, 21 -- each antenna, 22 -- wireless section, 23 -- digital converter (ADC), 24 -- antenna pattern selector, 25 -- multiplier, 26 -- antenna pattern change machine, 27 -- adding machine, 28 -- demodulator, 29 -- base station history acquisition machine, 30 -- receiving base

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station judging device, 31 -- power measurement machine, 32 -- traffic measurement machine, 33 -- base station Liszt creation machine, 34 -- modulator, 35 -- digital-analog converter (DAC), 36 -- wireless section, 37 -- antenna, 40 -- switch, 41 -- the 1st quality calculation machine, 42 -- the 2nd quality calculation machine, 43 -- the 3rd quality calculation machine, 44 -- the 4th quality calculation machine, and 45 and 46, 47 -- multiplier, 48 -- memory, 49 -- the Liszt creation machine, 50 -- base station Liszt, 71 -- base station history management table.

[Translation done.]

* NOTICES *

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TECHNICAL FIELD

[Field of the Invention]
[0001]
The present invention relates to the base station device used for the wireless communication system etc. which communicate while a mobile station performs a handover.

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PRIOR ART

[Background of the Invention]
[0002]
It consists of two or more base stations and one or more mobile stations, and in the wireless communication system which attains desired communication by connecting with any one of the at least two or more base stations, each mobile station becomes indispensable [a handover], in order that a mobile station may maintain good communication quality.
[0003]
The function of a handover comprises two processings of processing in which compare the processing which generally searches a different base station from the base station under connection with the searched base station and the base station connected now, and communication quality chooses a good base station. About the processing which searches the 1st base station between these two processings, when a base station transmits the list of peripheral base stations to a mobile station, it is known that that processing will be reducible.
[0004]
In order for a base station to acquire the information on a peripheral base station, there are a method of installing a base station intentionally previously, for example, and inputting mutual information, a method of investigating mutual positional relationship by exchanging information in base stations, etc. The method of investigating a peripheral base station is also known by asking him to teach the history of the base station connected to the past from a mobile station.
[0005]
In a base station [in / as this kind of advanced technology / a cell method radiotelephone system], By transmitting the information on other base stations to a mobile station on the assumption that the information on other surrounding base stations is perceived, the handover point candidate of a mobile station is limited and the technology which simplifies handover processing is already devised (for example, see Patent Document 1).
[0006]
About how to acquire the information on a surrounding base station, the method of investigating the information on a peripheral base station is known by receiving the history of the base station connected to the past from a mobile station (for example, see Patent Document 2).
[Patent document 1] JP,H6-77888,A
[Patent document 2] JP,2003-258900,A

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EFFECT OF THE INVENTION

[Effect of the Invention]
[0012]
As described above, according to the present invention, the power consumption of a mobile station can be reduced.

[Translation done.]

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TECHNICAL PROBLEM

[Problem to be solved by the invention]
[0007]
However, the incorrect notice which transmits the peripheral base station where the method of a gap to describe above is also placed at the south of a base station to the mobile station which is placed, for example at the north of a base station from the information on a direction not being included in the information on a peripheral base station as a handover point candidate may take place.
In this case, a mobile station will perform processing which evaluates communication quality to a handover point candidate's notified base station, i.e., the base station which cannot serve as the handover point, and had the problem of consuming useless electric power.
[0008]
It was made in order that the present invention might solve such problem, and it aims at providing the base station device which can reduce the power consumption of a mobile station.

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MEANS

[Means for solving problem]
[0009]
In order that the present invention may solve the above-mentioned problem, the base station device of the present invention, Electric power which received and acquired an electric wave from a surrounding base station device during communication with a mobile station is measured, and a base station device which creates communication quality information for the aforementioned mobile station to perform band OBA to a base station device of the aforementioned periphery, and transmits to the aforementioned mobile station is characterized by comprising the following:
An antenna which receives an electric wave from the aforementioned mobile station and a surrounding base station device.
A directive variable means into which the directivity of the aforementioned antenna is changed.
A selection means which selects the directivity of the aforementioned antenna which changes the directivity of an antenna by the aforementioned directive variable means, and becomes good [communication quality] to a mobile station under communication.
A power measurement means to measure the electric power of the base station device of the aforementioned periphery with the aforementioned antenna made into the directivity selected by the aforementioned selection means, A communication-quality-information preparing means which creates communication quality information for every base station device of the aforementioned periphery based on electric power of a base station device of the aforementioned periphery measured by the aforementioned power measurement means, A means to transmit communication quality information for every base station device of the aforementioned periphery created by the aforementioned communication-quality-information preparing means to the aforementioned mobile station under aforementioned communication.

[0010]
The present invention measures again the electric power obtained by the base station device of the present invention receiving the electric wave from a surrounding base station device during communication with a mobile station, A base station device which creates communication quality information for the aforementioned mobile station to perform band OBA to a base station device of the aforementioned periphery, and transmits to the aforementioned mobile station is characterized by comprising:
An antenna which receives an electric wave from the aforementioned mobile station and a surrounding base station device.
A directive variable means into which the directivity of the aforementioned antenna is made to change.
A means by which the directivity of an antenna is changed by the aforementioned directive variable means, and communication quality chooses first directivity that becomes good, and indirectional second directivity to a mobile station under communication.
A first power measurement means to measure the electric power of the base station device of the aforementioned periphery with the aforementioned antenna made into the first directivity

chosen [aforementioned], A second power measurement means to measure electric power of a base station device of the aforementioned periphery with the aforementioned antenna made into second directivity chosen [aforementioned], A communication-quality-information preparing means which creates communication quality information for every base station device of the aforementioned periphery based on electric power of a base station device of the aforementioned periphery measured, respectively by above-mentioned first power measurement means and a second power measurement means, A means to transmit communication quality information for every base station device of the aforementioned periphery created by the aforementioned communication-quality-information preparing means to the aforementioned mobile station under aforementioned communication.

[0011]
In the present invention, a mobile station and the base station device under communication, Since the directivity of an antenna is changed so that communication quality may become good to the mobile station under communication, the information on the peripheral base station which considered the direction of a peripheral base station for every mobile station is put on a base station list and it transmits to a mobile station, The mobile station can perform a handover now to the base station of the direction for which it was suitable as the handover point, and needs to cease to perform vainly processing which evaluates communication quality to the base station of a wrong direction, i.e., the base station which cannot serve as the handover point. As a result, the mobile station can perform now a base station and communication suitable for communication efficiently.

[Translation done.]

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DESCRIPTION OF DRAWINGS

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[Translation done.]

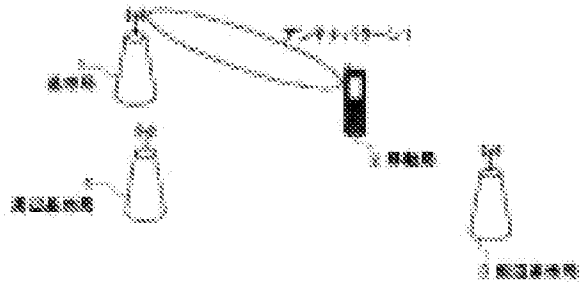
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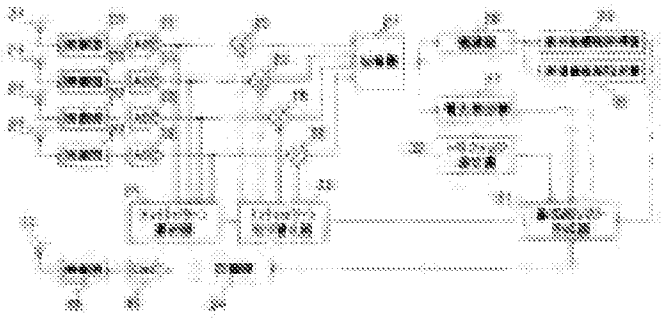
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DRAWINGS

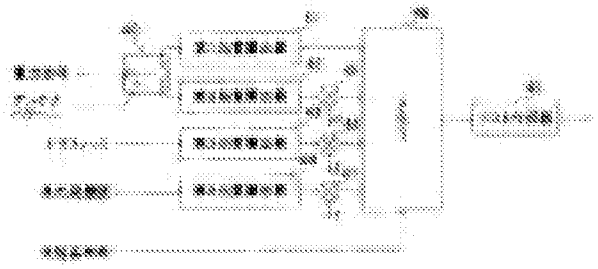
[Drawing 1]



[Drawing 2]



[Drawing 3]

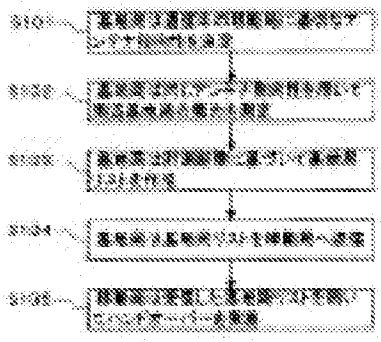


[Drawing 4]

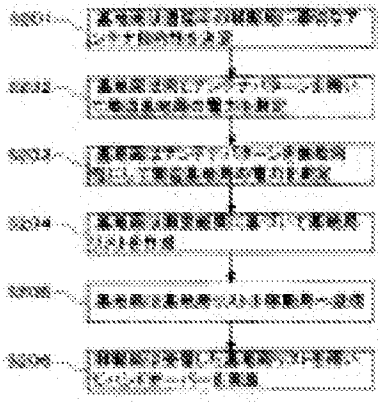
50 基地局リスト

基地局特定情報	通信品質情報
基地局1	品質1
基地局2	品質2
⋮	⋮

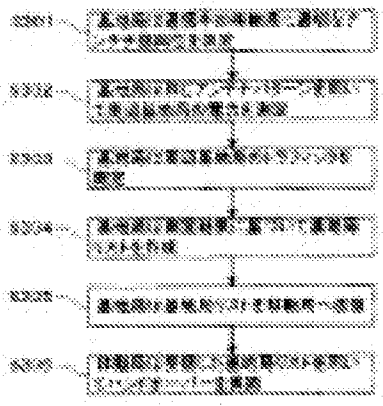
[Drawing 5]



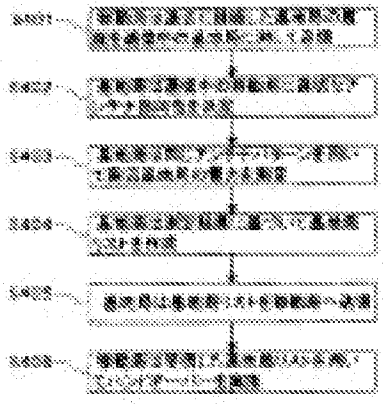
[Drawing 6]



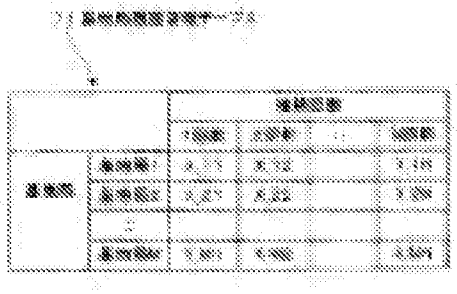
[Drawing 7]



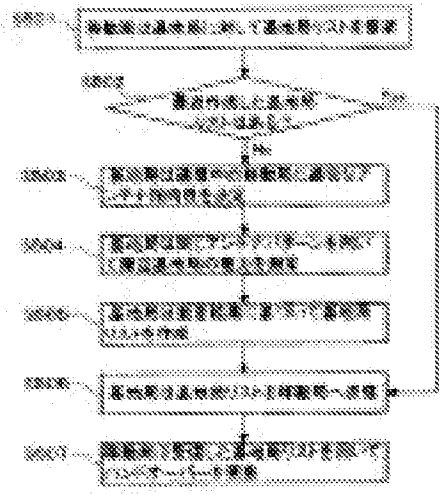
[Drawing 8]



[Drawing 9]



[Drawing 10]



[Translation done.]

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2006-086910
(43)Date of publication of application : 30.03.2006

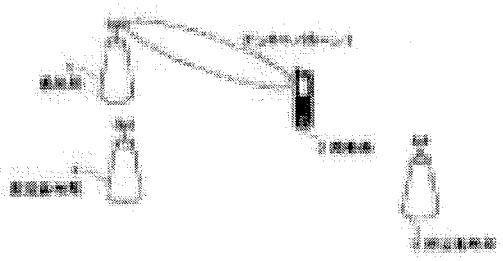
(51)Int.Cl. *H04B 7/26 (2006.01)*
H04Q 7/22 (2006.01)

(21)Application number : 2004-270713
(22)Date of filing : 17.09.2004

(71)Applicant : TOSHIBA CORP
(72)Inventor : AKITA KOJI
OGURA KOJI

(54) BASE STATION DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a base station device capable of reducing power consumption of a mobile station.
SOLUTION: The base station device 1 of a radio communication system has: an antenna 21 which receives radiowaves from the mobile station 2 and surrounding base stations; an antenna pattern switch 26 as a directivity variable means for varying directivity of the antenna 21; an antenna pattern selector 24 which selects the directivity of the antenna 21 in which communication quality becomes successful to the mobile station under communication by varying the directivity of the antenna; a power measuring instrument 31 which measures power of the surrounding base stations 3, 4 by the antenna 21 set to the selected directivity; a base station list creation device 33 which creates a base station list based on the measured power of the surrounding base stations 3, 4 and a means (such as a modulator 34, a DAC 35, a radio part 36) for transmitting the base station list to the mobile station 2 under the communication.



(19)日本国特許庁(JP)　(12)公開特許公報(A)　(11)特許出願公開番号
特開2006-86910
(P2006-86910A)
(43)公開日　平成18年3月30日(2006.3.30)

(51)Int.Cl.			F I			テーマコード（参考）
H04B	7/26	(2006.01)	H04B	7/26	B	5K067
H04Q	7/22	(2006.01)	H04B	7/26	107	

審査請求 有　請求項の数 5　OL　（全 15 頁）

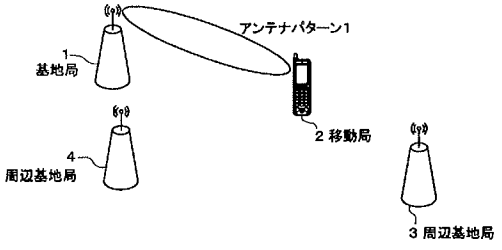
(21)出願番号　特願2004-270713 (P2004-270713)
(22)出願日　平成16年9月17日 (2004.9.17)

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Fターム(参考)　5K067 AA43　DD44　DD45　EE02　EE10
EE24　JJ39　KK02

(54)【発明の名称】基地局装置

(57)【要約】　（修正有）
【課題】移動局の消費電力を低減する。
【解決手段】この無線通信システムの基地局装置１は、移動局２および周辺基地局より電波を受信するアンテナ２１と、アンテナ２１の指向性を可変する指向性可変手段としてのアンテナパターン切り替え器２６と、アンテナの指向性を可変して通信中の移動局に対して通信品質が良好となるアンテナ２１の指向性を選定するアンテナパターン選択器２４と、選定された指向性としたアンテナ２１により周辺基地局３，４の電力を測定する電力測定器３１と、測定された周辺基地局３，４の電力に基づいて基地局リストを作成する基地局リスト作成器３３と、基地局リストを通信中の移動局２へ送信する手段（変調器３４、ＤＡＣ３５、無線部３６等）とを備える。
【選択図】図１



【特許請求の範囲】
【請求項１】
移動局と通信中に、周辺の基地局装置からの電波を受信して得た電力を測定して、前記移動局が前記周辺の基地局装置へバンドオーバを行うための通信品質情報を作成し前記移動局へ送信する基地局装置において、
前記移動局および周辺の基地局装置より電波を受信するアンテナと、
前記アンテナの指向性を可変する指向性可変手段と、
前記指向性可変手段によりアンテナの指向性を可変して通信中の移動局に対して通信品質が良好となる前記アンテナの指向性を選定する選定手段と、
前記選定手段により選定された指向性とした前記アンテナにより前記周辺の基地局装置の電力を測定する電力測定手段と、
前記電力測定手段により測定された前記周辺の基地局装置の電力に基づいて前記周辺の基地局装置毎の通信品質情報を作成する通信品質情報作成手段と、
前記通信品質情報作成手段により作成された前記周辺の基地局装置毎の通信品質情報を前記通信中の前記移動局へ送信する手段と
を具備したことを特徴とする基地局装置。
【請求項２】
移動局と通信中に、周辺の基地局装置からの電波を受信して得た電力を測定して、前記移動局が前記周辺の基地局装置へバンドオーバを行うための通信品質情報を作成し前記移動局へ送信する基地局装置において、
前記移動局および周辺の基地局装置より電波を受信するアンテナと、
前記アンテナの指向性を可変させる指向性可変手段と、
前記指向性可変手段によりアンテナの指向性を可変して通信中の移動局に対して通信品質が良好となる第１の指向性と無指向性の第２の指向性とを選択する手段と、
前記選択された第１の指向性とした前記アンテナにより前記周辺の基地局装置の電力を測定する第１の電力測定手段と、
前記選択された第２の指向性とした前記アンテナにより前記周辺の基地局装置の電力を測定する第２の電力測定手段と、
前記第１の電力測定手段及び第２の電力測定手段によりそれぞれ測定された前記周辺の基地局装置の電力に基づいて前記周辺の基地局装置毎の通信品質情報を作成する通信品質情報作成手段と、
前記通信品質情報作成手段により作成された前記周辺の基地局装置毎の通信品質情報を前記通信中の前記移動局へ送信する手段と
を具備したことを特徴とする基地局装置。
【請求項３】
請求項１，２いずれか１記載の基地局装置において、
前記周辺の基地局装置のトラフィックを測定するトラフィック測定手段を備え、
前記通信品質情報作成手段は、
前記電力測定手段により測定された前記周辺の基地局装置の電力と前記トラフィック測定手段により測定された前記周辺の基地局装置のトラフィックとを基に前記周辺の基地局装置毎の通信品質情報を作成することを特徴とする基地局装置。
【請求項４】
請求項１，２いずれか１記載の基地局装置において、
前記移動局が作成した過去に接続した基地局装置の通信履歴を前記移動局より取得する手段を備え、
前記通信品質情報作成手段は、
前記電力測定手段により測定された前記周辺の基地局装置の電力と前記移動局より受信された通信履歴とを基に前記周辺の基地局装置毎の通信品質情報を作成することを特徴と

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請求項１，２いずれか１記載の基地局装置において、
前記移動局より送信された通信品質情報の取得要求を受信する手段を備え、
前記通信品質情報作成手段は、
前記移動局より通信品質情報の取得要求が受信されたときに前記周辺の基地局装置毎の通信品質情報を作成することを特徴とする基地局装置。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、移動局がハンドオーバを行いながら通信する無線通信システム等に用いられる基地局装置に関する。
【背景技術】
【０００２】
複数の基地局と１つ以上の移動局とからなり、各移動局は少なくとも２つ以上の基地局のいずれか１つと接続することによって所望の通信を達成する無線通信システムにおいては、移動局が良好な通信品質を保つためにハンドオーバが必須となる。
【０００３】
ハンドオーバの機能は、一般に、接続中の基地局とは異なる基地局を探索する処理と、探索した基地局と現在接続している基地局を比較して通信品質が良好な基地局を選択する処理の２つの処理から構成される。この２つの処理のうち１つ目の基地局を探索する処理については、基地局が周辺基地局のリストを移動局に対して送信することにより、その処理を削減できることが知られている。
【０００４】
基地局が周辺基地局の情報を取得するには、例えば予め基地局を計画的に設置し相互の情報を入力しておく方法や、基地局どうしで情報をやりとりすることで相互の位置関係を調べる方法などがある。また、移動局から過去に接続した基地局の履歴を教えてもらうことにより、周辺基地局を調べる方法も知られている。
【０００５】
この種の先行技術としては、セル方式無線電話システムにおける基地局において、周辺の他の基地局の情報を感知していることを前提とし、他の基地局の情報を移動局に送信することにより、移動局のハンドオーバ先候補を限定し、ハンドオーバ処理を簡易にする技術が既に考案されている（例えば特許文献１参照）。
【０００６】
また、周辺の基地局の情報を得る方法については、移動局から過去に接続した基地局の履歴を受け取ることにより周辺基地局の情報を調べる方法が知られている（例えば特許文献２参照）。
【特許文献１】特開平６-７７８８８号公報
【特許文献２】特開２００３-２５８９００号公報
【発明の開示】
【発明が解決しようとする課題】
【０００７】
しかしながら、上記したいずれの方法も、周辺基地局の情報には方向の情報が含まれていないことから、例えば基地局の北に位置する移動局に対して、基地局の南に位置する周辺基地局をハンドオーバ先候補として伝えてしまう、誤通知が起こり得る。
この場合、移動局は、通知されたハンドオーバ先候補の基地局、つまりハンドオーバ先となり得ない基地局に対して通信品質を評価する処理を行うことになり、無駄な電力を消費してしまうという問題があった。
【０００８】
本発明はこのような課題を解決するためになされたもので、移動局の消費電力を低減す

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【０００９】
上記した課題を解決するために、本発明の基地局装置は、移動局と通信中に、周辺の基地局装置からの電波を受信して得た電力を測定して、前記移動局が前記周辺の基地局装置へバンドオーバを行うための通信品質情報を作成し前記移動局へ送信する基地局装置において、前記移動局および周辺の基地局装置より電波を受信するアンテナと、前記アンテナの指向性を可変する指向性可変手段と、前記指向性可変手段によりアンテナの指向性を可変して通信中の移動局に対して通信品質が良好となる前記アンテナの指向性を選定する選定手段と、前記選定手段により選定された指向性とした前記アンテナにより前記周辺の基地局装置の電力を測定する電力測定手段と、前記電力測定手段により測定された前記周辺の基地局装置の電力に基づいて前記周辺の基地局装置毎の通信品質情報を作成する通信品質情報作成手段と、前記通信品質情報作成手段により作成された前記周辺の基地局装置毎の通信品質情報を前記通信中の前記移動局へ送信する手段とを具備したことを特徴とする。

【００１０】
また本発明の基地局装置は、移動局と通信中に、周辺の基地局装置からの電波を受信して得た電力を測定して、前記移動局が前記周辺の基地局装置へバンドオーバを行うための通信品質情報を作成し前記移動局へ送信する基地局装置において、前記移動局および周辺の基地局装置より電波を受信するアンテナと、前記アンテナの指向性を可変させる指向性可変手段と、前記指向性可変手段によりアンテナの指向性を可変して通信中の移動局に対して通信品質が良好となる第１の指向性と無指向性の第２の指向性とを選択する手段と、前記選択された第１の指向性とした前記アンテナにより前記周辺の基地局装置の電力を測定する第１の電力測定手段と、前記選択された第２の指向性とした前記アンテナにより前記周辺の基地局装置の電力を測定する第２の電力測定手段と、前記第１の電力測定手段及び第２の電力測定手段によりそれぞれ測定された前記周辺の基地局装置の電力に基づいて前記周辺の基地局装置毎の通信品質情報を作成する通信品質情報作成手段と、前記通信品質情報作成手段により作成された前記周辺の基地局装置毎の通信品質情報を前記通信中の前記移動局へ送信する手段とを具備したことを特徴とする。

【００１１】
本発明では、移動局と通信中の基地局装置は、通信中の移動局に対して通信品質が良好となるようにアンテナの指向性を可変し、移動局毎に周辺基地局の方向を加味した周辺基地局の情報を基地局リストに載せて移動局へ送信するので、移動局は、ハンドオーバ先として適した方向の基地局へハンドオーバを行えるようになり、方向違いの基地局、つまりハンドオーバ先となり得ない基地局に対して通信品質を評価する処理を無駄に行わずに済むようになる。この結果、移動局は、通信に適した基地局と通信を効率的に行えるようになる。

【発明の効果】

【００１２】
以上説明したように本発明によれば、移動局の消費電力を低減することができる。

【発明を実施するための最良の形態】

【００１３】
以下、図面を参照しながら本実施の形態について詳細に説明する。
まず、本発明に係る無線通信システムの構成について説明する。図１はこの実施形態の無線通信システムの構成を示す図、図２は図１の無線通信システムの基地局の構成を示す図、図３は基地局の基地局リスト作成器の構成を示す図、図４は基地局リストを示す図である。

【００１４】
図１に示すように、この実施形態の無線通信システムは、基地局装置として基地局１と、この基地局１の周辺に点在して配置された少なくとも一つの周辺基地局（周辺基地局３

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りも通信品質のよいハンドオーバ先へハンドオーバを行う移動局２とから構成されている。

【００１５】

基地局１は、図２に示すように、移動局２、周辺基地局３および周辺基地局４より電波を受信するアンテナ２１と、それぞれアンテナ２１を通じて信号を受信する複数の無線部２２と、これら無線部２２によりそれぞれ受信されたアナログの受信信号をデジタル信号に変換するアナログ／デジタル変換器２３（アナログ／デジタルコーデック：以下ＡＤＣ２３と称す）と、これらＡＤＣ２３からの信号からアンテナパターンを選択するアンテナパターン選択器２４と、各アンテナ２１により受信された信号に対してウェイトをかける複数の乗算器２５と、アンテナパターン選択器２４により選択されたアンテナパターンへ切り替えるように各乗算器２５を制御するアンテナパターン切り替え器２６と、複数の乗算器２５から入力される信号を加算する加算器２７と、復調器２８と、基地局履歴取得器２９と、受信基地局判定器３０と、電力測定器３１と、トラフィック測定器３２と、基地局リスト作成器３３と、変調器３４と、デジタルアナログ変換器３５（デジタル／アナログコーデック：以下ＤＡＣ３５と称す）と、このＤＡＣ３５により変換された送信用のアナログ信号をアンテナ３７を通じて送信する無線部３６とを備えている。なお、他の周辺基地局３，４についても上記とほぼ同様の構成である。

【００１６】

アンテナパターン選択器２４は、通信中の移動局２に対して通信状態がよくなるウェイトを計算して出力する。アンテナパターン選択器２４により行われるアンテナパターンの選択とは、上記ウェイトを計算することである。通信中の移動局２に対して通信状態がよくなるウェイトを計算する方法としては、例えば最大比合成などを用いる。こうして計算されたウェイトがアンテナパターン切り替え器２６へ出力される。無指向性のアンテナパターンを生成する場合は、複数のアンテナ２１のうち１つを無指向性なものにし、この一つのアンテナ以外のアンテナに対応するウェイトを全て０にすることで実現する。

【００１７】

つまり、アンテナパターン選択器２４は、アンテナパターン切り替え器２６がアンテナ２１の指向性を可変して通信中の移動局に対して通信品質が良好となるアンテナ２１の指向性であるアンテナパターンを選定する選定手段として機能する。

【００１８】

アンテナパターン切り替え器２６は、アンテナパターン選択器２４から受け取ったウェイトを乗算器２５へ出力する。アンテナパターン切り替え器２６は、各乗算器２５へ出力するウェイトを切り替えることで、復調器２８に入力される信号のアンテナパターンをさまざまに可変する。加算器２７には、ウェイトを乗算された信号が入力される。

【００１９】

加算器２７は、各乗算器２５から入力された信号を加算合成することによりアンテナパターンの切り替えを行う。つまり、アンテナパターン切り替え器２６、乗算器２５、加算器２７は、アンテナ２１の指向性であるアンテナパターンを可変する指向性可変手段として機能する。

【００２０】

電力測定器３１は、加算器２７から出力される信号の２乗和をとることにより、信号電力を測定する。つまり、電力測定器３１は、アンテナパターン選択器２４により選定された指向性としたアンテナ２１により周辺基地局３，４の電力を測定する電力測定手段として機能する。

【００２１】

また、電力測定器３１は、指向性可変手段により生成された第１の指向性としたアンテナ２１により周辺基地局３，４の電力を測定する第１の電力測定手段と、指向性可変手段により生成された第２の指向性としたアンテナ２１により周辺基地局３，４の電力を測定

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トラフィック測定器３２は、電力測定器３１から出力される電力を一定期間モニタリングして、電力が予め設定された所定の閾値を超える時間の割合を求めることで、トラフィックを測定する。

【００２３】

基地局リスト作成器３３は、電力測定器３１で測定された電力とその電力が測定された基地局との関連付けを行う。基地局リスト作成器３３は、トラフィック測定器３２により測定されたトラフィックがどの基地局に対応するものなのかを判定する。基地局リスト作成器３３は、電力測定器３１により測定された周辺基地局３，４の電力に基づいて周辺基地局３，４毎の通信品質情報を作成する通信品質情報作成手段として機能する。

【００２４】

基地局履歴取得器２９は、復調器２８から入力されたデータ（移動局２から受信されたデータ）の中から移動局２が過去に基地局と接続した通信履歴データ（基地局履歴）を抽出して出力する。基地局履歴は、移動局２と基地局１間で通信されるデータの中に埋め込まれて移動局２から送信され、基地局１に受信される。

【００２５】

受信基地局判定器３０は、現在受信している信号がどの基地局のものなのかを判定すると基地局同定手段として機能する。基地局が受信した信号のデータの一部には、これを送信した基地局に対応する情報が含まれており、受信基地局判定器３０は、この情報を取り出すことにより基地局を同定する。ここで同定した基地局を基地局リスト作成器３３へ出力ことにより、電力やトラフィックといったデータがどの基地局に対応したものなのかを同定できる。

【００２６】

基地局リスト作成器３３は、図３に示すように、スイッチ４０、複数の品質算出手段（第１品質算出器４１、第２品質算出器４２、第３品質算出器４３、第４品質算出器４４）と、第２品質算出器４２に入力された電力により通信品質を算出した結果と重み付け値αとを乗算する乗算器４５と、第３品質算出器４３に入力されたトラフィックにより通信品質を算出した結果と重み付け値βとを乗算する乗算器４６と、第４品質算出器４４に入力された基地局履歴により通信品質を算出した結果と重み付け値γとを乗算する乗算器４７と、各周辺基地局との通信品質算出結果の一覧表である基地局リストを保存するメモリ４８と、このメモリ４８より基地局リストを読み出して出力するリスト作成器４９とを備えている。

【００２７】

スイッチ４０には、電力信号が入力される。スイッチ４０は、アンテナパターン切り替え器２６から通知されたアンテナパターンが無指向性に対応するものであった場合には、第１品質算出器４１へ、そうでない場合には、第２品質算出器４２へ電力信号を出力する。

第１品質算出器４１は、入力された電力信号に基づき通信品質を算出する。第２品質算出器４２は、入力された電力信号に基づき通信品質を算出する。第３品質算出器４３は、周辺基地局３，４のトラフィックに基づき通信品質を算出する。第３品質算出器４３は、周辺基地局３，４のトラフィックを測定するトラフィック測定手段として機能する。第４品質算出器４４は、移動局２から受信された基地局履歴に基づき通信品質を算出する。上記アンテナ２１、無線部２２、ＡＤＣ２３、基地局履歴取得器２９、第４品質算出器４４等は、移動局２が作成した過去に接続した基地局の通信履歴を移動局２より取得する手段として機能する。

【００２８】

基地局リスト作成器３３には、基地局リストを保存するためのメモリ４８が設けられている。このメモリ４８には、周辺基地局３，４を同定するための情報と、その基地局３，４の品質を示す情報が対応付けられて保存されている。

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と、基地局リスト作成器３３では、それぞれに対応する品質算出器４１～４４によって品質情報に変換されてメモリ４８に記憶される。

【００３０】

第１品質算出器４１以外の品質算出器、つまり第２品質算出器４２～第４品質算出器４４から出力される品質については、それぞれ重み付け値α、β、γをかけた結果とする。このようにすることで、それぞれの品質算出器４１～４４から出力される品質に対して重要度に応じた重み付けを行うことができる。

【００３１】

メモリ４８には、これらの品質情報と同時に、受信基地局を同定するための情報も入力される。メモリ４８内にこの基地局が含まれる場合には、その基地局に対応する品質を更新する。メモリ４８内にこの基地局が含まれていない場合には新たに基地局を登録する。以上のようにして基地局リスト保存用のメモリ４８内のデータを更新する。

【００３２】

リスト作成器４９は、基地局リスト保存用のメモリ４８内の全てのデータ、または上位一部のデータを取り出してリストを生成し、このデータを変調器３４へ送る。このデータは変調器３４によって変調された後、ＤＡＣ３５によりアナログ信号に変換され、無線部３６及びアンテナ３７によって移動局２へ送信される。つまり、変調器３４、ＤＡＣ３５、無線部３６及びアンテナ３７は、作成された基地局リスト５０（図４参照）を通信中の移動局２へ送信する手段として機能する。

【００３３】

図４に示すように、基地局リスト５０は、自局から電波を受信可能な基地局毎にそれぞれの通信品質情報が記憶された通信品質管理テーブルである。基地局特定情報とは、例えばＩＰアドレス、ＭＡＣアドレス、基地局識別情報（ＢＳＳＩＤ）といった固有のＩＤ、使用している周波数情報、使用している拡散符号、同期に必要なタイミング情報などがあげられる。また、この基地局特定情報は、基地局１が周辺基地局３、４の電力を測定する際に合わせて取得する。

【００３４】

通信品質情報とは、測定した電力値をそのまま用いてもよく、また値を間引くことによって圧縮した情報を用いてもよく、通信品質の優劣の順番を示す値を用いてもよい。

【００３５】

続いて、図５を参照してこの無線通信システムの動作を説明する。図５はこの無線通信システムの第１動作例を示すフローチャートである。

【００３６】

基地局１では、複数のアンテナ２１で受信される信号に基づいて乗算器２５でウェイトをかけることで、アンテナ２１の指向性パターン（以下アンテナパターンという）を変えつつ、移動局２から受信された信号の電力を測定することで、通信中の移動局２に対して通信品質が良好となるアンテナパターンを選定する。

【００３７】

つまり、基地局１では、アンテナパターン選択器２４が、通信中の移動局２に適切なアンテナ２１の指向性（アンテナパターン）を決定し（図５のＳ１０１）、アンテナパターン切り替え器２６は、その決定したアンテナパターンとなるように乗算器２５のウェイトを可変することで、アンテナ２１の指向性を切り替える。

【００３８】

アンテナパターンを切り替える方法としては、この例のように複数のアンテナ２１からの受信信号を重み付け合成することにより行う方法の他、アンテナ２１自体に指向性があるもの複数用意し、これを切り替えることによって行う方法や、アンテナ２１自体に指向性があるものを１つ用意して、このアンテナ２１の向きを物理的に変えることで行う方法などがある。

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ては、複数のアンテナパターンを切り替えて通信品質を比較することによって最良のパターンを見つけ出す方法がある。

【００４０】

複数のアンテナ２１からの受信信号を重み付け合成する場合には、各アンテナ２１から受信した信号を用いて重み付け合成後の信号の受信特性がよくなるように重みを計算することで通信品質が良好となるアンテナパターンを選択（選定）する。受信特性がよくなるように重みを計算する方法としては、例えば最大比合成などの技術を用いる。

【００４１】

このようにして基地局１のアンテナパターン選択器２４が、通信中の移動局２に対して適切なアンテナパターンを決定し、アンテナパターン切り替え器２６が、各乗算器２５へのウェイトを可変してアンテナ２１の指向性を、決定したアンテナパターンへ切り替えると、次に電力測定器３１は、そのアンテナパターンにて周辺基地局３，４の電力を測定する（Ｓ１０２）。

【００４２】

一般に基地局１は、自局（この基地局１）に接続している全移動局２に対して制御情報といった情報をブロードキャスト通信する。例えば８０２．１１の無線ＬＡＮではビーコンパケットがブロードキャストされる。また、Ｗ-ＣＤＭＡではＣＰＩＣＨというチャネルがブロードキャストされる。こういったブロードキャストされる情報を周辺基地局３，４から受信することにより、電力測定器３１は、周辺基地局３，４の電力を測定する。

【００４３】

なお、周辺基地局と搬送周波数が異なる場合には、周波数を切り替えて受信を行うことにより周辺基地局の電力を測定する。周辺基地局と搬送周波数が同じで符号分割多重されている場合には、周波数を切り替えずに受信し、デジタル信号処理により周辺基地局からの信号を分離し電力を測定する。

【００４４】

このようにして測定した周辺基地局３，４の電力は、通信中の移動局２に対してアンテナパターンを向けた状態で測定した電力であるため、この移動局２に近い周辺基地局ほど高い電力が観測される。例えば図１では、基地局１は通信中の移動局２に対してアンテナパターン１を選択し、このアンテナパターン１を用いて周辺基地局３と周辺基地局４の電力を測定する。図１の例では、アンテナパターン１が通信中の移動局２の方向を向いているので、周辺基地局４よりも周辺基地局３の電力の方が高く観測されることが予想される。ここで測定したデータと、基地局１を特定する情報とを組み合わせて基地局リスト５０（図４参照）を作成する（Ｓ１０３）。

【００４５】

このようにして基地局リスト作成器３３で作成された基地局リスト５０は、内部のメモリ４８に記憶された後、リスト作成器４９により所定のタイミングで読み出されて、基地局リスト作成器３３から変調器３４、ＤＡＣ３５、無線部３６、アンテナ３７という順に送られて、基地局１から通信中の移動局２へ送信される（Ｓ１０４）。

【００４６】

基地局リスト５０を送信する手段としては、基地局リスト５０を送信する専用の送信部を用いてもよく、また、通常の通信手段にて他のデータや制御情報を送る際にこれらの情報と共に送信してもよい。基地局リスト５０を送信するタイミングは、定期的であってもよく、電力測定器３１が電力測定を行った結果、移動局２との通信品質が低下したと判定したときでもよい。また、メモリ４８の基地局リスト５０を更新するタイミングは、基地局リスト５０を送信する直前が望ましいが、これができない場合は、事前に基地局リスト５０を作成しておいてもよい。

【００４７】

移動局２が基地局リスト５０を受信すると、移動局２は、この基地局リスト５０に基づ

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対してのみハンドオーバを試みてもよい。いずれにしても、受信された基地局リスト５０の通信品質情報に基づいて通信品質の良好なものから順にハンドオーバを試みる。

【００４８】

移動局２がハンドオーバを試みるタイミングは、基地局リスト５０を受信した直後でもよく、現在接続中の基地局１との通信品質が低下したことが検知されたときでもよい。

【００４９】

このようにこの第１動作例によれば、基地局１から移動局２へ、方向を加味して作成した周辺基地局３，４毎の通信品質情報である基地局リスト５０が送られ、この基地局リスト５０を受信した移動局２は、通信品質の高い周辺基地局３をハンドオーバ先の候補としてハンドオーバを試みるので、ハンドオーバ先となる可能性が低い周辺基地局４についてハンドオーバを試みることがなくなり、ハンドオーバを効率的に行うことができ、移動局２の低消費電力化を行うことができる。なお、基地局１でスマートアンテナ等を用いることにより、周辺基地局３，４と連携することなく、移動局２との通信により精度よい基地局リスト５０を作成することができる。

すなわち、移動局２は、基地局１から受信した基地局リスト５０に基づいてハンドオーバを行うことで、ハンドオーバに関わる処理を削減でき、その結果、低消費電力化を実現できる。

【００５０】

次に、図６を参照してこの無線通信システムの第２動作例について説明する。図６はこの無線通信システムの第２動作例を示すフローチャートである。

【００５１】

この第２動作例では、基地局１では、アンテナパターン切り替え器２６およびアンテナパターン選択器２４が、はじめに、通信中の移動局２に対して適切な指向性のあるアンテナパターンを決定し（図６のＳ２０１）、アンテナ２１の指向性をそのアンテナパターンへ切り替える。電力測定器３１は、このアンテナパターンを用いて周辺基地局３，４の電力を測定する（Ｓ２０２）。なお、ここで測定した電力を、後で測定する電力と区別するために個別移動局用の周辺基地局電力と呼ぶことにする。

【００５２】

次に、アンテナパターン切り替え器２６およびアンテナパターン選択器２４は、アンテナ２１の指向性を、無指向性としたアンテナパターンへ切り替え、電力測定器３１は、無指向性のアンテナパターンにて周辺基地局３，４の電力を測定する（Ｓ２０３）。なお、ここで測定した電力を全移動局用の周辺基地局電力と呼ぶことにする。無指向性のアンテナパターンとは、全方向への利得がほぼ同じアンテナ、もしくは水平面３６０度の利得がほぼ同じアンテナを示す。

【００５３】

基地局リスト作成器３３は、このようにして取得した、個別移動局用の周辺基地局電力と全移動局用の周辺基地局電力から通信品質情報を作成する（Ｓ２０４）。個別移動局用の周辺基地局電力では、通信中の移動局２に対してアンテナパターンを向けた状態で測定した電力であるため、この移動局２に近い周辺基地局３ほど高い電力が観測される。

【００５４】

つまり、アンテナパターン切り替え器２６およびアンテナパターン選択器２４は、アンテナ２１の指向性を可変して通信中の移動局に対して通信品質が良好となる第１の指向性と無指向性の第２の指向性とを生成し、電力測定器３１は、それぞれの指向性で周辺基地局３，４の２つの電力を測定し、基地局リスト作成器３３は、２つの電力測定結果に基づいて周辺基地局３，４毎の通信品質情報である基地局リストを作成する。

【００５５】

しかしながら、アンテナパターンが向いていない方向に存在する基地局であっても、距離的に近くにあるものについては電力が強く見えてしまう場合がある。これに対し、全移

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【００５６】
すなわち、個別移動局用の周辺基地局電力が同じ値となる基地局が複数存在した場合、全移動局用の周辺基地局電力の小さい基地局の方が、移動局２の近くに存在する可能性が高いことになる。
【００５７】
このような判定結果に基づいて、例えば、まずは個別移動局用の周辺基地局電力に基づいて通信品質情報の値の設定または順位設定を行い、ここで差がでなかったものについては全移動局用の周辺基地局電力の小さい方の通信品質情報の値を上げるかまたは順位をあげるという方法が考えられる。
【００５８】
他にも、全移動局用の周辺基地局電力に重みをかけて個別移動局用の周辺基地局電力から引いたものを新たな電力値として扱い、これをもとに通信品質情報をつくる方法が考えられる。この場合も、新たな電力値をそのまま通信品質情報として用いてもよく、値を間引くことによって圧縮した情報を用いてもよく、通信品質の優劣の順番を示す値を用いてもよい。このようにして作成した通信品質情報と、基地局を特定する情報を組み合わせて基地局リスト５０を作成する。
【００５９】
このようにして作成した基地局リスト５０は、基地局１から移動局２へ送信される（Ｓ２０５）。
移動局２は、基地局１から受信した基地局リスト５０に基づいてハンドオーバを試みる（Ｓ２０６）。
【００６０】
このようにこの第２動作例によれば、アンテナパターン切り替え器２６およびアンテナパターン選択器２４は、アンテナ２１の指向性を可変して通信中の移動局に対して通信品質が良好となる第１の指向性と無指向性の第２の指向性とを生成し、電力測定器３１は、それぞれの指向性で周辺基地局３，４の２つの電力を測定し、基地局リスト作成器３３は、２つの電力測定結果に基づいて周辺基地局３，４毎の通信品質情報である基地局リストを作成することで、周辺基地局３，４と移動局２との方向差の同定精度が向上するので、第１動作例と比べてさらに精度のよい基地局リスト５０を作成できるので、ハンドオーバを効率的に行うことができ、移動局２の低消費電力化を行うことができる。
【００６１】
次に、この無線通信システムの第３動作例について説明する。図７はこの無線通信システムの第３動作例を示すフローチャートである。
【００６２】
この第３動作例の場合、基地局１では、アンテナパターン切り替え器２６およびアンテナパターン選択器２４が、はじめに、第１動作例と同様に、通信中の移動局２に対して適切なアンテナパターンを決定し（図７のＳ３０１）、電力測定器３１は、このアンテナパターンを用いて周辺基地局３，４の電力を測定する（Ｓ３０２）。
【００６３】
まて、基地局１では、第３品質算出器４３が、周辺基地局３，４のトラフィックを測定する（Ｓ３０３）。周辺基地局３，４のトラフィックを測定する方法は、例えば時分割多重されているシステムであれば、時間的にみて電力が強くなる割合を測定することでトラフィックを推定できる。また周波数分割多重されているシステムであれば、全帯域のうち電力が強くなっている帯域の割合を測定することでトラフィックを推定できる。
基地局リスト作成器３３は、このようにして取得した、周辺基地局の電力と周辺基地局のトラフィックから通信品質情報を作成する（Ｓ３０４）。
【００６４】
一般に、移動局２は、電力が強くなる基地局と接続することが望ましい。しかしながら

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と接続する方が通信品質を向上できることがある。

【００６５】

このようなケースを前提にして、基地局リスト作成器３３は、電力測定器３１により測定された周辺基地局３，４の電力に基づいて基地局リスト５０の通信品質情報の値の設定または順位設定を行い、ここで差が生じなかったものについてはトラフィックの小さい方の通信品質情報の値を上げるか、または順位を上げるという方法により差を出す。

【００６６】

他にも、トラフィックの大きさに重みをかけて周辺基地局３，４の電力から差し引いたものを新たな電力値として扱い、これを基に通信品質情報を作るといった方法が考えられる。この場合も、新たな電力値をそのまま通信品質情報として用いてもよく、値を間引くことによって圧縮した情報を用いてもよく、通信品質の優劣の順番を示す値を用いてもよい。

【００６７】

このようにして作成した通信品質情報と、基地局を特定する情報を組み合わせて基地局リスト５０を作成する。

このようにして基地局リスト作成器３３が作成した基地局リスト５０は、基地局リスト作成器３３から、変調器３４、ＤＡＣ３５、無線部３６という順に送られて、移動局２へ送信される（Ｓ３０５）。

移動局２は、受信した基地局リスト５０に基づいてハンドオーバを試みる（Ｓ３０６）。

【００６８】

このようにこの第３動作例によれば、周辺基地局３，４のトラフィックを測定するトラフィック測定手段としての第３品質算出器４３を備え、基地局リスト作成器３３は、電力測定器３１により測定された周辺基地局３，４の電力と第３品質算出器４３により測定された周辺基地局３，４のトラフィックとを基に周辺基地局３，４毎の通信品質情報を作成するので、距離的には近くてもトラフィックが多いせいで通信品質がよくならないといったケースを回避でき、第１動作例と比べてさらに精度のよい基地局リスト５０を作成できるので、ハンドオーバを効率的に行うことができ、移動局２の低消費電力化を行うことができる。

【００６９】

次に、図８，図９を参照してこの無線通信システムの第４動作例について説明する。図８はこの無線通信システムの第４動作例を示すフローチャート、図９はメモリ４８に設定される基地局履歴管理テーブルを示す図である。

【００７０】

この第４動作例では、移動局２が基地局１に対して接続する際、この移動局２が過去に接続していた基地局１，３，４などの接続履歴の情報をこれから接続する基地局１に対して送信する（図８のＳ４０１）。

基地局１では、基地局履歴取得器２９が、移動局２から受信して取得した接続履歴を基地局履歴としてメモリ４８の基地局履歴管理テーブル７１に保存する。

【００７１】

図９に示すように、基地局履歴管理テーブル７１は、基地局１に接続してきた全ての移動局２からの情報を一つにまとめて管理するためのテーブルであり、移動局が過去の通信履歴として基地局にどのくらい接続していたかを表している。

【００７２】

例えばある移動局２がこの基地局１に接続する際に、これよりも２つ前に他の基地局に接続していたものとすると、基地局履歴管理テーブル７１の「Ｘ＿１２」が１つインクリメントされる。基地局履歴管理テーブル７１の基地局履歴情報は、定期的にリセットしてもよく、バッファを規定して、これを超える情報については古いものから順に捨てるよ

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このようにして作成した基地局履歴管理テーブル７１の基地局履歴情報から、基地局１に対してハンドオーバをする可能性の高い周辺基地局が分かる。例えば、道路や障害物といった地理的な条件から、ここを移動する移動局がハンドオーバする際にたどる可能性が高い経路が存在する場合は、基地局履歴管理テーブル７１を参照することで、これを推定することができる。

【００７４】

移動局２が基地局１に接続すると、第１動作例と同様に、基地局１では、アンテナパターン選択器２４およびアンテナパターン切り替え器２６が、通信中の移動局２に対して適切なアンテナパターンを決定し（Ｓ４０２）、電力測定器３１は、このアンテナパターンにて周辺基地局３，４の電力を測定する（Ｓ４０３）。

【００７５】

基地局リスト作成器３３は、このようにして取得した、周辺基地局３，４の電力と基地局履歴管理テーブル７１の基地局履歴情報とから通信品質情報を作成する（Ｓ４０４）。この場合、基地局リスト作成器３３は、まず周辺基地局３，４の電力に基づいて通信品質情報の値の設定または順位設定を行い、ここで差がでなかったものについては基地局履歴情報の１回前の接続回数が大きい方の基地局の通信品質情報の値を上げるか、または順位を上げるという方法で差を出す。他にも、基地局履歴情報の１回前の接続回数に重みをかけて周辺基地局の電力に加えたものを新たな電力値として扱い、これを基に通信品質情報を作る方法等が考えられる。

【００７６】

この場合も、新たな電力値をそのまま通信品質情報として用いてもよく、値を間引くことによって圧縮した情報を用いてもよく、通信品質の優劣の順番を示す値を用いてもよい。このようにして作成した通信品質情報と、基地局を特定する情報とを組み合わせて基地局リスト５０を作成する。

このようにして基地局リスト作成器３３により作成された基地局リスト５０は、基地局リスト作成器３３から、変調器３４、ＤＡＣ３５、無線部という順に送られて、移動局２へ送信される（Ｓ４０５）。

移動局２は、受信した基地局リスト５０に基づいてハンドオーバを試みる（Ｓ４０６）。

【００７７】

このようにこの第４動作例によれば、基地局１は、移動局２が作成した過去に接続した基地局の通信履歴を移動局２より取得する手段としての基地局履歴取得器２９を備え、基地局リスト作成器３３は、電力測定器３１により測定された周辺基地局３，４の電力と移動局２より受信された通信履歴とを基に周辺基地局３，４毎の通信品質情報である基地局リスト５０を作成するので、例えば地理的な条件などでハンドオーバ候補となりやすい周辺基地局３，４を特定することができ、基地局１は、この通信履歴を用いることで、より精度の高い基地局リスト５０を作成し、移動局２へ送ることができる。つまり、第１動作例と比べてさらに精度のよい基地局リスト５０を作成できるので、ハンドオーバを効率的に行うことができ、移動局２の低消費電力化を行うことができる。

【００７８】

次に、図１０を参照してこの無線通信システムの第５動作例について説明する。図１０はこの無線通信システムの第５動作例を示すフローチャートである。

【００７９】

この第５動作例では、移動局２は、基地局１に対して、基地局リスト５０の送信を要求する（Ｓ５０１）。このタイミングは、定期的であっても良く、基地局１との通信品質が低下したことが検出されたときでも良い。

移動局２からの基地局リストの送信要求を基地局１が受信すると、基地局１のリスト作成器４９は、最近作成した基地局リスト５０がメモリ４８にあるかどうか、メモリ４８

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この判定の結果、最近作成した基地局リスト５０が存在する場合（Ｓ５０２のＹｅｓ）、リスト作成器４９は、その基地局リスト５０をメモリ４８から読み出して移動局１へ送信する（Ｓ５０６）。

移動局１は、基地局１から送信されてきた基地局リスト５０に基づいてハンドオーバを試みる（Ｓ５０７）。

【００８１】

一方、最近作成した基地局リスト５０がメモリ４８に存在しない場合（Ｓ５０２のＮｏ）、第１動作例と同様に、基地局１では、アンテナパターン選択器２４が、通信中の移動局２に対して適切なアンテナパターンを決定し（Ｓ５０３）、そのアンテナパターンとなるようにアンテナ２１の指向性をアンテナパターン切り替え器２６が切り替える。

電力測定器３１は、切り替えられたアンテナパターンにて受信された周辺基地局３，４の信号の電力を測定し（Ｓ５０４）、電力測定結果を基地局リスト作成器３３へ送る。

【００８２】

基地局リスト作成器３３は、電力測定器３１から受け取った電力測定結果、つまり周辺基地局３，４の電力に基づいて基地局リスト５０を作成し（Ｓ５０５）、この基地局リスト５０を移動局２へ送信する（Ｓ５０６）。移動局２は基地局１から受信された基地局リスト５０に基づいてハンドオーバを試みる（Ｓ５０７）。

【００８３】

このようにこの第５動作例によれば、移動局２が基地局リスト送信要求を基地局１へ自発的に送信し、この要求に応答する形で基地局１から送られてきた基地局リスト５０を基にハンドオーバを行う。つまり、移動局２がハンドオーバを必要としているときに基地局１で基地局リスト５０を作成あるいはメモリから読み出して移動局２に送るので、基地局１との無線通信がさらに少なくなり、ハンドオーバをより効率的に行うことができる。すなわち、移動局２の側から要求があったときだけ、基地局リスト５０を作成し送信するので、不要な通信を削減でき、移動局２の低消費電力化を行うことができる。

【００８４】

なお、本発明は上記実施形態そのままに限定されるものではなく、実施段階ではその要旨を逸脱しない範囲で構成要素を変形して具体化できる。また、上記実施形態に開示されている複数の構成要素の適宜な組み合わせにより、種々の発明を形成できる。例えば、実施形態に示される全構成要素から幾つかの構成要素を削除してもよい。さらに、異なる実施形態にわたる構成要素を適宜組み合わせてもよい。

【図面の簡単な説明】

【００８５】

【図１】本発明の実施の形態の無線通信システムの構成を示すブロック図。

【図２】図１の無線通信システムの基地局の構成示す図。

【図３】図２の基地局の基地局リスト作成器の構成を示す図。

【図４】基地局リストを示す図。

【図５】この無線通信システムの第１動作例を示すフローチャート。

【図６】この無線通信システムの第２動作例を示すフローチャート。

【図７】この無線通信システムの第３動作例を示すフローチャート。

【図８】この無線通信システムの第４動作例を示すフローチャート。

【図９】基地局履歴管理テーブルを示す図。

【図１０】この無線通信システムの第５動作例を示すフローチャート。

【符号の説明】

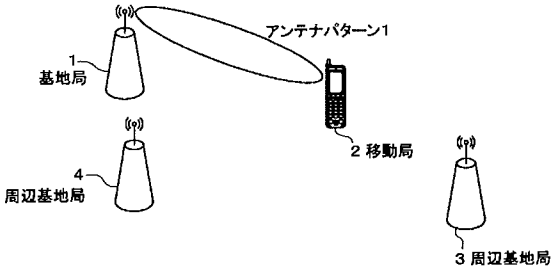
【００８６】

１…基地局、２…移動局、３…周辺基地局、４…周辺基地局、２１…アンテナ、２１…各アンテナ、２２…無線部、２３…デジタル変換器（ＡＤＣ）、２４…アンテナパターン選択器、２５…乗算器、２６…アンテナパターン切り替え器、２７…加算器、２８…復調

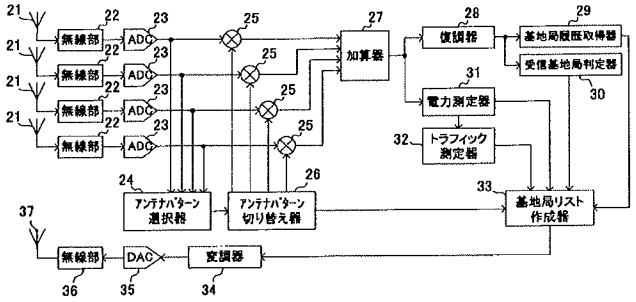
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換器（ＤＡＣ）、３６…無線部、３７…アンテナ、４０…スイッチ、４１…第１品質算出器、４２…第２品質算出器、４３…第３品質算出器、４４…第４品質算出器、４５，４６，４７…乗算器、４８…メモリ、４９…リスト作成器、５０…基地局リスト、７１…基地局履歴管理テーブル。

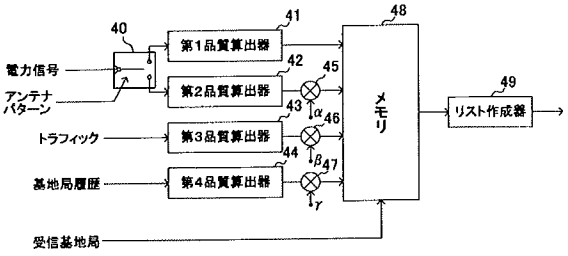
【図１】



【図２】



【図３】

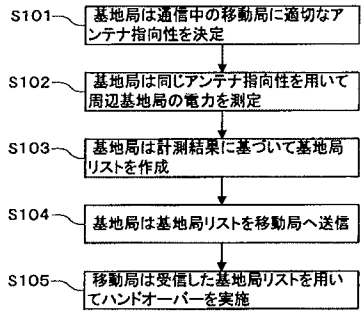


【図４】

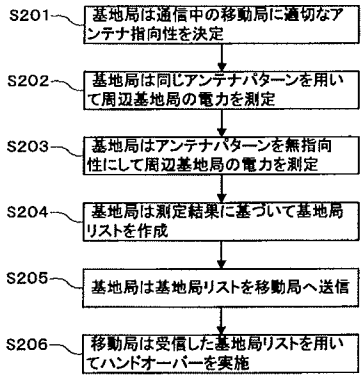
50 基地局リスト

基地局特定情報	通信品質情報
基地局1	品質1
基地局2	品質2
⋮	⋮

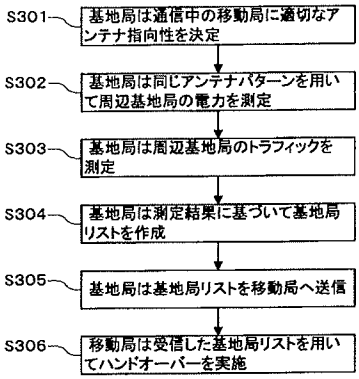
【図５】



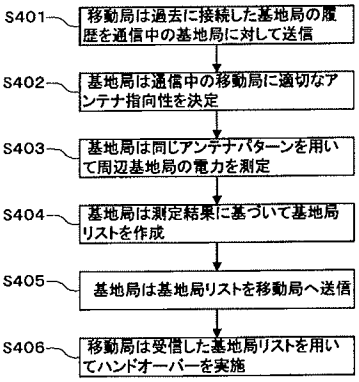
【図６】



【図７】



【図８】

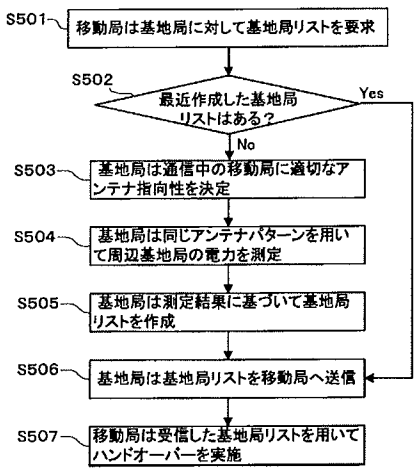


【図９】

71 基地局履歴管理テーブル

		接続回数			
		1回前	2回前	…	N回前
基地局	基地局1	X_11	X_12		X_1N
	基地局2	X_21	X_22		X_2N
	:				
	基地局M	X_M1	X_M2		X_MN

【図１０】



(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 October 2010 (28.10.2010)

PCT

(10) International Publication Number
WO 2010/121885 A1

(51) International Patent Classification:
H04W 36/08 (2009.01)

(21) International Application Number:
PCT/EP2010/054153

(22) International Filing Date:
30 March 2010 (30.03.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09158269.2 20 April 2009 (20.04.2009) EP

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(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, CL, 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, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *of inventorship (Rule 4.17(iv))*

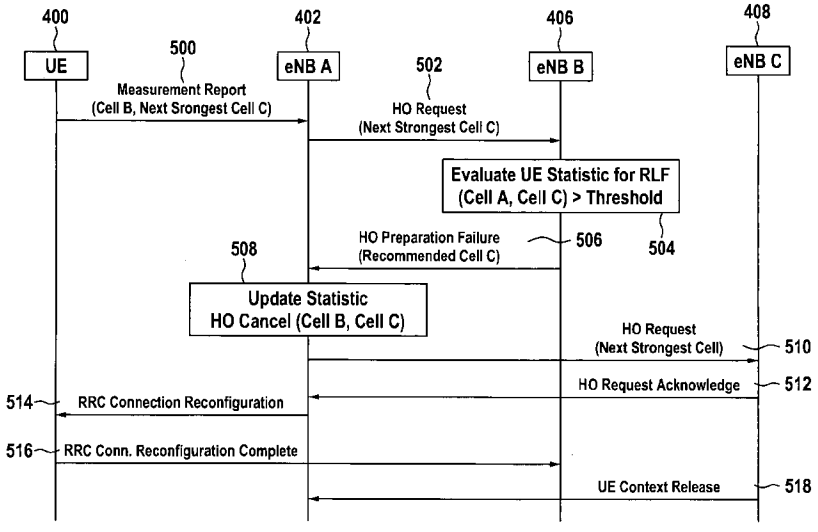
Published:

— *with international search report (Art. 21(3))*

— *with amended claims (Art. 19(1))*

(54) **Title**: SELF-OPTIMIZING HANDOVER METHOD

Fig. 5



(57) **Abstract**: The invention relates to methods of using a trainable software module used in the handover procedure employing the location based information for the self optimization of wireless communication networks, in particular for the self optimization of cellular mobile networks. Embodiments of the invention address the problems of radio link failures and rapid handovers immediately after transferring a wireless appliance from one base station apparatus to the other at certain cell border locations by evaluating which base station apparatus a wireless appliance should have its wireless connection transferred to using trained databases or a trainable software module.

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SELF-OPTIMIZING HANDOVER METHOD

Description

Field of the Invention

The invention relates to the self optimization of wireless communication networks, in particular to the self optimization of cellular telephone networks.

Background of the Invention

When wireless appliances such as mobile terminals are passed from one cell to another there can be problems with radio coverage at the boundary between cells. There are situations in real network environments where handovers to target cells shall be avoided at specific border locations. Such situations occur e.g. when a mobile terminal moves immediately after handover into a coverage hole of the target cell and no rapid handover can be executed to a new neighbor cell.

For example, when a mobile terminal is transferred to a new cell the terminal can suddenly enter a region where the radio connection with the new cell is lost. In another example, a mobile terminal can be successfully transferred to a new neighbor cell in case of predefined handover conditions are fulfilled, i.e. normally to a cell with the strongest reported signal, and then quickly move to a region where the new connection becomes weak enough that the connection needs to be handed over again to the old or another neighbor cell.

Summary of the Invention

Embodiments of the invention provide for a method of operating a first base station, a computer program product for operating the first base station, a method of operating a second base station apparatus, and a computer program product for operating a second base station apparatus in the independent claims. Embodiments of the invention are described in the dependent claims.

Embodiments of the invention address the aforementioned problem by evaluating which base station apparatus a wireless appliance should have its wireless connection transferred to using either a database or a trainable software module. In some embodiments, the network performs better as successive radio failures or rapid handovers increase the amount of data used for the database or for training the trainable software module.

The technical problem to be solved is based on the usage of a self-detection and self-optimization mechanism in wireless networks, especially for 3GPP (3rd

Generation Partnership Project) LTE (Long Term Evolution) mobile access networks, to increase the system performance, to minimize handover failures and even to avoid non suitable handovers. Embodiments of the invention may also apply to other wireless networks such as: IEEE 802.16 (WIMAX) or 3GPP2 (CDMA2000).

The best existing solutions does not consider scenarios where abrupt handover failures occur for mobile terminals in a target base station immediately after the source base station has received a successful handover confirmation from the target base station. The terms base station and cell can be used as synonyms. 3GPP LTE specified the possibility that a source base station can prepare multiple neighbor cells as candidates for handovers of a terminal. However, the preparations will be cancelled for all other neighbors when the target base station confirms a successful handover. Another possibility is the evaluation of "UE history information" information elements which is specified in 3GPP TS 36.413 and TS 36.423. In this case the base stations transmit the last visited cell information like the visit times of a certain mobile terminal in the handover request message. However, this information can

only help in case of successive handovers but not for an unexpected abrupt handover failure especially caused at a specific cell border location.

Embodiments of the invention may improve the quality of the wireless communication connection in environments where a mobile terminal remains only a short time in a target cell and then quickly performs successive handover to a new neighbor cell especially for cases when problems occur at specific cell border locations.

The radio conditions in the overlap area of two or more neighbor cells may differ at different locations at the border area. It may be suitable to handover a mobile terminal from one cell to another at one location of the border area whereas it may be unsuitable at another location of the same border area. In order to detect problematic handover locations at the border area of neighbor cells, base stations which are involved in handover procedures of mobile terminals shall exchange border location based information. For example by using the LTE specified "UE History Information" information element which is included in the "Handover Request" message. This information shall include either cell identifiers and signal strength measurements of neighbor cells reported by mobile terminals towards the source cell/base station which can be mapped on the location of mobile terminals or/and other location based information like beamforming parameters, e.g. in terms of angles, used by the source cell or/and the coordinates of the involved mobile terminals, if available. The exchange of the cell identifiers and the corresponding measured signal strengths can be based on all detected neighbor cells or at least only such neighbor cells for which a certain threshold has been reached, i.e. on the basis of strongest cells. It shall be also possible to exchange reported signal strength values together with the corresponding cell identifiers or only a ranking of identifiers of the strongest cells.

When the target base station has detected problems in handovers at some specific location of cell border, it can reject further requested handovers. For example by using a LTE specified "Handover Preparation Failure" message, which could also include the cause for the rejection e.g. "handover recommended to another neighbor cell" enhanced by a specific parameter like the Physical Cell identifier or Cell Global

identifier of the preferred cell for handover. The rejection will be transmitted after having analyzed that mobile terminals moving into a certain border area are always lost in a coverage hole of the target cell or they immediately handed over towards one of the listed neighbor cells.

A wireless appliance is defined herein as any communication device which established at least a two way wireless communication with a device capable of receiving the wireless communication connection. Examples of a wireless appliance includes a cell phone, a handheld radio, and any computing device able to connect to a wireless network. The general term used for wireless appliance in wireless networks is "mobile terminal".

A base station apparatus is defined herein as a device adapted for establishing a wireless communication connection with a wireless appliance and for providing the wireless appliance access to a communication network. For example the communication network can be the global wireless/wireline communication network, public land mobile/fixed network or the world wide web.

A signal quality report is defined herein as a report sent from a wireless appliance to a serving base station apparatus that contains information that can be used to assess the quality or strength of connections between the wireless appliance and a collection of base station apparatuses including the serving base station apparatus. The quality rating of a wireless communication connection is a value which ranks how well a particular wireless communication channel is expected to perform. A higher quality rating is defined herein as meaning that the wireless communication channel has a better connection. This means that the wireless communication channel has a stronger more robust radio connection which enables data transmissions at higher data rates. Higher data loss or even call drops can be avoided when using the better wireless connection. If the signal quality report gives a rating of the absolute strength of a wireless connection then it is the so called Reference Signal Received Power (RSRP). The ratio of the received power with respect to the source power, which is also known as the Reference Signal Received Quality (RSRQ) can

also be used. The rating indicates which kind of modulation scheme can be used to minimize the loss of data or information packets. Information which indicates the position of the wireless appliance relative to each of the set of base station apparatuses can also be used by the source base station apparatus on the basis of the signal quality report which indicates a kind of fingerprint. Another alternative is the transmission of absolute coordinates by the wireless appliance by using global navigation satellite system data.

eNB is an acronym for "evolved Universal Terrestrial Radio Access Network Node B" and is an embodiment of a base station apparatus. UE is an acronym for User Equipment and is equivalent to a wireless appliance. RLF is an acronym for Radio Link Failure. HO is an acronym for Handover. RRC is an acronym for Radio Resource Control. RCC messages are used amongst others for the establishment, connection, and release of wireless communication connections.

A trained evaluation module is a trainable software module. One embodiment of a trained evaluation module is adapted for selecting a base station apparatus to transfer a wireless appliance to using a signal quality report and/or information which identifies the location of a wireless apparatus. Another embodiment of a trained

evaluation module is adapted for accepting or rejecting the transfer of a wireless appliance using a signal quality report and/or information which identifies the location of a wireless apparatus. . A trained evaluation module can be implemented using a trainable pattern recognition module. A trainable pattern recognition module can be implemented by using a variety of different methods. Examples of different methods or algorithms that could be used are: Principal Component Analysis, Neural Network, CN2 algorithm, C4.5 algorithm, Iterative Dichotomiser 3 (ID3), nearest neighbor search algorithm, naive Bayes classifier algorithm, Holographic Associative Memory, or perception learning algorithm. Training data can be generated by a self-learning mechanism based on specific cell border locations under consideration of successive communication failures or rapid handover requests. Training data may also be generated manually or with a simulation. Manually created training data and/or simulated training data may be useful when the network

first begins operational mode. The trained evaluation module may also be implemented as and/or comprise a database.

The trained evaluation module can be implemented at a single site that each of the base station apparatus connect to. For instance the base station apparatuses can connect via a computer network to a central computer which controls the handover of the wireless appliance to successive base station apparatuses. The trained evaluation module can also be distributed between the different base station apparatuses. If the trained evaluation modules are distributed they may either cooperate or operate independently. If they cooperate, then they may pass messages between them and may share database or training data. If they operate independently, then each base station apparatus may generate training data using the communication failures and/or the information of rapid handovers that each is aware of.

The invention provides for a method of operating a first base station apparatus for transferring a wireless communication connection with a wireless appliance from the first base station appliance to one of the second base station apparatuses. The set of second base station apparatuses comprises at least a preferred base station apparatus and an alternative base station apparatus. The method comprises receiving a signal quality report from the wireless appliance. The signal quality report can

comprise a variety of information. A signal quality report is defined herein as any information which can be used to evaluate the quality of a connection between a wireless appliance and reported base station apparatuses and which can also be used to map on the location of the mobile terminal. This can contain measures of the strength of the signal between the wireless appliance and the base station apparatuses, and it can also contain information relating the position of the mobile terminal. For example the RSRP reference signal receive power or the RSRQ, reference signal receive quality can be used. The strength of a reference signal can be measured and reported by a mobile terminal. The location can be reported using GNSS or global navigation satellite system data. An example of a GNSS system is the so called GPS or global positioning system. The signal quality report can also contain information on the location and velocity of the wireless appliance. It can also contain

information on the location and the direction of travel. The signal quality report comprises a quality rating of the connection between the wireless appliance and each of the second base station apparatuses as well as the first base station apparatus. The signal quality report is used to evaluate how well a potential connection would be and to decide what connection to make. The method further comprises selecting the preferred base station using the quality rating of each of second base station apparatuses compared to the signal quality of the first base station apparatus.

The method further comprises sending a first transfer request to the preferred base station apparatus. The first transfer request comprises the signal quality report. The signal quality report that is contained within the first transfer request may contain the full data that was received by the first base station, or the data may be condensed or summarized. For example the signal quality report within the first transfer request may have information on several base station apparatuses removed if they are not a candidate for transfer if their power or quality rating is below a certain threshold. The first base station may also perform calculations on the signal quality report or a substitution of physical cell identifiers by cell global identifiers. These calculations could be sent instead of the raw data from the signal quality report. The method further comprises receiving a first transfer request reply from the preferred base station apparatus. At this point a message has been sent from the first base station to the preferred base station apparatus.

The preferred base station then sends a reply message to inform the first base station whether the transfer should commence or should be cancelled. The first transfer request reply comprises either a transfer acknowledgement message or a transfer cancel message. The transfer acknowledgement message informs the first base station to proceed with transferring the wireless communication connection to the preferred base station. The transfer cancel message informs the first base station apparatus to not proceed with transferring the wireless communication connection to the preferred base station. In this case communication with an alternative base station is initiated in order to transfer the wireless communication connection to the alternative base station apparatus. The method further comprises sending a first connection reconfiguration request to the wireless appliance if the transfer request reply

comprises the transfer acknowledgement message. The first connection reconfiguration request informs the wireless appliance that the wireless communication connection will be transferred to the preferred base station apparatus. The method further comprises receiving a first release command from the preferred base station apparatus if the first connection reconfiguration request was sent. This is a message from the preferred base station apparatus to the first base station apparatus that tells the first base station apparatus that communication has been successfully established between the preferred base station apparatus and the wireless appliance. The method further comprises terminating the corresponding communication connections according to the wireless appliance if the first release command is received. At this point the wireless communication connection has been successfully transferred from the first base station apparatus to the preferred base station apparatus. The preferred base station apparatus can be determined in a number of different ways. Typically reported RSRP values are used to select the preferred base station apparatus and to rank each of the set of alternative base station apparatuses.

The method further comprises sending a second transfer request to the alternative base station apparatus if the transfer request reply comprises a transfer cancel message. At this step the first base station apparatus is making a connection with the alternative base station apparatus in an effort to transfer the wireless communication connection from the first base station apparatus to the alternative base station apparatus. The method further comprises receiving a second transfer request reply from the alternative base station apparatus if the second transfer request was sent. The second transfer request reply comprises either a transfer acknowledgement message or a transfer cancel message. The method further comprises sending a second connection reconfiguration request to the wireless appliance if the second transfer request reply comprises the transfer acknowledgement message. The second connection reconfiguration request instructs the wireless appliance to shift the wireless communication connection from the first base station apparatus to the alternative base station apparatus. The method further comprises receiving a second release command from the alternative base station appliance if the second

communication reconfiguration request was sent. The method further comprises terminating the corresponding communication connections according to the wireless appliance if the second release command is received.

In another embodiment, the first transfer request reply specifies which of the second base stations is the alternative base station. This embodiment is advantageous, because the preferred base station apparatus can have a database or a trained evaluation module which is able to determine the best second best base station to transfer the wireless communication connection of the wireless appliance to.

In another embodiment, the connection between the alternative base station and the wireless apparatus has the second highest quality rating. This embodiment is advantageous because the quality rating can then be used to select directly the alternative base station.

In another embodiment the connection between the preferred base station and the wireless apparatus has the highest quality rating. This embodiment is advantageous, because the quality rating can be used to determine the preferred base station apparatus.

In another embodiment the preferred base station apparatus is selected using a trained evaluation module. The trained evaluation module is adapted to be trained using training data. The training data is defined herein as any data or examples used to train a trainable software module.

In another embodiment, if the first transfer request reply comprises a transfer cancel message the first transfer request also comprises training data. The method further comprises the step of updating the trained evaluation module with the training data in the first transfer request reply. This is advantageous, because the system can use the connections between the first and preferred base station apparatuses to improve the efficiency in which a good connection is found.

In another embodiment, if the first transfer request reply comprises a transfer cancel message the first transfer request comprises a cause value indicating the reason for the transfer cancel message.

In another embodiment, if the first transfer request reply comprises a transfer cancel message the first transfer request comprises a base station apparatus identifier that identifies the alternative base station apparatus.

In another embodiment, the method further comprises the steps of generating a set of training data using the signal quality report and the first transfer request reply. The method further comprises updating the trained evaluation module using a set of training data. This embodiment is advantageous, because if the first transfer reply request indicates that the transfer of the wireless appliance to a preferred base station is rejected, the trained evaluation module can be trained to not do this again.

In another aspect, the invention provides for a computer program product comprising machine executable instructions for performing the method of any one of the preceding claims on a base station apparatus. The base station apparatus comprises a computer system, a microprocessor, and/or a microcontroller. This is advantageous, because the machine executable code can be used for automating the transfer procedure.

In another aspect, the invention provides for a method of operating a second base station apparatus for receiving the transfer of a wireless communication connection with a wireless appliance from a first base station appliance. The method comprises receiving a first transfer request from the first base station apparatus. The first transfer request comprises a signal quality report. A signal quality report is generated using cell identifiers and/or a quality rating of the connection between the wireless apparatus and each of the base station apparatuses within communication range of a wireless appliance. The cell identifiers and/or the quality rating of the connection

between the wireless apparatus and each of the base stations has been previously described.

The method further comprises generating a first transfer request reply using a trained evaluation module using the first transfer request. The first transfer request reply comprises either a transfer acknowledgement message or a transfer cancel message. The trained evaluation module has been previously discussed. In embodiments where there is a trained evaluation module in both the first base station and the second base station, the trained evaluation modules can be identical and on the same computer system or they can be distributed across the individual base station apparatuses. The method further comprises sending the first transfer request reply to the first base station. The method further comprises receiving a first connection reconfiguration complete message from the wireless appliance if the first transfer request reply comprises a transfer acknowledgement message. The first connection reconfiguration complete message is a message from the wireless appliance that lets the second base station know that the wireless appliance has reconfigured itself properly. The method further comprises establishing the wireless communication connection with the wireless appliance if the first connection reconfiguration complete message has been received. At this point the wireless communication connection has been successfully transferred from the first base station apparatus to the second base station apparatus. The method further comprises sending a context release message to the first base station apparatus if the first connection reconfiguration complete message was received.

It is also possible that the first transfer request reply contains a transfer cancel message. In this case the wireless communication connection of the wireless appliance was not transferred to the second base station apparatus. The transfer cancel message is used by the first base station apparatus that it should try to transfer the wireless appliance to an alternative base station apparatus.

In another embodiment, the method further comprises the step of monitoring the wireless communication connection for a predetermined period of time for a communication change event. A communication change event is defined herein as any event which is undesirable for a wireless communication connection. Examples would be a loss of connection, a deterioration in the quality of the connection, for instance a loss of signal strength or the data in the signal being corrupted, or a request from the handset to transfer to another base station again rapidly. The method further comprises the step of generating a set of training data using the signal quality report and the first transfer request reply if the communication change event occurs within the predetermined time. This is advantageous, because if the communication change event occurs within the predetermined time, then it indicates that it is not advantageous to transfer the communication connection of the wireless apparatus to the second base station. In this case the training data is then used to update the evaluation module. The method further comprises the step of training the trained evaluation modules with the set of training data.

In another embodiment, the communication change event is loss of radio communication.

In another embodiment, the communication change event is the reception of a second signal quality report from the wireless appliance indicating that the wireless communication connection with the wireless appliance should be transferred to a different base station apparatus. This embodiment is advantageous, because it indicates that the communication connection needs to be transferred to a different base station apparatus too quickly. The trained evaluation module can then be updated with information to prevent this from happening again.

In another embodiment, the first transfer request reply comprises a transfer cancel message.

In another embodiment, if the first transfer request reply comprises a transfer cancel message the first transfer request reply comprises a set of training data generated

using the signal quality report. This is advantageous, because the training data can be sent to a trained evaluation module in the first base station apparatus.

In another embodiment, if the first transfer request reply comprises a transfer cancel message the first transfer request comprises a cause value indicating the reason for the transfer cancel message.

In another embodiment, if the first transfer request reply comprises a transfer cancel message the first transfer request comprises a base station apparatus identifier that identifies the alternative base station apparatus.

In another embodiment, if the first transfer request reply comprises a transfer cancel message the first transfer request reply specifies an alternative base station apparatus to transfer the wireless communication connection to. This embodiment is advantageous, because the optimum base station apparatus to transfer the wireless communication connection to may not necessarily have the next highest quality or signal strength rating.

In another embodiment the signal quality report comprises global navigation satellite system data. This embodiment is advantageous, because the position of the wireless apparatus can be used to evaluate the best base station apparatus to transfer to.

In another embodiment the signal quality report comprises measurement data of the beam forming method for example in terms of angles used by the first base station for the wireless communication method. This embodiment is advantageous, because the beam forming method can be used to approximate the location of the wireless appliance.

In another embodiment, the trained evaluation module is adapted for using the signal quality report to map a location and direction of travel of the wireless application with the purpose of generating the first transfer reply request. This is advantageous because the location and the direction of travel can be used to identify regions

where using the quality rating of the connection may be misleading as to which is the best base station apparatus to transfer the wireless communication connection to.

In another aspect the invention provides for a computer program product comprising machine executable instructions for performing the method of operating a second base station apparatus for receiving the transfer wireless communication connection with the wireless appliance from the first base station appliance.

In another aspect, the invention provides for a base station apparatus adapted for performing any one of the embodiments of the method of the invention.

Brief Description of the Drawings

In the following preferred embodiments of the invention will be described, by way of examples only, and with reference to the drawings in which:

Figure 1 shows a flow chart for an embodiment of a method for operating a first base station,

Figure 2 shows a flow chart for an embodiment of a method for operating a second base station which has been selected by the first base station for the transfer of the wireless connection,

Figure 3 illustrates the situation where radio link failure occurs just after the hand off of a wireless appliance from one base station apparatus to another at a certain cell border location,

Figure 4 illustrates the flow of messages for handover procedure between the wireless appliance and the corresponding base stations and how a radio link failure can be detected for a certain cell border location using a timer in the second base station apparatus,

Figure 5 illustrates the flow of messages for a transfer of a wireless communication connection being rejected by a second base station apparatus due to a previous radio link failure at a certain cell border location,

Figure 6 illustrates the flow of messages where a first base station apparatus selects the second base station apparatus, which does not has the highest signal quality rating, with the help of handover rejections received from the second base station caused by previous radio link failures for a certain cell border location,

Figure 7 illustrates a situation where rapid handovers occur just after a wireless appliance has been transferred between two base station apparatuses at a certain cell border location,

Figure 8 illustrates the flow of messages and how a rapid handover can be determined for a certain cell border location using a timer,

Figure 9 illustrates the flow of messages where a wireless communication connection being rejected by a second base station apparatus due to a rapid handovers at a certain cell border location,

Figure 10 illustrates the flow of messages where a first base station apparatus selects the second base station apparatus, which does not has the highest signal quality rating, with the help of handover rejections received from the second base station caused by previous rapid handovers at a certain cell border location.

Detailed Description

Like numbered elements in these figures are either identical elements or perform the same function. Elements which have been discussed previously will not necessarily be discussed in later figures if the function is identical.

Figure 1 shows a flowchart for an embodiment of a method of operating a first base station for transferring a wireless communication connection with the wireless appliance to one of a set of second base station apparatuses. Step 100 is the start of the method. Step 102 is receiving the signal quality report. The signal quality report contains a quality rating or a measure of the connection between the wireless appliance and each of the second base station apparatuses. This can be a measure of the

position of the wireless apparatus relative to the different second base station apparatuses, or it can also be a measure of the signal strengths or the ratio of the power

with respect to the source power. In step 104 a preferred base station is selected. The preferred base station can be selected using the quality rating of each of the second base station apparatuses. The next step is step 106 which is sending a first transfer request to the preferred base station apparatus. The first transfer request may specify a location identifier which provides information for mapping the location of the wireless apparatus. The location identifier may specify the location of the wireless apparatus, or it may be a mapping. For example the signal strengths of the various base station apparatuses within range combined with a prior knowledge of these signal strengths could be used to construct such a mapping.

Step 106 is a request by the first base station to transfer the wireless appliance to the preferred base station apparatus. In the next step the first transfer request reply is received from the preferred base station. In either a transfer acknowledgement message or a transfer cancel message is received with the first transfer reply request. In the case of a transfer acknowledgement message, the wireless communication is transferred from the first base station to the preferred base station. In this case the next step is step 124 which is to send a first connection reconfiguration request to the wireless appliance. The next step is step 126 which is to receive a first release command from the preferred base station apparatus. This is an indication that the preferred base station has established the wireless communication connection with the wireless appliance. In the next step the first base station terminates the wireless communication connection with the wireless appliance. The termination of a wireless communication connection may include the termination of the connection to the communication network that the base station apparatus provides to the wireless appliance. Step 130 is after this and this is an end of the method. Step 108 was to receive the first transfer request reply. In the case that a transfer cancel message is received, the next step is 110 which is to send a second transfer request. The second transfer request may also specify a location identifier which provides information for mapping the location of the wireless apparatus. The second transfer request is sent to the alternative base station apparatus. The next

step is step 112 which is to receive a second transfer request reply. As with the first transfer request reply 108, the second transfer request reply 112 has two possibilities also. Again these are receiving either a transfer acknowledgement message or a transfer cancel message. In the case of a cancel transfer message, the first base station will try to transfer to an additional base station apparatus 122. In the case of an acknowledged transfer message, the next step is 114 which is to send a second connection reconfiguration request. The next step is step 116 which is to receive a second release command from the alternative base station. The next step is step 118 which is to terminate the wireless connection with the wireless appliance 118. Again, the termination of a wireless communication connection may include the termination of the connection of the communication network that the base station apparatus provides to the wireless appliance. At this point the wireless communication connection has been successfully transferred to the alternative base station apparatus.

Figure 2 shows an embodiment of the method of operating a second base station apparatus in the form of a flowchart. In the transfer of a wireless communication connection with a wireless appliance from a first base station appliance is shown in this flowchart. Step 200 is the start of the method. Step 202 is to receive a first transfer request from the first base station apparatus. The first transfer request may comprises a signal quality report and the signal quality report as previously described is generated using a quality rating of the connection between the wireless apparatus and each of the base station apparatuses within communication range of the wireless appliance. The first transfer request may also comprise a a location identifier which provides information for mapping the location of the wireless apparatus. The next step is step 204 which is to generate a first transfer request reply. The first transfer request reply is generated using a training evaluation module using the first transfer request. The first transfer request reply comprises either a transfer acknowledgement message or a transfer cancel message. In the case of a transfer acknowledgement message, the next step is to send the first transfer request reply with transfer acknowledgement message to the first base station 210. The next step is step 212 which is to establish a wireless communication connection with the wireless appliance. The next step is step 214 and this is to send a context release mes-

sage to the first base station. After step 214, the next step is 216 which is the end of the method. However, if the first transfer request reply contained a transfer cancel message, then the next step after step 204 is step 206. Step 206 is sending the first transfer request reply with the transfer cancel message. The first transfer request reply may comprise a cause value which indicates the reason for the transfer cancel message. The first transfer request may also comprise a base station apparatus identifier which may be used to identify an alternative base station apparatus to transfer the wireless appliance to. At this point the second base station has rejected the transfer of the wireless appliance. The next step is step 208 which is the end of the method.

Figure 3 illustrates the situation where a wireless appliance moves from one base station apparatus to a second base station apparatus through positions 312, 316, 318. Figure 3 shows base station apparatus A 300, base station apparatus B 304, and base station apparatus C 308. Line 302 is the boundary of the range of the wireless coverage of base station apparatus A 300. Line 306 is the boundary of coverage of base station apparatus B 304. Line 310 is the boundary of coverage for base station apparatus C. In this illustration the base station apparatuses are eNBs. Initially the wireless appliance is at position 312. It then moves towards the boundary of base station apparatus A's coverage 302. At position 316 the appliance is transferred to the control of base station apparatus B 304. When the wireless appliance enters region 320, the wireless appliance at 318 then loses communication with base station apparatus B 304. This figure illustrates the necessity of being able to accurately predict radio link failures when the relative position of the wireless apparatus is known. If the coverage hole 320 is known in advance by base station apparatus A 300, then the wireless appliance 312, 316, 318 could have been transferred to base station apparatus C 308 instead of base station apparatus B 304.

In the embodiments shown in figures 3 through 10, the wireless appliance is a mobile terminal or UE. The base station apparatuses are the cells served by the eNBs.

In figure 3, the border location can be differentiated, if the handover preparation request received by the target cell (base station apparatus B 304) from the source cell

(base station apparatus A 300) contains additional information in terms of approaching UE coordinates, used beam-forming parameters of source cell, signal strength of other available candidate cells or ranking of available strongest neighbor cells (like cell C 308 as the second strongest cell). Hence the location based information can be comprised of any other information that provides the hint about the specific location at the border. By using that information, the target cell which has a problematic cell border area can avoid the handovers coming from the source cell only at that border location.

An improved solution can be achieved when the source cell receives a qualitative feedback from the target cell, i.e. when the target cell includes in the handover preparation failure message a cause value, e.g. "handover recommended to another neighbor cell" and even better also information which candidate cell should be selected for a handover, e.g. by indicating the cell identifier, e.g. Physical Cell ID or Cell Global ID. Then the source cell can directly request a handover towards the cell recommended by the rejecting target cell. Later on when an additional self-learning algorithm is implemented in the source cell which analyses the received feedbacks from the target cell in combination with UE measurement reports/ signal quality reports, the source cell is able to decide on handovers directly to some other suitable neighbor cell.

Figure 3 shows an assumed network scenario based on 3 base station apparatuses (cells) 300, 304, 308. The coverage area of these cells overlaps in a certain region 316 and a coverage hole 320 of one of these cells may be caused by a topological environment, e.g. shadowed by a mountain or a big building. Coverage holes can exist in real deployments even after an extensive planning phase where a radio access network is optimized in terms of radio conditions.

Consider a mobile terminal (UE = User Equipment or wireless appliance) 312 that moves from cell A 300 towards cell B 304 and performs a successful handover with cell B 304 as shown in figure 3. However, just after a successful handover indicated

by cell B 304 towards cell A 300, the UE 318 falls into the coverage hole 320 of cell B 304 and faces a Radio Link Failure (RLF). After the RLF and after going through the standard procedure, the UE 318 connects itself to cell C 308. If cell B 304 learns that it has a coverage hole near the border of cell A 300 and UEs 312 coming from there face always or in most cases RLFs, it should cancel handover requests arising from cell A 300. However, there is no border location information available according to UEs 312, 314 moving from cell A 300 towards cell B 304. Therefore, this would not be a perfect solution as the coverage hole does not affect the complete common border area of cell B 304 with cell A 300 as shown in figure 3. UEs coming from the other parts of the cell border between cell A 300 and cell B 304 do not face such problems. Hence if location based border information is exchanged between the cell A 300 and cell B 304 during the handover, cell B 304 can decide on the basis of a self-learning algorithm to reject dedicated handover requests coming from cell A 300.

In the example scenario shown in figure 3, the border location can be differentiated if the handover preparation request received by cell B 304 from cell A 300 contains information about cell C 308 as the second strongest cell. With the help of self-learning algorithm in cell B 304, cell B 304 can analyze that the handovers coming from cell A 300 with cell C 308 as the second strongest mostly face RLFs. Thus if cell A 300 sends handover preparation requests to cell B 304 for the UEs which include cell C 308 as the second strongest cell, cell B 304 will reject those handovers. If cell A 300 prepares handover for the UEs which do not include cell C 308 as second strongest cell, cell B 304 will accept those handovers.

Figure 4 shows the detection of a radio link failure 424 using a detection timer 422. Figure 4 shows the communications between a wireless appliance 400, base station apparatus A 402, base station apparatus B 406, and base station apparatus C 408 with the help of flow of messages. The first communication is from the wireless appliance 400 to the base station apparatus A 402. A measurement report 410 showing that base station apparatus B is the strongest signal with base station apparatus C 408 having the second strongest signal. A handover request 412 is then sent from base station apparatus A 402 to base station apparatus B 406. In step 414 a hand-

over request acknowledge is sent from base station apparatus B to base station apparatus A 402. Base station apparatus A 402 then sends an RRC connection reconfiguration message 416 to the wireless appliance 400. The wireless appliance 400 then sends an RRC connection reconfiguration to complete message 418 to the base station apparatus B 406. Base station B 406 then sends a wireless appliance context release message 420 to base station apparatus A 402. At this time a radio link failure detection timer 422 is started. During the time the detection timer 422 is active a radio link failure 424 event occurs. 426 indicates that the timer expired and there was no contact from the wireless appliance 400. At this point the statistics are updated in base station apparatus B 406 and training data is generated to indicate that the wireless appliance 400 should have been transferred to base station apparatus C 408 instead of base station apparatus B 406. A statistical test may be performed on the failure to determine if training data should be generated. For instance if just a single failure occurs it may be due to the operator and/or the positioning of the wireless appliance. If multiple failures occur and the number of failures is statistically significant then the training data is generated.

Figure 4 shows a possible message exchange during the handover process between UE 400, eNB (name of a base station specified by 3GPP LTE) of cell A 402 and eNB of cell B 406 which are facing the situation represented by figure 3. This message flow is based upon the specified handover procedure in 3GPP TS 36.300 (only relevant messages are shown in figure 2). Cell B 406 can learn about the problematic border location with cell A 402, e.g. by setting a special timer.

Figure 5 illustrates the rejection of the transfer of a wireless appliance 400 from base station apparatus A 402 to base station apparatus B 406 by base station apparatus B 406. In this figure there is base station apparatus A 402, base station apparatus B 406, and base station apparatus C 408, and wireless appliance 400. In a first step the wireless appliance 400 sends a measurement report 500 indicating that base station apparatus B has the strongest signal and that base station apparatus C has the second strongest signal 500 to base station apparatus A 402. Base station apparatus A 402 then sends a handover request 502 to base station apparatus B 406. The handover request 502 also indicates that the next strongest base station

apparatus signal is from base station apparatus C 408. In step 504 the statistics are evaluated using trained evaluation module in step 504. The trained evaluation module decides that the wireless appliance 400 should be transferred to base station apparatus C 408 instead. Base station apparatus B then sends a handover preparation failure message 506 to base station apparatus A 402. The base station apparatus A 402 receives this message and updates the statistics 508 concerning this handover cancel. This information is then used to generate training data which is used to train the trained evaluation module. Base station apparatus A 402 then sends a handover request to base station apparatus C 408. Base station apparatus C 408 then sends a handover request acknowledgement message 512 to base station apparatus A 402. Base station apparatus A then sends an RRC connection reconfiguration message 514 to the wireless appliance 400. The wireless appliance 400 then sends an RRC connection reconfiguration complete 516 message to base station apparatus C 408. Base station apparatus C 408 then sends a wireless appliance context release message 518 to base station apparatus A 402.

In figure 5, it is shown that the cell B 406 detects the problem and rejects the handovers by sending a handover preparation failure message to cell A 402 including a recommendation to perform handover to cell C 408. Then cell A 402 will accept this recommendation and attempts handover preparation towards cell C 408.

Figure 6 illustrates the selection of base station apparatus C 408 instead of base station apparatus B 406 (although B is the strongest cell) for the transfer of a wireless communication connection between a wireless apparatus 400 and base station A 402. In the first step a measurement report is sent from the base station apparatus 400 to base station A 402. In step 602 the handover request is evaluated by a trained evaluation module. The trained evaluation module rejects the transfer to base station B 406 and instead initiates the procedure of transferring the wireless appliance 400 to base station apparatus C 408. In the next step base station apparatus A 402 sends a handover request message 604 to base station apparatus C 408. Base station apparatus C 408 then sends a handover request acknowledge 606 to base station apparatus A 402. Base station apparatus A then sends an RRC connection reconfiguration message 608 to the wireless appliance 400. The wire-

less appliance then sends an RRC connection reconfiguration complete message 610 to base station apparatus C 408. The base station apparatus C then sends a wireless appliance context release message 612 to base station apparatus A 402.

Moreover cell A 402 also learns from the feedbacks of cell B 406. In figure 6, it is shown that when UE 400 sends handover request 604 to cell A 402 with cell B 406 as handover candidate and cell C 408 as the second strongest cell, cell A 402 detects the problem and sends a handover preparation request directly to cell C 408 instead of cell B 406.

The location based information during handover preparation and the corresponding feedbacks transmitted between two cells can also be used for other approaches, e.g. to avoid short visit times caused by UEs 400 moving through hot spots or by UEs 400 moving through a small transit cell as shown in figure 7. These situations are also very common in a typical urban deployment.

Figure 7 is an illustration of how a wireless appliance 700, 702, 704, can briefly enter radio range of a base station apparatus and then quickly leave it again. Base station apparatus A 708 is shown with the boundary of its wireless coverage 710. Base station apparatus B 714 is shown with the boundary of its wireless coverage 716. Base station apparatus C 712 is shown with the boundary of its wireless coverage 718. The wireless appliance 700, 702, 704 is shown in several different positions. Initially the wireless appliance 700 is only within radio range of base station apparatus A 708. As the wireless appliance 700 travels along path 706, it briefly enters a region where it is located within radio range of base station apparatus C 712. However, it quickly exits this region and goes to position 704 where it is out of range of base station apparatus C 712. In this case, if the wireless appliance 700, 702, 704 is transferred to base station apparatus C 712, it would result in the wireless appliance 700, 702, 704, having to be transferred rapidly to base station apparatus B 714. In this situation it is the best to save the network signaling overload if the wireless appliance 700, 702, 704, is transferred directly to base station apparatus B 714 instead.

In the embodiment shown in figure 7, the wireless appliance 700, 702, 704 is a cell phone or UE. The base station apparatuses 708, 714, 712 are cellular telephone cells.

Such another approach is shown in figure 7 based on an assumed network scenario including 3 cells. A part of the coverage area of cell A 710, cell B 716 and cell C 718 overlaps in such a way that cell C 712 appears to be strongest for a very small region in this overlap. Consider a UE 700, 702, 704 that moves from cell A 708 in the direction of cell B 714 and pass through this overlap area 702 as shown in figure 7. The UE 700, 702, 704 will perform handover from cell A 708 to cell C 712 and then from cell C 712 to cell B 714. However, the visit time of the UE 700, 702, 704 in cell C 712 s very short. Just after coming to cell C 712 it makes successive handover to cell B 714. If cell A 708 prepares the handover to cell C 712 with the additional information of cell B 714 as the second strongest cell, cell C 712 can learn this situation and can reject the handovers. Later on, cell A 708 can directly perform handovers to cell B 714 for UEs 700, 702, 704 moving in that region.

The possible handover messages flow diagrams between the UE, eNBs of cell A, cell C and cell B for the detection and rectification of this problem by cell C and cell A are shown in figures 8, 9 and 10.

Figure 8 shows an example of using a detection timer 812 to detect when a rapid handoff failure occurs. In step 800 the wireless appliance 820 sends a measurement report 800 to base station apparatus A 822. Measurement report 800 indicates that base station apparatus C has the strongest signal and that the next strongest signal is from base station apparatus B. Base station apparatus A 822 then sends a handover request 802 to base station apparatus C 828. The handover request 802 contains information that the next strongest base station apparatus signal is from base station apparatus B 826. Base station apparatus C 828 then sends a handover request acknowledge message 804 to base station apparatus A 822. Base station apparatus A 822 then sends an RRC connection reconfiguration message 806 to the wireless appliance 820. The wireless appliance 820 then sends an RRC connection reconfiguration complete message 808 to base station apparatus C 828. Base

station apparatus C then sends a wireless appliance context release message 810 to base station apparatus A. At the same time a rapid handover detection timer 812 is started. During the duration of this timer 812, a measurement report 814 is sent from the wireless appliance 820 to the base station apparatus C 828. This measurement report 814 indicates that the strongest signal is from base station apparatus B. As this rapid handover was detected, the trained evaluation module is trained using this information.

Figure 9 shows the rejection of a handover from base station apparatus A to base station apparatus C 828 that is rejected by the trained evaluation module of base station apparatus C 828. The first step is step 900 in which a measurement report is sent from the wireless appliance 820 to base station apparatus A 822. The measurement report 900 contains information that the strongest signal from the base station apparatuses is from base station apparatus C 828, with the next strongest signal being from base station apparatus B 826. Base station apparatus A 822 then sends a handover request 902 to base station apparatus C 828. The handover request 902 contains information that the next strongest signal is from base station apparatus B 826. The trained evaluation module of base station apparatus C 828 evaluates the rapid handovers in step 904. The trained evaluation module then decides that it is better to transfer the wireless appliance 820 to base station apparatus B 406. In step 906 base station apparatus C 828 sends a handover preparation cancel message 906 to base station apparatus A 822. Within the handover preparation cancel message 906 is a recommendation that the wireless appliance 820 be transferred to base station apparatus B 826. Base station apparatus A 822 then updates its own trained evaluation module in step 908. Base station apparatus A 822 then sends a handover preparation message 910 to base station apparatus B 826. Base station apparatus B 826 then sends a handover request acknowledge message 912 to base station apparatus A 822. Base station apparatus A 822 then sends an RRC connection reconfiguration message 914 to wireless appliance 820. Wireless appliance 820 then sends an RRC connection reconfiguration complete message 916 to base station apparatus B 826. Base station apparatus B 826 then sends a wireless appliance context release message 918 to base station apparatus A 822.

Figure 10 illustrates the selection of base station apparatus B 826 instead of base station apparatus C 828 (although C is the strongest cell) for the transfer of a wireless communication connection between a wireless apparatus 820 and base station A 822. In step 1000 wireless appliance 820 sends a measurement report 1000 message to base station apparatus A 822. The measurement report 1000 contains information that base station apparatus C 828 has the strongest signal and that base station apparatus B 826 has the second strongest signal. The trained evaluation module of base station apparatus A 822 then evaluates the measurement report 1000 in step 1002. The trained evaluation module then determines that due to rapid handovers the wireless appliance 820 should instead be transferred to base station apparatus B 826. In the next step base station apparatus A 822 sends a handover request preparation signal 1004 to base station apparatus B 826. Base station apparatus B 826 then sends a handover request acknowledge message 1006 to base station apparatus A 822. Base station apparatus A 822 then sends an RRC connection reconfiguration message 1008 to wireless appliance 820. Wireless appliance 820 then sends an RRC connection reconfiguration complete message 1010 to base station apparatus B 826. Base station apparatus B 826 then sends a wireless appliance context release message 1012 to base station apparatus A 820.

List of reference numerals

300	Base station apparatus A
302	Boundary of wireless coverage of base station apparatus A
304	Base station apparatus B
306	Boundary of wireless coverage of base station apparatus B
308	Base station apparatus C
310	Boundary of wireless coverage of base station apparatus C
312	Position of wireless appliance only within range of base station apparatus A
314	Path of wireless appliance
316	Position of wireless appliance when transferred to base station apparatus B
318	Position of wireless appliance in coverage hole of base station apparatus B
320	Wireless communication coverage hole of base station apparatus B
400	Wireless appliance
402	Base station apparatus A
406	Base station apparatus B
408	Base station apparatus C
424	Radio link failure event
700	Position of wireless appliance only within range of base station apparatus A

702	Position of wireless appliance when briefly in range of base station apparatus C
704	Position of wireless appliance when out of range of base station apparatus C
706	Path traversed by wireless appliance
708	Base station apparatus A
710	Boundary of wireless coverage of base station apparatus A
712	Base station apparatus C
714	Base station apparatus B
716	Boundary of wireless coverage of base station apparatus B
718	Boundary of wireless coverage of base station apparatus C
820	Wireless appliance
822	Base station apparatus A
826	Base station apparatus B
828	Base station apparatus C

Claims

1. A method of operating a first base station apparatus (300, 402, 708, 822) for transferring a wireless communication connection with a wireless appliance (312, 316, 318, 400, 700, 702, 704, 820) from the first base station appliance to one of a set of second base station apparatuses (304, 308, 406, 408, 712, 714, 826, 828) comprising at least a preferred base station apparatus (304, 406, 712, 828) and an alternative base station apparatus (308, 408, 714, 826) wherein the method comprises:

   - receiving a signal quality report (102, 410, 500, 600, 800, 900, 1000) from the wireless appliance, wherein the signal quality report comprises a quality rating of the connection between the wireless appliance and each of the second base station apparatuses, wherein the signal quality report comprises a location identifier for mapping the location of the wireless appliance.

   - selecting the preferred base station (104, 602, 1002) using the signal quality report,

   - sending a first transfer request (106, 412, 502, 604, 802, 902, 1004) to the preferred base station apparatus, wherein the first transfer request comprises the signal quality report,

   - receiving a first transfer request reply (108, 414, 506, 606, 804, 906, 1006) from the preferred base station apparatus, wherein the first transfer request reply comprises either a transfer acknowledgement message (414, 606, 804, 1006) or a transfer cancel message (506, 906),

   - sending a first connection reconfiguration request (124, 416, 608, 806, 1008) to the wireless appliance if the transfer request reply comprises the transfer acknowledgement message, wherein the first connection reconfiguration request instructs the wireless appliance to shift the

wireless communication connection from the first base station apparatus to the preferred base station apparatus,

- receiving a first release command (126, 420, 612, 810, 1012) from the preferred base station apparatus if the first connection reconfiguration request was sent,
- terminating the wireless communication connection (128) with the wireless appliance if the first release command is received,
- sending a second transfer request (110, 510, 910) to the alternative base station apparatus if the first transfer request reply comprises a transfer cancel message,
- receiving a second transfer request reply (112, 512, 912) from the alternative base station apparatus if the second transfer request was sent, wherein the first transfer request reply comprises either a transfer acknowledgement message or a transfer cancel message,
- sending a second connection reconfiguration request (114, 514, 914) to the wireless appliance if the second transfer request reply comprises the transfer acknowledgement message, wherein the second connection reconfiguration request instructs the wireless appliance to shift the wireless communication connection from the first base station apparatus to the alternative base station apparatus,
- receiving a second release command (116, 518, 918) from the alternative base station appliance if the second connection reconfiguration request was sent,
- terminating the wireless communication connection (118) with the wireless appliance if the second release command is received or a first internal timer expires,

2. The method of claim 1, wherein the first transfer request reply (506, 906) specifies which of the second base stations is the alternative base station.

3. The method of claim 1or 2, wherein the connection between the alternative base station and the wireless appliance has the second highest quality rating and/or wherein the connection between the preferred base station and the wireless appliance has the highest quality rating.

4. The method of claim 1, 2, or 3, wherein the preferred base station apparatus and/or the alternative base station apparatus is selected using a trained evaluation module, wherein the trained evaluation module is adapted to be trained using training data.

5. The method of claim 4, wherein if the first transfer request reply comprises a transfer cancel message (506, 906) the first transfer request comprises a cause value indicating the reason for the transfer cancel message and/or a base station apparatus identifier that identifies the alternative base station apparatus.

6. The method of claim 4 or 5, wherein the method further comprise the steps of:

   - generating a set of training data using the signal quality report and the first transfer request reply,

   - updating the trained evaluation module (426, 508, 816, 908) using a set of training data.

7. A computer program product comprising machine executable instructions for performing the method of any one of the preceding claims on a base station apparatus.

8. A method of operating a second base station (406, 408, 712, 714, 826, 828) apparatus for receiving the transfer of a wireless communication connection with a wireless appliance (312, 316, 318, 400, 700, 702, 704, 820) from a first base station appliance (300, 402, 708, 822), wherein the method comprises:

   - receiving a first transfer request (202) from the first base station apparatus, wherein the first transfer request comprises a signal quality report, wherein the signal quality report is generated using a quality rat-

ing of the connection between the wireless apparatus and each base station apparatus within communication range of the wireless appliance.

- generating a first transfer request reply (204) using a trained evaluation module using the first transfer request, wherein the first transfer request reply comprises either a transfer acknowledgement message or a transfer cancel message,
- sending the first transfer request reply (206, 210) to the first base station,
- receiving a first connection reconfiguration complete (211) message from the wireless appliance if the first transfer request reply comprise the transfer acknowledgement message,
- establishing the wireless communication connection (212) with the wireless appliance if the first connection reconfiguration complete message was received,
- sending a context release (214) to the first base station apparatus if the first connection reconfiguration complete message was received.

9. The method of claim 8, wherein the method further comprises the steps of:

- monitoring the wireless communication connection for a predetermined period of time (422, 812) for a communication change event,
- generating a set of training data using the signal quality report and the first transfer request reply if the communication change event occurs within the predetermined time,
- training the trained evaluation module using the set of training data (426, 816).

10. The method of claim 9, wherein the communication change event is the loss of radio communication (424).

11. The method of claim 9, wherein the communication change event is the reception of a second signal quality report (814) from the wireless appliance indicating that the wireless communication connection with the wireless appliance should be transferred to a different base station apparatus.

12. The method of any one of claims 8 through 11, wherein if the first transfer request reply comprises a transfer cancel message (506, 906) the first transfer request comprises a cause value indicating the reason for the transfer cancel message.

13. The method of any one of claims 8 through 12, wherein if the first transfer request reply comprises a transfer cancel message (506, 906) the first transfer request reply comprises a base station apparatus identifier that identifies the alternative base station apparatus.

14. The method of any one of claims 8 through 13, wherein the signal quality report comprises global navigation satellite system data which provides the location of the wireless appliance and/or wherein the signal quality report comprises measurement data of the beam forming method used by base station apparatuses for forming the wireless communication link and/or wherein the trained evaluation module is adapted for using the signal quality report to map a location and direction of travel of the wireless application for the purpose of generating the first transfer request reply.

15. A computer program product comprising machine executable instructions for performing the method of any one of claims 8 through 14 on a base station apparatus.

AMENDED CLAIMS
received by the International Bureau on 08 July 2010 (08.07.2010)

Claims

1. A method of operating a first base station apparatus (300, 402, 708, 822) for transferring a wireless communication connection with a wireless appliance (312, 316, 318, 400, 700, 702, 704, 820) from the first base station appliance to one of a set of second base station apparatuses (304, 308, 406, 408, 712, 714, 826, 828) comprising at least a preferred base station apparatus (304, 406, 712, 828) and an alternative base station apparatus (308, 408, 714, 826) wherein the method comprises:

- receiving a signal quality report (102, 410, 500, 600, 800, 900, 1000) from the wireless appliance,
- selecting the preferred base station (104, 602, 1002) using the signal quality report,
- sending a first transfer request (106, 412, 502, 604, 802, 902, 1004) to the preferred base station apparatus, wherein the first transfer request comprises the signal quality report,
- receiving a first transfer request reply (108, 414, 506, 606, 804, 906, 1006) from the preferred base station apparatus, wherein the first transfer request reply comprises either a transfer acknowledgement message (414, 606, 804, 1006) or a transfer cancel message (506, 906), wherein the selection between the transfer acknowledgement message and the transfer cancel message is made using the signal quality reoprt,
- sending a first connection reconfiguration request (124, 416, 608, 806, 1008) to the wireless appliance if the transfer request reply comprises the transfer acknowledgement message, wherein the first connection reconfiguration request instructs the wireless appliance to shift the wireless communication connection from the first base station apparatus to the preferred base station apparatus,

- receiving a first release command (126, 420, 612, 810, 1012) from the preferred base station apparatus if the first connection reconfiguration request was sent,

- terminating the wireless communication connection (128) with the wireless appliance if the first release command is received,

- sending a second transfer request (110, 510, 910) to the alternative base station apparatus if the first transfer request reply comprises a transfer cancel message,

wherein the method is characterized by performing the steps of:

- receiving a second transfer request reply (112, 512, 912) from the alternative base station apparatus if the second transfer request was sent, wherein the first transfer request reply comprises either a transfer acknowledgement message or a transfer cancel message,

- sending a second connection reconfiguration request (114, 514, 914) to the wireless appliance if the second transfer request reply comprises the transfer acknowledgement message, wherein the second connection reconfiguration request instructs the wireless appliance to shift the wireless communication connection from the first base station apparatus to the alternative base station apparatus,

- receiving a second release command (116, 518, 918) from the alternative base station appliance if the second connection reconfiguration request was sent,

- terminating the wireless communication connection (118) with the wireless appliance if the second release command is received or a first internal timer expires,

wherein the signal quality report comprises a quality rating of the connection between the wireless appliance and each of the second base station apparatuses, wherein the first transfer request reply (506, 906) specifies which of the second base stations is the alternative base station.

2. The method of claim 1, wherein the connection between the alternative base station and the wireless appliance has the second highest quality rating and/or wherein the connection between the preferred base station and the wireless appliance has the highest quality rating.

3. The method of claim 1 or 2, wherein the preferred base station apparatus and/or the alternative base station apparatus is selected using a trained evaluation module which uses the quality signal report for the selection, wherein the trained evaluation module is adapted to be trained using training data, and wherein the training data is any one of the following: generated by a self-learning mechanism based on specific cell border locations from successive communication failures or rapid handover requests, manually created training data, and simulated training data.

4. The method of claim 3, wherein the signal quality report comprises a location identifier for mapping the location of the wireless appliance, and wherein the trained evaluation module uses the location identifier for selecting the preferred base station apparatus and/or the alternative base station apparatus.

5. The method of claim 3 or 4, wherein if the first transfer request reply comprises a transfer cancel message (506, 906) the first transfer request comprises a cause value indicating the reason for the transfer cancel message and/or a base station apparatus identifier that identifies the alternative base station apparatus.

6. The method of claim 3, 4, or 5, wherein the method further comprise the steps of:

- generating a set of training data using the signal quality report and the first transfer request reply,
- updating the trained evaluation module (426, 508, 816, 908) using a set of training data.

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7. A computer program product comprising machine executable instructions for performing the method of any one of the preceding claims on a base station apparatus.

8. A method of operating a second base station (406, 408, 712, 714, 826, 828) apparatus for receiving the transfer of a wireless communication connection with a wireless appliance (312, 316, 318, 400, 700, 702, 704, 820) from a first base station appliance (300, 402, 708, 822), wherein the method comprises:

- receiving a first transfer request (202) from the first base station apparatus, wherein the first transfer request comprises a signal quality report, wherein the signal quality report is generated using a quality rating of the connection between the wireless apparatus and each base station apparatus within communication range of the wireless appliance.

- generating a first transfer request reply (204) using a trained evaluation module using the signal quality report of the first transfer request, wherein the first transfer request reply comprises either a transfer acknowledgement message or a transfer cancel message (506, 906),

- sending the first transfer request reply (206, 210) to the first base station,

- receiving a first connection reconfiguration complete (211) message from the wireless appliance if the first transfer request reply comprise the transfer acknowledgement message,

- establishing the wireless communication connection (212) with the wireless appliance if the first connection reconfiguration complete message was received,

- sending a context release (214) to the first base station apparatus if the first connection reconfiguration complete message was received,

and characterized in that:

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wherein if the first transfer request reply comprises a transfer cancel message the first transfer request reply comprises a base station apparatus identifier that identifies the alternative base station apparatus.

9. The method of claim 8, wherein the method further comprises the steps of:

- monitoring the wireless communication connection for a predetermined period of time (422, 812) for a communication change event,
- generating a set of training data using the signal quality report and the first transfer request reply if the communication change event occurs within the predetermined time,
- training the trained evaluation module using the set of training data (426, 816),

wherein the communications change event is any one of the following: the loss of radio communication (424), the reception of a second signal quality report (814) from the wireless appliance indicating that the wireless communication connection with the wireless appliance should be transferred to a different base station apparatus, the loss of the wireless communication connection, the loss of signal strength for the wireless communication connection, and the corruption of data in the signal of the wireless communication channel.

10. The method of claims 8 or 9, wherein if the first transfer request reply comprises a transfer cancel message (506, 906) the first transfer request comprises a cause value indicating the reason for the transfer cancel message.

11. The method of any one of claims 8 through 10, wherein the signal quality report comprises global navigation satellite system data which provides the location of the wireless appliance and/or wherein the signal quality report comprises measurement data of the beam forming method used by base station apparatuses for forming the wireless communication link and/or wherein the trained evaluation module is adapted for using the signal quality report to map a location and direction of travel of the wireless application for the purpose of generating the first transfer request reply.

12. A computer program product comprising machine executable instructions for performing the method of any one of claims 8 through 11 on a base station apparatus.

Fig. 1

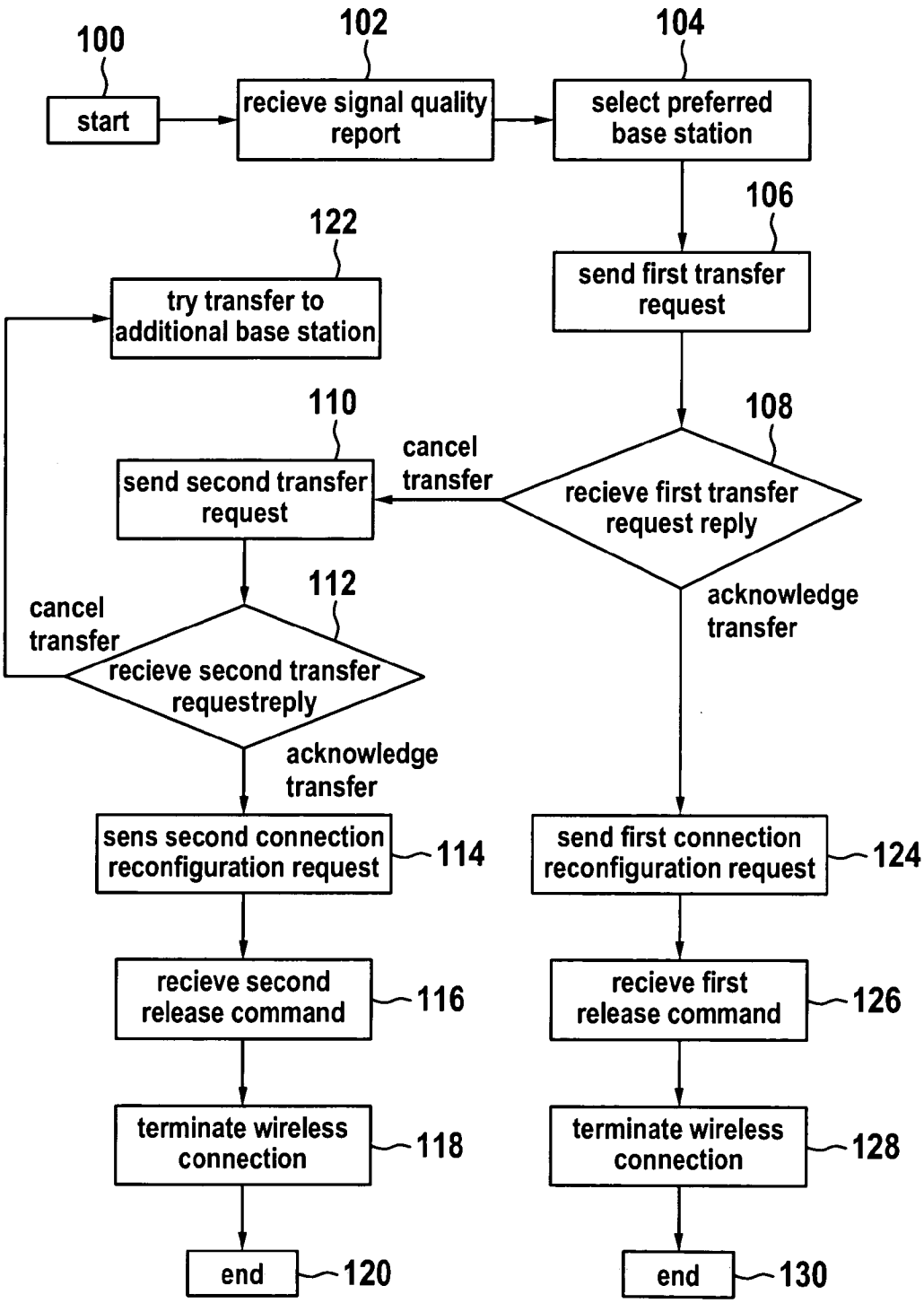
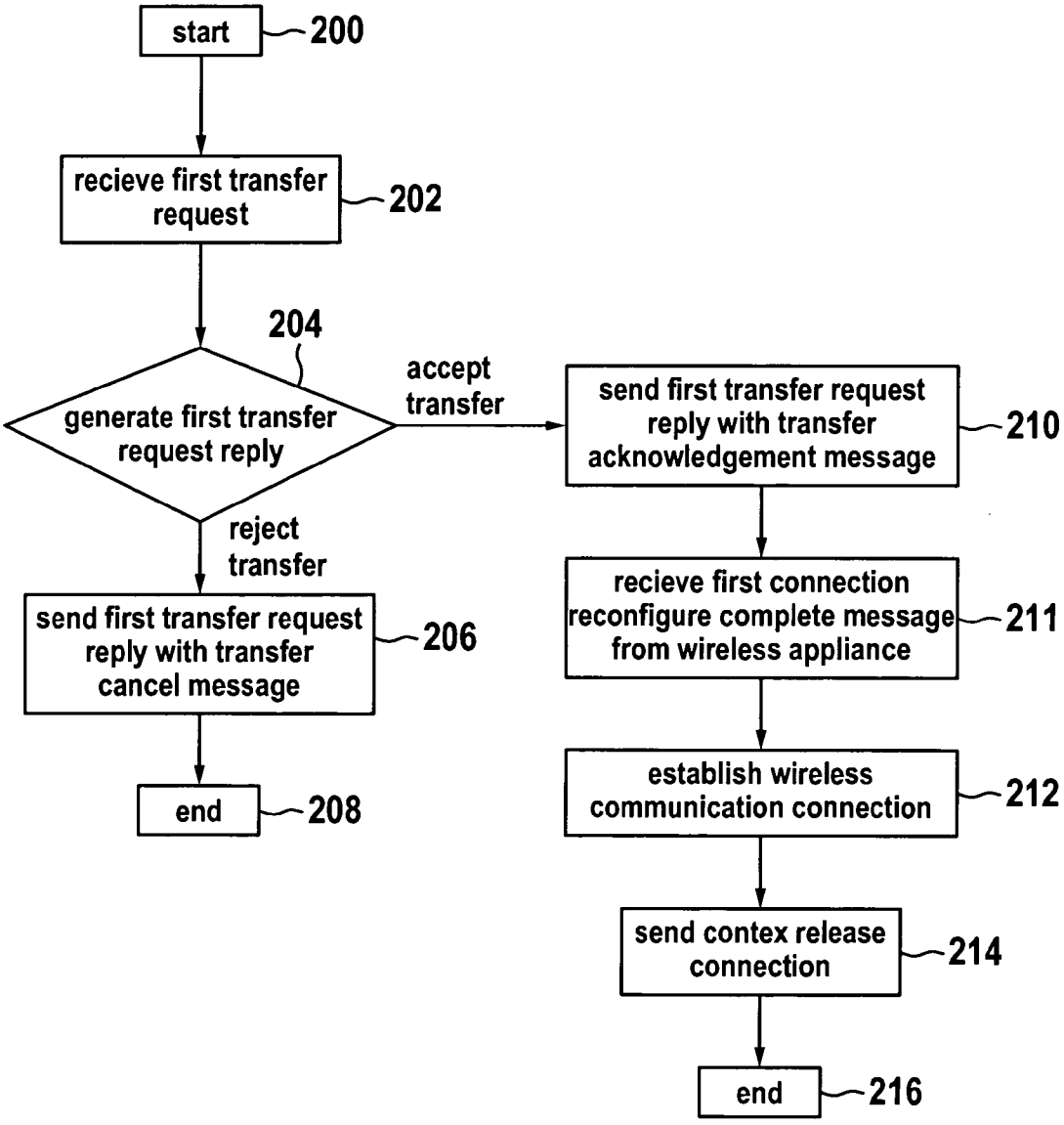
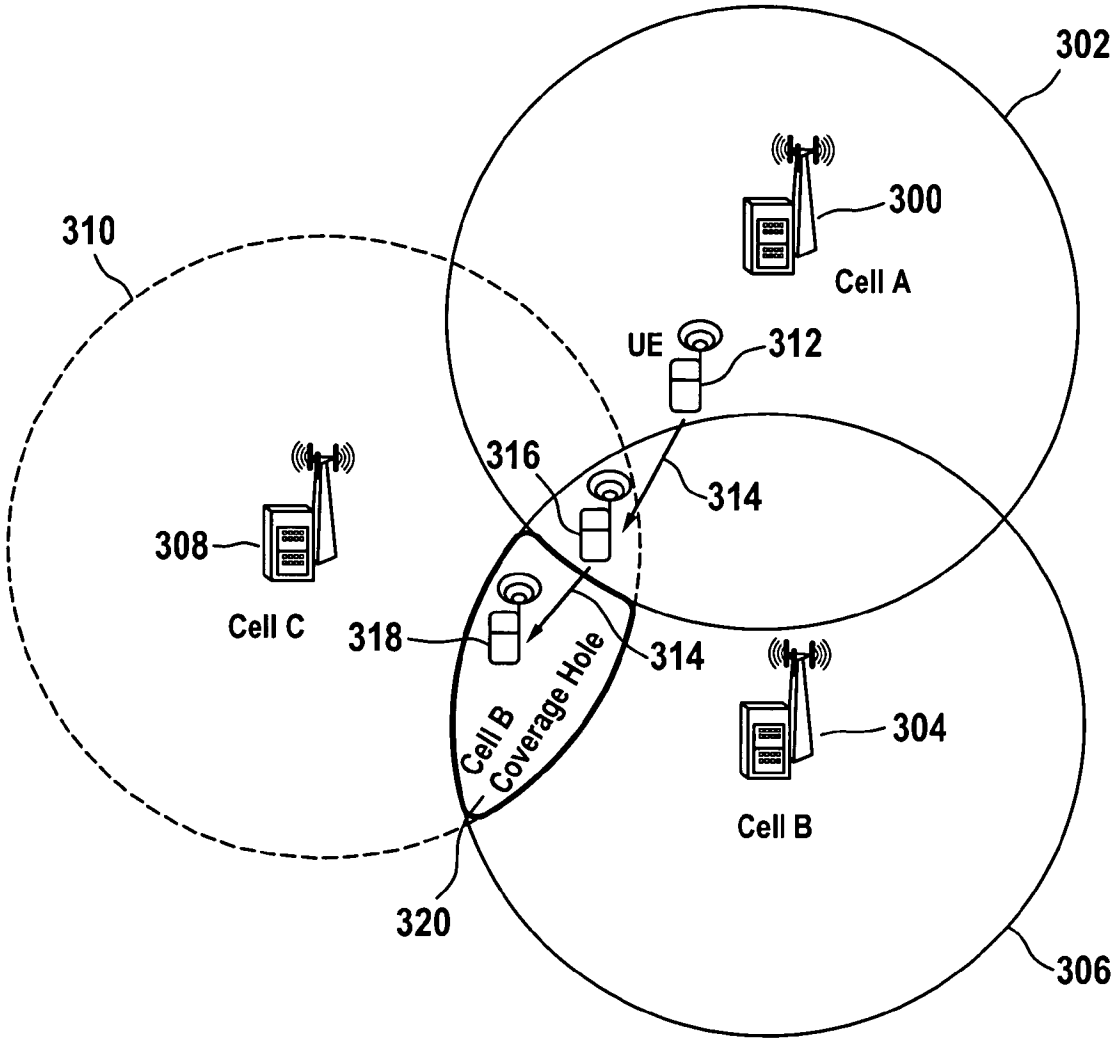

100
start
102
recieve signal quality report
104
select preferred base station
106
send first transfer request
108
recieve first transfer request reply
cancel transfer
acknowledge transfer
110
send second transfer request
112
recieve second transfer requestreply
cancel transfer
acknowledge transfer
122
try transfer to additional base station
sens second connection reconfiguration request
114
recieve second release command
116
terminate wireless connection
118
end
120
send first connection reconfiguration request
124
recieve first release command
126
terminate wireless connection
128
end
130

Fig. 2



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Fig. 3



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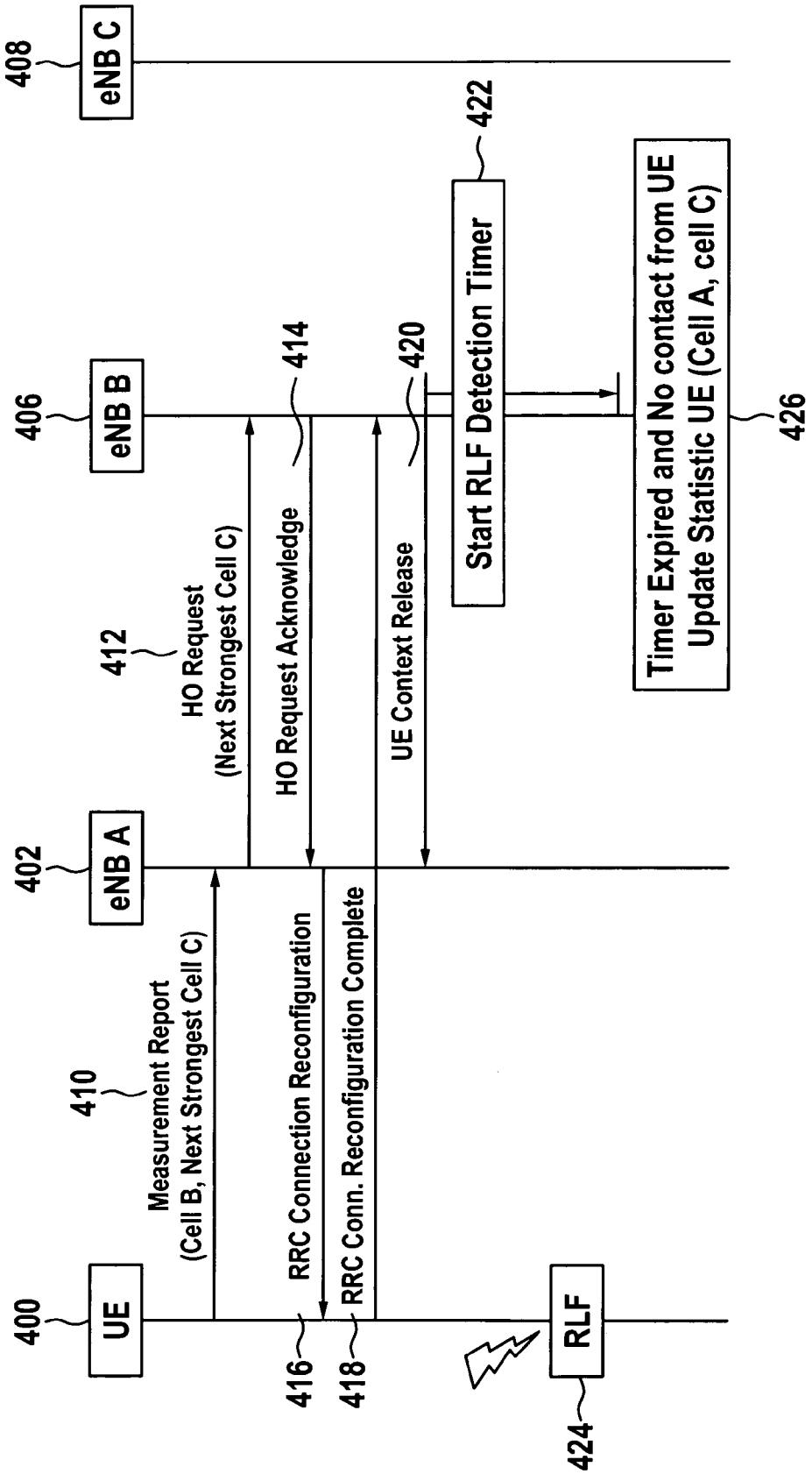


Fig. 4

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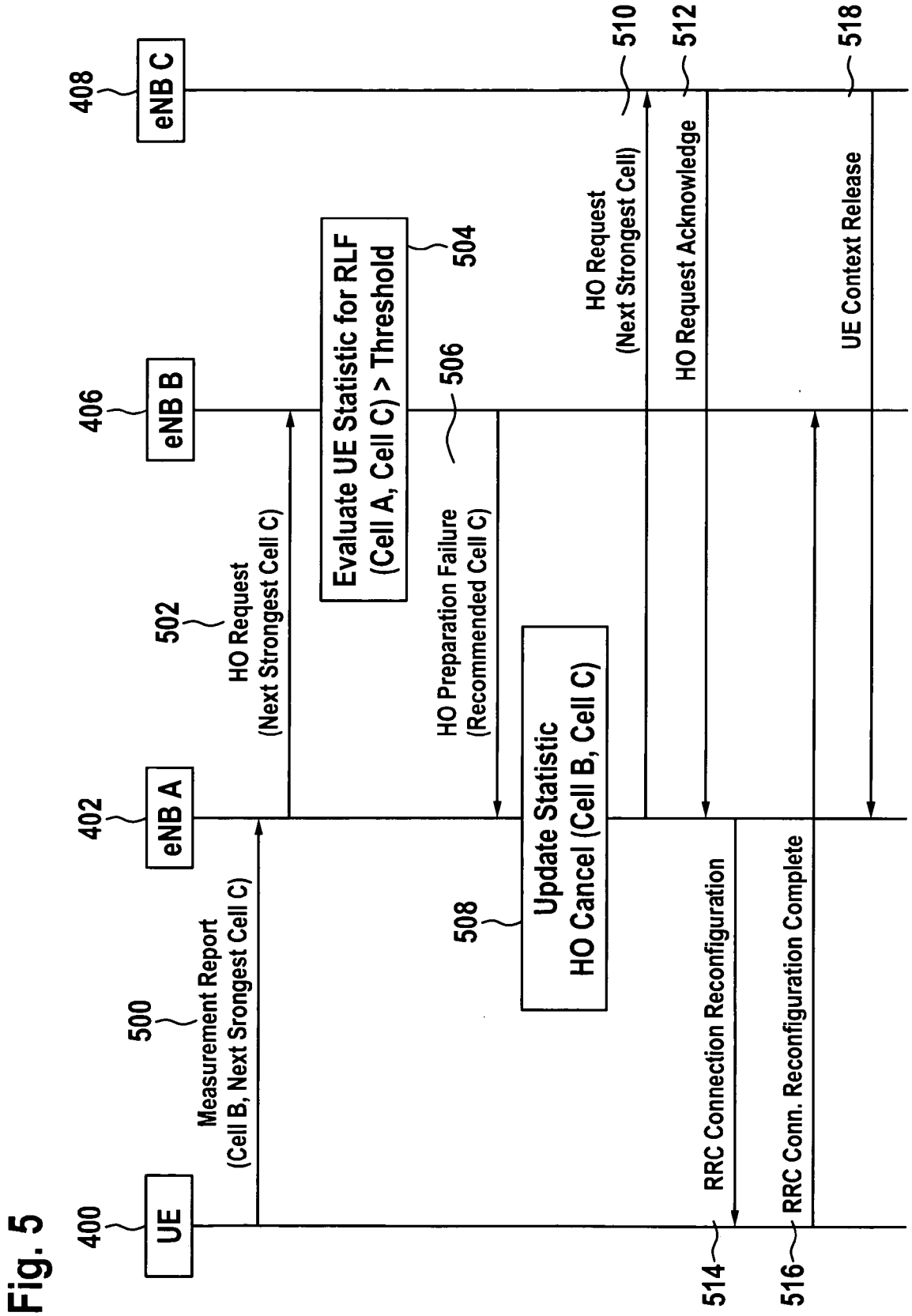

400
UE
402
eNB A
406
eNB B
408
eNB C
500
Measurement Report
(Cell B, Next Srongest Cell C)
502
HO Request
(Next Strongest Cell C)
504
Evaluate UE Statistic for RLF
(Cell A, Cell C) > Threshold
506
HO Preparation Failure
(Recommended Cell C)
508
Update Statistic
HO Cancel (Cell B, Cell C)
510
HO Request
(Next Strongest Cell)
512
HO Request Acknowledge
514
RRC Connection Reconfiguration
516
RRC Conn. Reconfiguration Complete
518
UE Context Release

Fig. 5

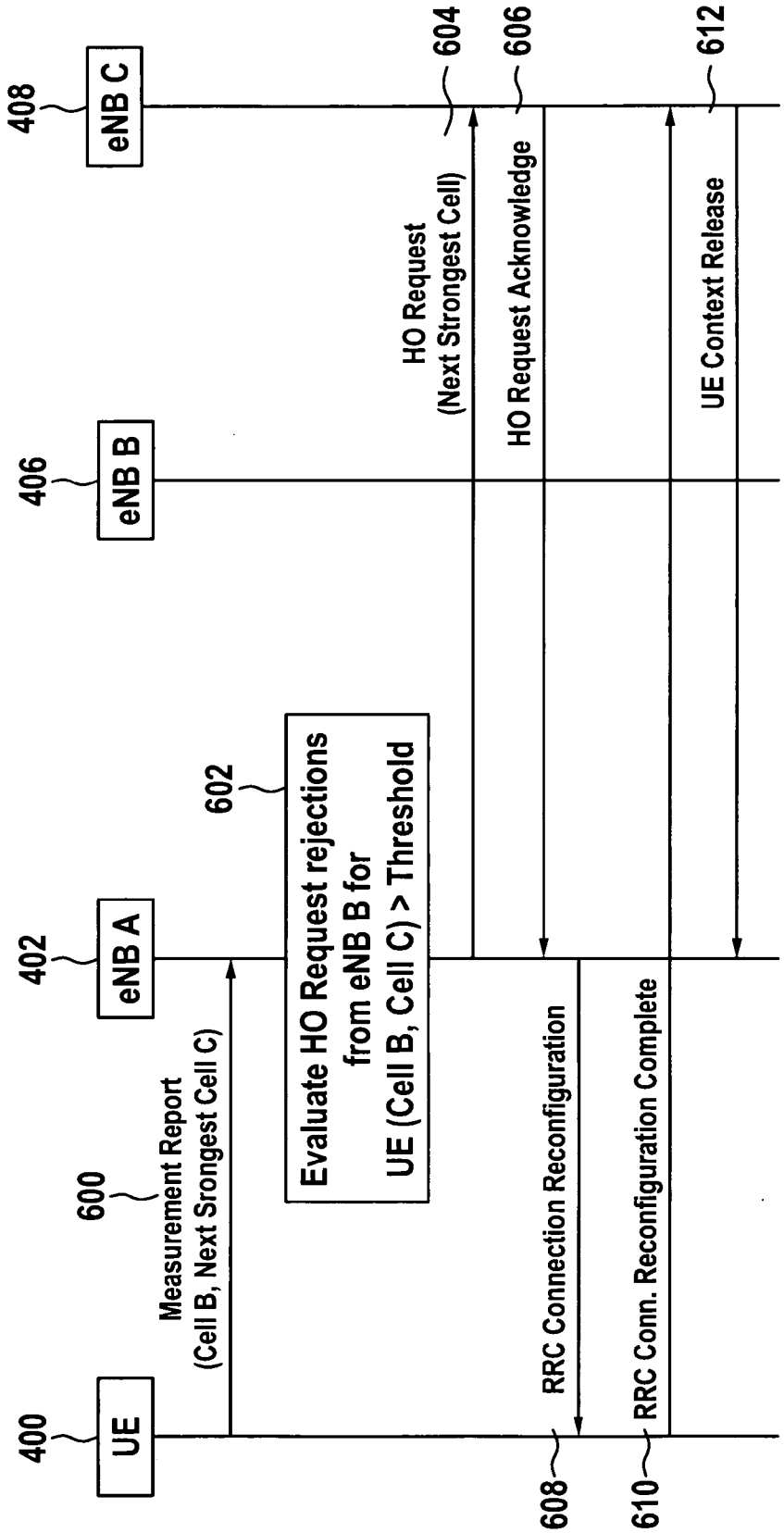

400
UE
402
eNB A
406
eNB B
408
eNB C
600
Measurement Report
(Cell B, Next Srongest Cell C)
602
Evaluate HO Request rejections
from eNB B for
UE (Cell B, Cell C) > Threshold
604
HO Request
(Next Strongest Cell)
606
HO Request Acknowledge
608
RRC Connection Reconfiguration
610
RRC Conn. Reconfiguration Complete
612
UE Context Release

Fig. 6

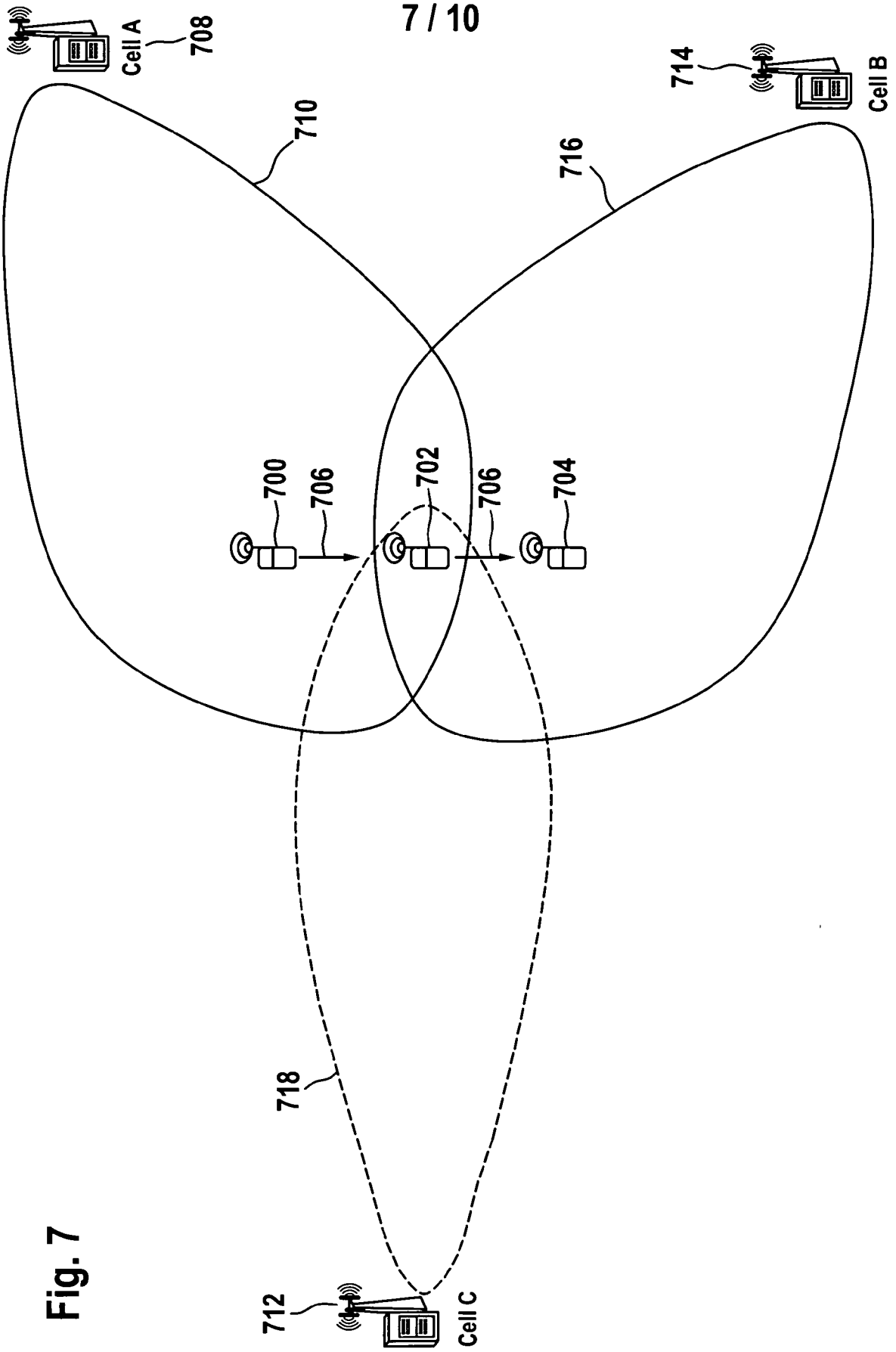


Fig. 7

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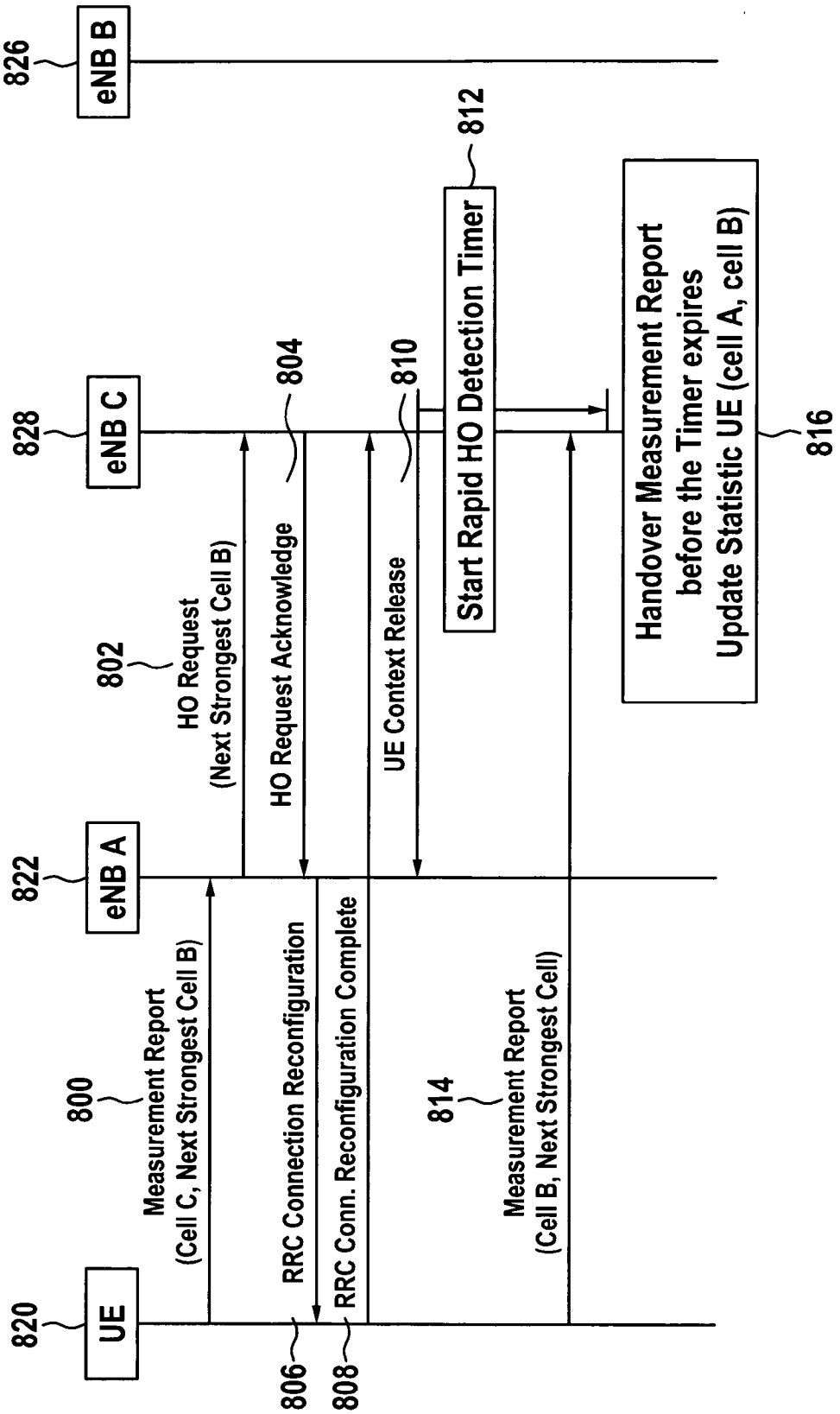


Fig. 8

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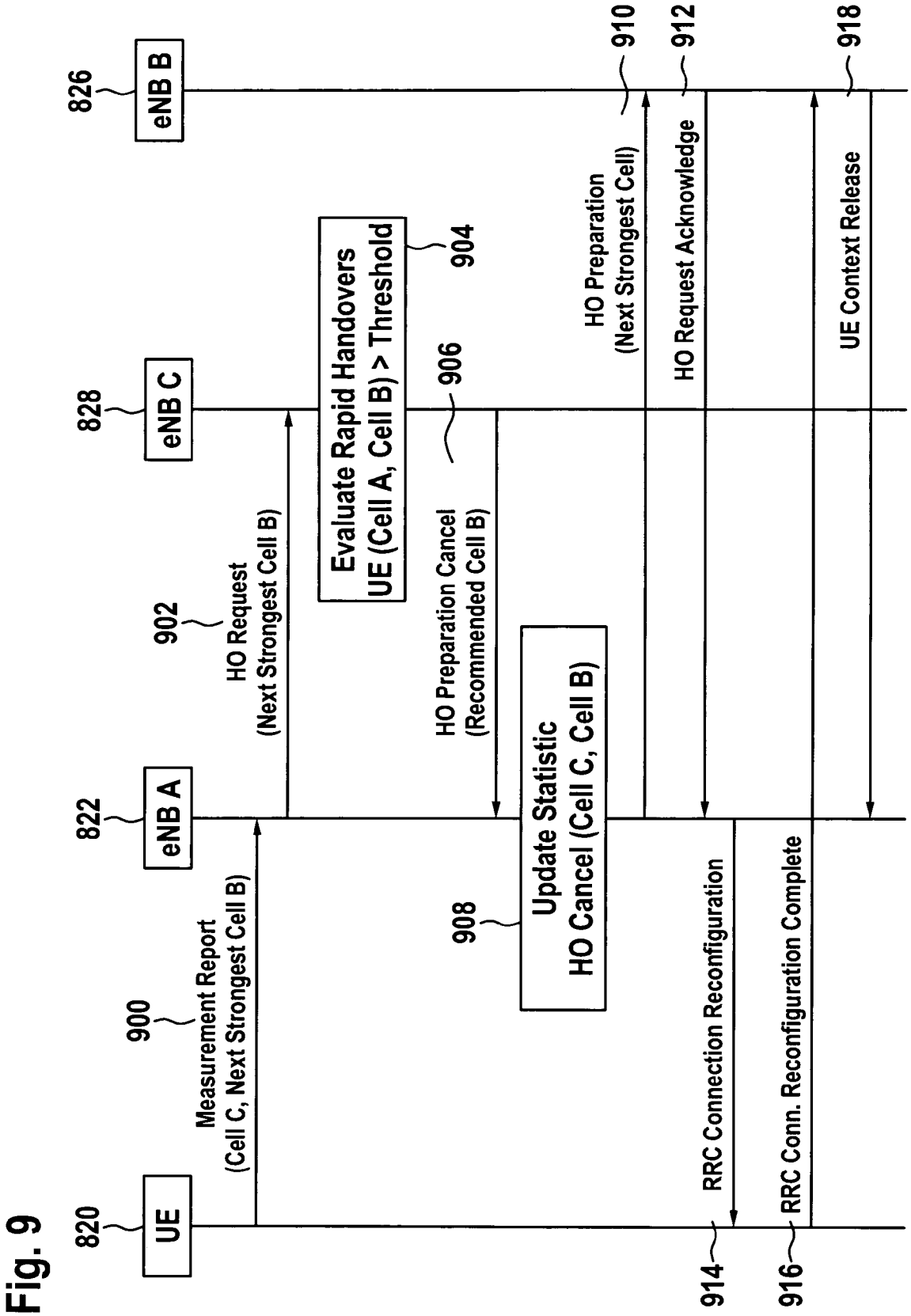


Fig. 9

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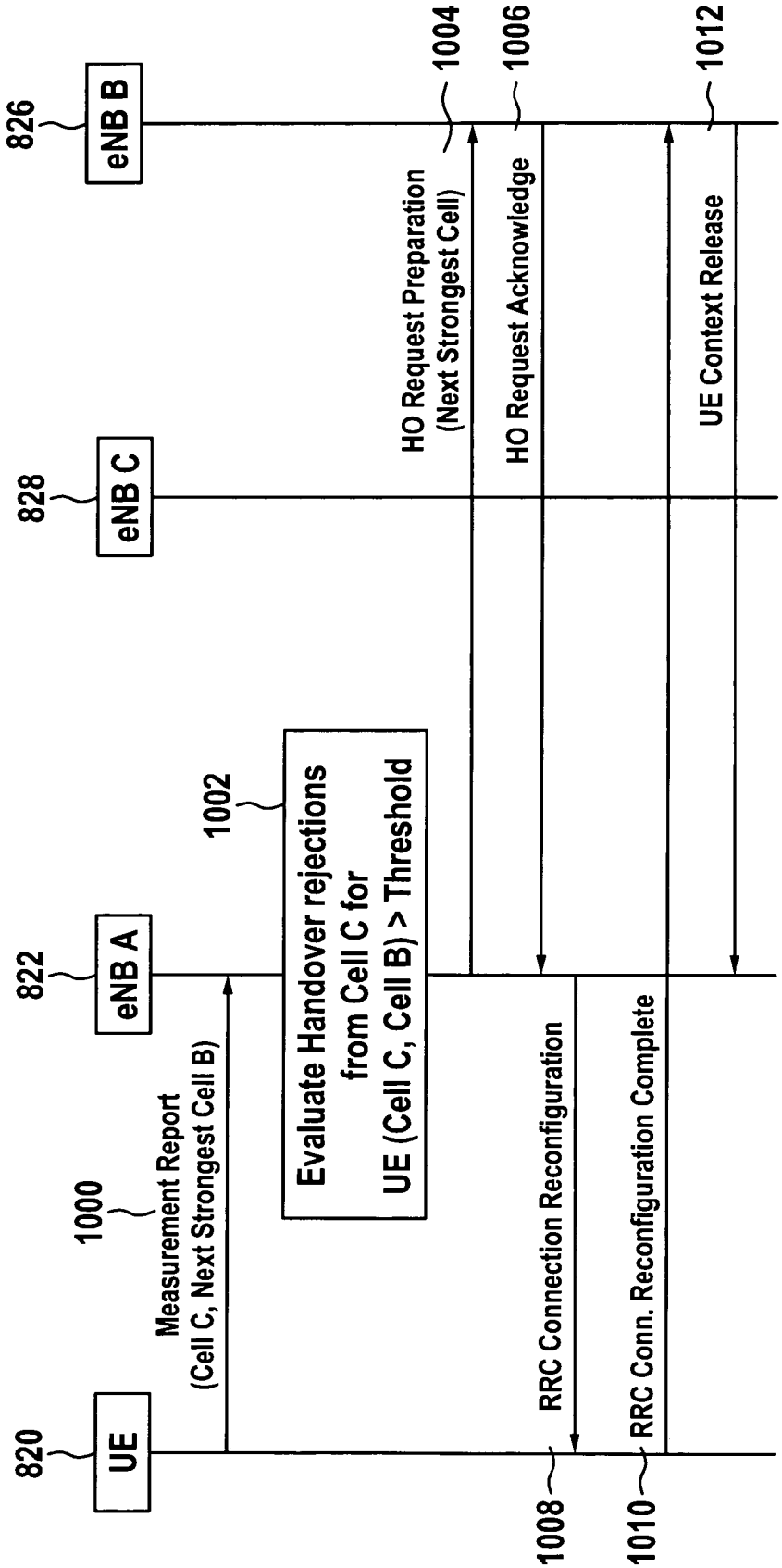


Fig. 10

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/054153

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W36/08
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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	"3GPP TS 36.300 V8.5.0 (2008-05) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall Description; Stage 2 (Release 8)" 3GPP TS 36.300 V8.5.0,, vol. 36.300, no. V8.5.0, 1 May 2008 (2008-05-01), pages 1-134, XP002532523 page 42, line 4 - page 45, line 7 * figure 10.1.2.1.1-1 * ----- -/--	1,3-12, 14,15

[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

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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
21 May 2010	07/06/2010

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	Hegeman, Hans

Samsung Ex. 1002, Page 365 of 615

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	3GPP RAN2: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 8)" 3GPP TS 36.331 V8.5.0 (2009-03), March 2009 (2009-03), pages 1-204, XP002546641 pages 56-72	1,3-12, 14,15
Y	3GPP RAN3: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 application protocol (X2AP) (Release 8)" 3GPP TS 36.423 V8.5.0 (2009-03), March 2009 (2009-03), pages 1-100, XP002546612 * pages 11 - 13, sections 8.2.1.1 - 8.2.1.4 * * pages 23 - 27, sections 9.1.1.1 - 9.1.1.6 * * pages 38 - 42, section 9.2.6 *	1,3-12, 14,15
Y	US 2006/227744 A1 (METKE ANTHONY R [US] ET AL) 12 October 2006 (2006-10-12)	4,6,9,14
A	paragraphs [0019] - [0031]	1,8
A	MOULY M ET AL: "The GSM system for Mobile Communications" GSM SYSTEM FOR MOBILE COMMUNICATIONS. COMPREHENSIVE OVERVIEW OF THE EUROPEAN DIGITAL CELLULAR SYSTEMS, CELL & SYS, FRANCE, 1 January 1992 (1992-01-01), pages 396-412, XP002127743 ISBN: 978-2-9507190-0-3 page 408 figure 6.36	1-15
A	EP 1 909 521 A (MATSUSHITA ELECTRIC IND CO LTD [JP]) 9 April 2008 (2008-04-09) paragraphs [0059] - [0068] paragraphs [0109], [0110] paragraphs [0115], [0116] paragraphs [0040] - [0043] figure 8	1-15
A	US 6 728 540 B1 (DESANTIS CHARLES M [US] ET AL) 27 April 2004 (2004-04-27) column 2, lines 48-62 column 6, lines 13-23 column 6, line 49 - column 7, line 24	4,8

-/--

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/054153

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
T	ALCATEL-LUCENT: "Location Based cell border information share during handover" 3GPP TSG-RAN WG3#64 R3-091295, 4 May 2009 (2009-05-04), - 8 May 2009 (2009-05-08) pages 1-3, XP002546613 San Fransisco, USA the whole document	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2010/054153

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006227744 A1	12-10-2006	CN 101151913 A	26-03-2008
		DE 112006000810 T5	07-02-2008
		GB 2439897 A	09-01-2008
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EP 1909521 A	09-04-2008	CN 101554078 A	07-10-2009
		WO 2008040503 A2	10-04-2008
		JP 2010506470 T	25-02-2010
US 6728540 B1	27-04-2004	NONE	

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]
It is a communication control method in a communications system including two or more base transceiver stations provided with an adaptive array antenna,
In radio communication equipment and the 1st base transceiver station under communication, existence of reception of a sending signal from the aforementioned radio communication equipment is detected,
A communication control method characterized by what transmission of said 1st base transceiver station is controlled for so that the aforementioned radio communication equipment may carry out a handover to said 1st base transceiver station and the 2nd adjoining base transceiver station, when a sending signal from the aforementioned radio communication equipment is not able to be received.
[Claim 2]
The communication control method according to claim 1 characterized by what a stop or a transmission output is reduced [a thing] for transmission of said 1st base transceiver station when a sending signal from the aforementioned radio communication equipment is not able to be received.
[Claim 3]
It is a communication control method in a communications system containing two or more base transceiver stations provided with an adaptive array antenna, and a communication control unit which controls two or more base transceiver stations concerned,
About each aforementioned base transceiver station, position information which shows an interaction region which receives communication interferences from an adjoining base transceiver station, and a weighting coefficient for the base transceiver station concerned to turn a beam to the aforementioned interaction region at least are made to correspond, and it memorizes to an interference table,
Radio communication equipment acquires the 1st base transceiver station and a weighting coefficient which the 1st base transceiver station concerned has applied at least during communication among two or more aforementioned base transceiver stations, Based on comparison with a weighting coefficient of a corresponding base transceiver station memorized by the acquired weighting coefficient and aforementioned interference table, it is judged whether the aforementioned radio communication equipment is placed at an interaction region,
As a result, a communication control method characterized by what transmission of said 1st base transceiver station is controlled for so that the radio communication equipment concerned may carry out a handover to said 1st base transceiver station and the 2nd adjoining base transceiver station, when the aforementioned radio communication equipment is placed at an interaction region.
[Claim 4]
In the aforementioned radio communication equipment and said 1st base transceiver station under communication, existence of reception of a sending signal from the aforementioned radio communication equipment is detected,

The communication control method according to claim 3 judging whether the aforementioned radio communication equipment is placed at an interaction region when a sending signal from the aforementioned radio communication equipment is not able to be received.
[Claim 5]
The communication control method according to claim 3 or 4 characterized by what a stop or a transmission output is reduced [a thing] for transmission of said 1st base transceiver station when the aforementioned radio communication equipment is placed at an interaction region.
[Claim 6]
It is a communications system containing two or more base transceiver stations provided with an adaptive array antenna, and a communication control unit which controls two or more base transceiver stations concerned,
Each of two or more aforementioned base transceiver stations,
While transmitting a weighting coefficient applied to beam generation to the aforementioned communication control unit, it has a communication control unit means of communication which receives an interaction region decided result from the aforementioned communication control unit,
The aforementioned communication control unit,
A receiving means which receives the aforementioned weighting coefficient transmitted from each aforementioned base transceiver station,
An interference table which corresponds and memorizes position information which shows an interaction region which receives communication interferences from an adjoining base transceiver station, and a weighting coefficient for the base transceiver station concerned to turn a beam to the aforementioned interaction region at least about each aforementioned base transceiver station,
Radio communication equipment acquires the 1st base transceiver station and a weighting coefficient which the 1st base transceiver station concerned has applied at least during communication among two or more aforementioned base transceiver stations, An interaction region judging means which judges whether the aforementioned radio communication equipment is placed at an interaction region based on comparison with a weighting coefficient of a corresponding base transceiver station memorized by the acquired weighting coefficient and aforementioned interference table,
It has a transmitting means which transmits an interaction region decided result by the aforementioned interaction region judging means to said 1st base transceiver station,
So that the aforementioned radio communication equipment may carry out a handover to said 1st base transceiver station and the 2nd adjoining base transceiver station, when judged with the aforementioned radio communication equipment being placed at the aforementioned interaction region by the aforementioned interaction region judging means. A communications system constituting so that transmission in said 1st base transceiver station may be controlled.
[Claim 7]
It is the base transceiver station provided with adaptive array ANTE,
A signal detection means which detects existence of reception of a sending signal from radio communication equipment under communication,
A transmission control means which controls transmission by the aforementioned signal detection means to carry out a handover to a base transceiver station where the radio communication equipment concerned adjoins when a sending signal from the aforementioned radio communication equipment is not able to be received,
A ****(ing) base transceiver station.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
The present invention relates to a communication control method, a communications system, and a base transceiver station.
[Background of the Invention]
[0002]
Conventionally, as a mobile communications system, cellular system is known and, these days, he can also be proceeding standardization of high-speed wireless communications, such as WiMAX (Worldwide Interoperability for Microwave Access), for example.
[0003]
The electric wave from an adjoining base transceiver station is kept from interfering in cellular system by using a frequency band which is different in an adjoining base transceiver station. For this reason, in cellular system, several different frequency bands are used and the wireless communication network is built.
[0004]
On the other hand, in WiMAX, TDD (Time Division Duplexing) which carries out time sharing of going up and the going down, and transmits and receives them on the same frequency is adopted. For this reason, the transmission wave from other terminals is kept from turning into an interference wave of a base transceiver station transmission wave of the terminal which is communicating with other base transceiver stations by synchronizing the frame structure between base transceiver stations in WiMAX.
[0005]
However, in the wireless communication system which uses the frequency of a broadband like WiMAX, it is assumed that it becomes difficult to assign a frequency band which is different in an adjoining base transceiver station like cellular system in view of effective use of limited frequency. For this reason, when the same frequency band is used between adjoining base transceiver stations, a communication-interferences region will arise from between base transceiver stations carrying out the frame synchronization between adjoining base transceiver stations.
[0006]
Thus, the terminal which exists in this region if a communication-interferences region produces, Since the transmission wave from an adjoining base transceiver station will be received simultaneously, in the region in which each receiving intensity becomes comparable, it becomes difficult to separate each transmission wave, and we cannot carry out a handover to an adjoining base transceiver station, but are anxious about being in an interruption state.
[0007]
An adaptive array is applied to two or more wireless base station antennas as what reduces the insensible field by interference, and what formed the null in the direction of two or more base transceiver stations is proposed (for example, see Patent Document 1).
[Patent document 1] JP,H11-308037,A

[Description of the Invention]
[Problem to be solved by the invention]
[0008]
However, the thing of disclosure to the above-mentioned Patent document 1 is related with the site diversity system of the double office simultaneous transmission and reception which synthesizes at a terminal the electric wave which carried out simultaneous transmission from two or more base transceiver stations, and raises the transmission quality, and a terminal cannot apply it to the system which communicates with one base transceiver station.
[0009]
Therefore, the the object of this invention made in view of this situation can carry out a handover to an adjoining base transceiver station promptly, and there is in providing the communication control method, communications system, and base transceiver station which can communicate stably.
[Means for solving problem]
[0010]
Invention of the communication control method concerning Claim 1 which attains the above-mentioned purpose is a communication control method in a communications system including two or more base transceiver stations provided with the adaptive array antenna,
In radio communication equipment and the 1st base transceiver station under communication, the existence of reception of the sending signal from the aforementioned radio communication equipment is detected,
When the sending signal from the aforementioned radio communication equipment is not able to be received, transmission of the 1st above-mentioned base transceiver station is controlled so that the aforementioned radio communication equipment carries out a handover to the 1st above-mentioned base transceiver station and the 2nd adjoining base transceiver station.
[0011]
Invention concerning Claim 2 is set to the communication control method according to claim 1,
When the sending signal from the aforementioned radio communication equipment is not able to be received, a stop or a transmission output is reduced for transmission of the 1st above-mentioned base transceiver station.
[0012]
the communications control concerning Claim 3 -- an invention of process is a communication control method in the communications system containing two or more base transceiver stations provided with the adaptive array antenna, and the communication control unit which controls two or more base transceiver stations concerned
About each aforementioned base transceiver station, the position information which shows the interaction region which receives communication interferences from an adjoining base transceiver station, and a weighting coefficient for the base transceiver station concerned to turn a beam to the aforementioned interaction region at least are made to correspond, and it memorizes to an interference table,
Radio communication equipment acquires the 1st base transceiver station and the weighting coefficient which the 1st base transceiver station concerned has applied at least during communication among two or more aforementioned base transceiver stations, Based on comparison with the weighting coefficient of the corresponding base transceiver station memorized by the acquired weighting coefficient and aforementioned interference table, it is judged whether the aforementioned radio communication equipment is placed at an interaction region,
As a result, when the aforementioned radio communication equipment is placed at an interaction region, transmission of the 1st above-mentioned base transceiver station is controlled so that the radio communication equipment concerned carries out a handover to the 1st above-mentioned base transceiver station and the 2nd adjoining base transceiver station.
[0013]
Invention concerning Claim 4 is set to the communication control method according to claim 3,
In the aforementioned radio communication equipment and the 1st above-mentioned base

transceiver station under communication, the existence of reception of the sending signal from the aforementioned radio communication equipment is detected,
When the sending signal from the aforementioned radio communication equipment is not able to be received, it is judged whether the aforementioned radio communication equipment is placed at an interaction region.
[0014]
Invention concerning Claim 5 is set to the communication control method according to claim 3 or 4,
When the aforementioned radio communication equipment is placed at an interaction region, a stop or a transmission output is reduced for transmission of the 1st above-mentioned base transceiver station.
[0015]
Invention of the communications system concerning Claim 6 which attains the above-mentioned purpose is a communications system containing two or more base transceiver stations provided with the adaptive array antenna, and the communication control unit which controls two or more base transceiver stations concerned,
Each of two or more aforementioned base transceiver stations,
While transmitting the weighting coefficient applied to beam generation to the aforementioned communication control unit, it has a communication control unit means of communication which receives the interaction region decided result from the aforementioned communication control unit,
The aforementioned communication control unit,
The receiving means which receives the aforementioned weighting coefficient transmitted from each aforementioned base transceiver station,
The interference table which corresponds and memorizes the position information which shows the interaction region which receives communication interferences from an adjoining base transceiver station, and a weighting coefficient for the base transceiver station concerned to turn a beam to the aforementioned interaction region at least about each aforementioned base transceiver station,
Radio communication equipment acquires the 1st base transceiver station and the weighting coefficient which the 1st base transceiver station concerned has applied at least during communication among two or more aforementioned base transceiver stations, The interaction region judging means which judges whether the aforementioned radio communication equipment is placed at an interaction region based on comparison with the weighting coefficient of the corresponding base transceiver station memorized by the acquired weighting coefficient and aforementioned interference table,
It has a transmitting means which transmits the interaction region decided result by the aforementioned interaction region judging means to the 1st above-mentioned base transceiver station,
So that the aforementioned radio communication equipment may carry out a handover to the 1st above-mentioned base transceiver station and the 2nd adjoining base transceiver station, when judged with the aforementioned radio communication equipment being placed at the aforementioned interaction region by the aforementioned interaction region judging means. It constituted so that the transmission in the 1st above-mentioned base transceiver station might be controlled.
[0016]
It is the base transceiver station where invention equipped with adaptive array ANTE the base transceiver station concerning Claim 7 which attains the above-mentioned purpose,
The signal detection means which detects the existence of reception of the sending signal from the radio communication equipment under communication,
The transmission control means which controls transmission by the aforementioned signal detection means to carry out a handover to the base transceiver station where the radio communication equipment concerned adjoins when the sending signal from the aforementioned radio communication equipment is not able to be received,

It ****.
[Effect of the Invention]
[0017]
Since according to the present invention transmission was controlled during communication with radio communication equipment to carry out a handover to an adjoining base transceiver station when this radio communication equipment was placed at the interaction region, Time (interruption time) for radio communication equipment to exist in an interaction region is reduced, the handover of the radio communication equipment can be promptly carried out to an adjoining base transceiver station, and it becomes possible to communicate stably.
[Best Mode of Carrying Out the Invention]
[0018]
Hereafter, with reference to figures, it describes about an embodiment of the invention.
[0019]
Fig.1 is a figure for describing the principle of the communications system concerning the 1 embodiment of the present invention. A communications system shown in Fig.1 is provided with the following.
Two or more base transceiver station 1-1,1-2 ...
The communication control unit 2 which controls these.
Each base transceiver station 1-1,1-2 ... (hereafter, in pointing out one base transceiver station) the base transceiver station 1 -- describing -- the same frequency band being used, and, while carrying out a wireless communication to the terminal (radio communication equipment) 3 which exists in the communications area of the base transceiver station 1 concerned by TDD which carried out the frame synchronization between base transceiver stations, Each base transceiver station 1 had two or more antennas, and the adaptive array antenna which controls the directivity of an antenna and improves a link situation is used for it to the terminal 3 which is communicating.
[0020]
According to this embodiment, as shown in Fig.1 (a) for example, when the base transceiver station 1-1 is not able to receive the sending signal from the terminal 3 during communication with the terminal 3, that is notified to the communication control unit 2, and it is judged in the communication control unit 2 whether the terminal 3 is placed at an interaction region. As a result, as shown in Fig.1 (a), in being placed at an interaction region with the base transceiver station 1-2 where the terminal 3 adjoins. It controls so that that is transmitted to the base transceiver station 1-1 under communication, a stop or a transmission output is reduced, transmission to the terminal 3 is shown in Fig.1 (b) in the base transceiver station 1-1 by this, and the terminal 3 carries out a handover to the base transceiver station 1-2.
[0021]
Fig.2 is a functional block diagram showing the schematic structure of the essential part of each base transceiver station 1 in the communications system shown in Fig.1, and the communication control unit 2.Each base transceiver station 1 is provided with the following.
The terminal means of communication 11 which is constituted similarly and carries out a wireless communication to a terminal.
The communication control unit means of communication 12 which communicates by the communication control unit 2, a cable, or radio.
The control means 13 which controls the whole operation.
The terminal means of communication 11 has the beam creating means 15 which controls the directivity of an antenna based on the weighting coefficient computed based on the input signal from the terminal under communication.
[0022]
The communication control unit 2 is provided with the following.
The base transceiver station means of communication 21 including a transmitting means and a receiving means which communicate with the base transceiver station 1.
Interaction region judging means 22.
Interference table 23.

The control means 25 which controls the whole.

[0023]
The position information which shows the interaction region by the base transceiver station 1-1 and the base transceiver station 1-2 which adjoin mutually in the interference table 23 by this embodiment, It memorizes by the recording format which the 1st weighting coefficient for the base transceiver station 1-1 to turn a beam to this interaction region and the 2nd weighting coefficient for the base transceiver station 1-2 to turn a beam are made to correspond, for example, is shown in Fig.3.
[0024]
Here, a recording format shown in Fig.3 is provided with the following.
The number of base transceiver stations related to position information.
An identifier according to the number of base transceiver stations.
Data pointer.
The weighting coefficient of each base transceiver station is memorized to the address which a subsequent data pointer shows to an identifier. For example, as shown in the address P1 and P2, provided the address holding a base station identifier, position information, carrier frequency band information, the number of antennas, and a data pointer and shown to the data pointer in the address P3 and P4. It is made to correspond with the identifier of the antenna which was arranged at the corresponding base transceiver station, and a weighting coefficient is memorized. The yne DIKKUSU file for every identifier of a base transceiver station is generated independently, and it may enable it to link to the information which has a weighting coefficient related to each base transceiver station. For example, the address P1 is made to link as weight information to the identifier 1 of a base transceiver station.
[0025]
In order to judge whether the terminal 3 is placed at an interaction region to the weighting coefficient of the terminal 3 and the base transceiver station under communication in this embodiment, In order to be able to search easily whether the 1st applicable weighting coefficient exists from the terminal 3 and the base transceiver station under communication, the set which collected data pointers (for example, address P1) for every base transceiver station is made preferably. Since it differs according to carrier frequency, the propagation characteristic is structurized according to carrier frequency, for example so that branching of search can be performed, as shown in Fig.4.
[0026]
It describes about specific operation of this embodiment, referring to the flow chart shown in Fig.5 hereafter.
[0027]
For example, when the base transceiver station 1-1 communicates with the terminal 3. The base transceiver station 1-1 both (Step S51) assigns a zone to the terminal 3 as if the weighting coefficient applied to turning a beam to the terminal 3 by the beam creating means 15 is computed based on the input signal from the terminal 3 (Step S52), and starts communication.
[0028]
Then, during communication by the terminal means of communication 15 of the base transceiver station 1-1, It is asked whether if it is not reception about the sending signal from the terminal 3, transmit (Step S53) and the weighting coefficient which has applied to beam generation at the time to the communication control unit 2 by the communication control unit means of communication 12, and the terminal 3 is placed at the communication control unit 2 in an interaction region.
[0029]
[if an inquiry of the interaction region from the base transceiver station 1-1 is received via the base transceiver station means of communication 21 in the communication control unit 2 / at that time], The adjoining base transceiver station 1-2 acquires the weighting coefficient applied to beam generation from the base transceiver station 1-2 via the base transceiver station means of communication 21. And the actual weighting coefficient acquired from the base transceiver

station 1-1 and the base transceiver station 1-2 in the interaction region judging means 22, If it searches whether there is any same combination based on comparison with the 1st weighting coefficient and the 2nd weighting coefficient which are stored in the interference table 23, it judges with it being placed at an interaction region with the same combination and there is no same combination, it will judge with it not being placed at an interaction region (Step S54).

[0030]

Here, when judged with the terminal 3 being placed at the interaction region with the base transceiver station 1-2, that is transmitted to the base transceiver station 1-1 via the base transceiver station means of communication 21. Thereby, in the terminal-control means 11 of the base transceiver station 1-1, transmission is controlled to reduce a stop or a transmission output for transmission to the terminal 3 (Step S55), and as shown in Fig.1 (b), he is urged for the terminal 3 to carry out a handover to the base transceiver station 1-2.

[0031]

Namely, the receiving intensity of the base transceiver station 1-1 and the adjoining base transceiver station 1-2 becomes comparable [the terminal 3], since it will be intermingled and a signal will be received, it becomes impossible to receive neither of the signals in an interaction region (decipherment), but. As mentioned above, when a stop or a transmission output is reduced, the transmission to the terminal 3 from the base transceiver station 1-1 in the terminal 3, Since the receiving intensity of the base transceiver station 1-1 becomes low, when the receiving intensity from the base transceiver station 1-2 does not change, the signal of the base transceiver station 1-1 will be buried in the signal of the base transceiver station 1-2. As a result, since the terminal 3 can receive the signal of the base transceiver station 1-2 to instead of [which cannot receive the signal of the base transceiver station 1-1 which was carrying out wireless connection until now], the handover demand from the base transceiver station 1-1 will go up to the base transceiver station 1-2. Thereby, the terminal 3 becomes possible [performing smoothly the handover from the base transceiver station 1-1 to the base transceiver station 1-2].

[0032]

When the transmitting situation of the terminal 3 is pursued and the handover to fixed time and other base transceiver stations cannot be checked after performing reduction of the transmission power to the terminal 3, or a stop, the base transceiver station 1-1 returns transmission power, and resumes communication. In Step S54, when judged with the terminal 3 not being placed at an interaction region with the base transceiver station 1-2, for example in the terminal-control means 11 of the base transceiver station 1-1, it controls to increase the transmission output to the terminal 3.

[0033]

Therefore, in this embodiment, the terminal means of communication 11 of each base transceiver station 1 constitutes the base transceiver station 1 concerned, the signal detection means which detects the existence of reception of the sending signal from the terminal under communication, and the transmission control means which controls transmission to the terminal under communication.

[0034]

As mentioned above, in this embodiment, when the base transceiver station 1-1 is not able to receive the sending signal from the terminal 3 during communication with the terminal 3. In judging whether the terminal 3 is placed at an interaction region with reference to the interference table 23 in the communication control unit 2 and being placed at an interaction region, Since transmission of the base transceiver station 1-1 was controlled to carry out a handover to the adjoining base transceiver station 1-2, Time (interruption time) for the terminal 3 to exist in an interaction region can be reduced, the handover of the terminal 3 can be promptly carried out to the adjoining base transceiver station 1-2, and communicative stability can be secured.

[0035]

The present invention is not limited only to the above-mentioned embodiment, and many deformation or change are possible for it. For example, although adjoining base transceiver

station shall use the same frequency band in the above-mentioned embodiment, when the transmission wave from the base transceiver station which adjoins even when operating frequency bands differ turns into an interference, the present invention can be applied effectively. In the above-mentioned embodiment, when the sending signal from the terminal 3 was not able to be received to the terminal 3 and base transceiver station 1-1 side under communication, in the communication control unit 2, judged whether the terminal 3 would be placed at an interaction region using the interference table 23, but. When the sending signal from the terminal 3 is not able to be received to the terminal 3 and base transceiver station 1-1 side under communication, without using the interference table 23, As what has a high possibility of being placed at an interaction region, transmission to the terminal 3 can be controlled, and it can also constitute so that the handover to the base transceiver station where the terminal 3 adjoins may be urged. On the above-mentioned embodiment and in the terminal 3 side and the base transceiver station 1-1 side under communication, Based on comparison with the weighting coefficient applied in the base transceiver station 1-1, and the memory content of an interference table, it can also be judged whether the terminal 3 is placed at an interaction region, without detecting the existence of reception of the sending signal from the terminal 3.

[0036]

The position information which shows the interaction region by the base transceiver station 1-1 and the base transceiver station 1-2 which adjoin mutually in the interference table 23 by the embodiment mentioned above, Although the 1st weighting coefficient for the base transceiver station 1-1 to turn a beam to this interaction region and the 2nd weighting coefficient for the base transceiver station 1-2 to turn a beam were made to correspond and were memorized, The position information which shows the interaction region which receives communication interferences from an adjoining base transceiver station, and a weighting coefficient for the base transceiver station concerned to turn a beam to an interaction region at least are made to correspond, and it may be made to memorize them about each base transceiver station. In this case, the weighting coefficient acquired from the base transceiver station 1-1 under communication, What is necessary is to compute the difference value of a weighting coefficient for every antenna based on comparison with the weighting coefficient of the corresponding base transceiver station 1-1 memorized by the interference table 23, and just to judge with the terminal 3 being placed at the interaction region, when distribution of the difference value of a weighting coefficient is in constant value. In this case, it will be meant that whether the electric wave which which adjoining base transceiver station may cause interference is sent out and a possibility that the terminal 3 exists in the region from which interference with other base transceiver stations may be started although it cannot limit are high. In adopting this judgment method, preferably, When the base transceiver station 1-1 controls the transmission to the terminal 3 and the terminal 3 carries out a handover to the base transceiver station 1-2, the weighting coefficient of the base transceiver station 1-1 at the time of judging it as interference and the weighting coefficient of the base transceiver station 1-2 of the handover point are made to correspond, and it registers with the interference table 23.

[Brief Description of the Drawings]

[0037]

[Drawing 1]It is a figure for describing the principle of the communications system concerning the 1 embodiment of the present invention.

[Drawing 2]It is a functional block diagram showing the schematic structure of the essential part of each base transceiver station in the communications system shown in Fig.1, and a communication control unit.

[Drawing 3]It is a figure showing an example of the recording format of the interference table shown in Fig.2.

[Drawing 4]It is a figure showing the modification of the recording format shown in Fig.3.

[Drawing 5]It is a flow chart for describing specific operation of the communications system shown in Fig.1.

[Explanations of letters or numerals]

[0038]

1-1,1-2 Base transceiver station
2 Communication control unit
3 Terminal (radio communication equipment)
11 Terminal means of communication
12 Communication control unit means of communication
13 Control means
15 Beam creating means
21 Base transceiver station means of communication
22 Interaction region judging means
23 Interference table
25 Control means

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TECHNICAL FIELD

[Field of the Invention]
[0001]
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PRIOR ART

[Background of the Invention]
[0002]
Conventionally, as a mobile communications system, cellular system is known and, these days, he can also be proceeding standardization of high-speed wireless communications, such as WiMAX (Worldwide Interoperability for Microwave Access), for example.
[0003]
The electric wave from an adjoining base transceiver station is kept from interfering in cellular system by using a frequency band which is different in an adjoining base transceiver station. For this reason, in cellular system, several different frequency bands are used and the wireless communication network is built.
[0004]
On the other hand, in WiMAX, TDD (Time Division Duplexing) which carries out time sharing of going up and the going down, and transmits and receives them on the same frequency is adopted. For this reason, the transmission wave from other terminals is kept from turning into an interference wave of a base transceiver station transmission wave of the terminal which is communicating with other base transceiver stations by synchronizing the frame structure between base transceiver stations in WiMAX.
[0005]
However, in the wireless communication system which uses the frequency of a broadband like WiMAX, it is assumed that it becomes difficult to assign a frequency band which is different in an adjoining base transceiver station like cellular system in view of effective use of limited frequency. For this reason, when the same frequency band is used between adjoining base transceiver stations, a communication-interferences region will arise from between base transceiver stations carrying out the frame synchronization between adjoining base transceiver stations.
[0006]
Thus, the terminal which exists in this region if a communication-interferences region produces, Since the transmission wave from an adjoining base transceiver station will be received simultaneously, in the region in which each receiving intensity becomes comparable, it becomes difficult to separate each transmission wave, and we cannot carry out a handover to an adjoining base transceiver station, but are anxious about being in an interruption state.
[0007]
An adaptive array is applied to two or more wireless base station antennas as what reduces the insensible field by interference, and what formed the null in the direction of two or more base transceiver stations is proposed (for example, see Patent Document 1).
[Patent document 1] JP,H11-308037,A

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EFFECT OF THE INVENTION

[Effect of the Invention]
[0017]
During communication with radio communication equipment, when this radio communication equipment was placed at an interaction region, transmission was controlled by the present invention to carry out a handover to an adjoining base transceiver station.
Therefore, time (interruption time) for radio communication equipment to exist in an interaction region is reduced, the handover of the radio communication equipment can be promptly carried out to an adjoining base transceiver station, and it becomes possible to communicate stably.

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TECHNICAL PROBLEM

[Problem to be solved by the invention]
[0008]
However, the thing of disclosure to the above-mentioned Patent document 1 is related with the site diversity system of the double office simultaneous transmission and reception which synthesizes at a terminal the electric wave which carried out simultaneous transmission from two or more base transceiver stations, and raises the transmission quality, and a terminal cannot apply it to the system which communicates with one base transceiver station.
[0009]
Therefore, the the object of this invention made in view of this situation can carry out a handover to an adjoining base transceiver station promptly, and there is in providing the communication control method, communications system, and base transceiver station which can communicate stably.

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MEANS

[Means for solving problem]
[0010]
Invention of the communication control method concerning Claim 1 which attains the above-mentioned purpose is a communication control method in a communications system including two or more base transceiver stations provided with the adaptive array antenna,
In radio communication equipment and the 1st base transceiver station under communication, the existence of reception of the sending signal from the aforementioned radio communication equipment is detected,
When the sending signal from the aforementioned radio communication equipment is not able to be received, transmission of the 1st above-mentioned base transceiver station is controlled so that the aforementioned radio communication equipment carries out a handover to the 1st above-mentioned base transceiver station and the 2nd adjoining base transceiver station.
[0011]
Invention concerning Claim 2 is set to the communication control method according to claim 1,
When the sending signal from the aforementioned radio communication equipment is not able to be received, a stop or a transmission output is reduced for transmission of the 1st above-mentioned base transceiver station.
[0012]
the communications control concerning Claim 3 -- an invention of process is a communication control method in the communications system containing two or more base transceiver stations provided with the adaptive array antenna, and the communication control unit which controls two or more base transceiver stations concerned
About each aforementioned base transceiver station, the position information which shows the interaction region which receives communication interferences from an adjoining base transceiver station, and a weighting coefficient for the base transceiver station concerned to turn a beam to the aforementioned interaction region at least are made to correspond, and it memorizes to an interference table,
Radio communication equipment acquires the 1st base transceiver station and the weighting coefficient which the 1st base transceiver station concerned has applied at least during communication among two or more aforementioned base transceiver stations, Based on comparison with the weighting coefficient of the corresponding base transceiver station memorized by the acquired weighting coefficient and aforementioned interference table, it is judged whether the aforementioned radio communication equipment is placed at an interaction region,
As a result, when the aforementioned radio communication equipment is placed at an interaction region, transmission of the 1st above-mentioned base transceiver station is controlled so that the radio communication equipment concerned carries out a handover to the 1st above-mentioned base transceiver station and the 2nd adjoining base transceiver station.
[0013]
Invention concerning Claim 4 is set to the communication control method according to claim 3,
In the aforementioned radio communication equipment and the 1st above-mentioned base

transceiver station under communication, the existence of reception of the sending signal from the aforementioned radio communication equipment is detected,
When the sending signal from the aforementioned radio communication equipment is not able to be received, it is judged whether the aforementioned radio communication equipment is placed at an interaction region.
[0014]
Invention concerning Claim 5 is set to the communication control method according to claim 3 or 4,
When the aforementioned radio communication equipment is placed at an interaction region, a stop or a transmission output is reduced for transmission of the 1st above-mentioned base transceiver station.
[0015]
Invention of the communications system concerning Claim 6 which attains the above-mentioned purpose is a communications system containing two or more base transceiver stations provided with the adaptive array antenna, and the communication control unit which controls two or more base transceiver stations concerned,
Each of two or more aforementioned base transceiver stations,
While transmitting the weighting coefficient applied to beam generation to the aforementioned communication control unit, it has a communication control unit means of communication which receives the interaction region decided result from the aforementioned communication control unit,
The aforementioned communication control unit,
The receiving means which receives the aforementioned weighting coefficient transmitted from each aforementioned base transceiver station,
The interference table which corresponds and memorizes the position information which shows the interaction region which receives communication interferences from an adjoining base transceiver station, and a weighting coefficient for the base transceiver station concerned to turn a beam to the aforementioned interaction region at least about each aforementioned base transceiver station,
Radio communication equipment acquires the 1st base transceiver station and the weighting coefficient which the 1st base transceiver station concerned has applied at least during communication among two or more aforementioned base transceiver stations, The interaction region judging means which judges whether the aforementioned radio communication equipment is placed at an interaction region based on comparison with the weighting coefficient of the corresponding base transceiver station memorized by the acquired weighting coefficient and aforementioned interference table,
It has a transmitting means which transmits the interaction region decided result by the aforementioned interaction region judging means to the 1st above-mentioned base transceiver station,
So that the aforementioned radio communication equipment may carry out a handover to the 1st above-mentioned base transceiver station and the 2nd adjoining base transceiver station, when judged with the aforementioned radio communication equipment being placed at the aforementioned interaction region by the aforementioned interaction region judging means. It constituted so that the transmission in the 1st above-mentioned base transceiver station might be controlled.
[0016]
It is the base transceiver station where invention equipped with adaptive array ANTE the base transceiver station concerning Claim 7 which attains the above-mentioned purpose,
The signal detection means which detects the existence of reception of the sending signal from the radio communication equipment under communication,
The transmission control means which controls transmission by the aforementioned signal detection means to carry out a handover to the base transceiver station where the radio communication equipment concerned adjoins when the sending signal from the aforementioned radio communication equipment is not able to be received,

It ****.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[0037]
[Drawing 1]It is a figure for describing the principle of the communications system concerning the 1 embodiment of the present invention.
[Drawing 2]It is a functional block diagram showing the schematic structure of the essential part of each base transceiver station in the communications system shown in Fig.1, and a communication control unit.
[Drawing 3]It is a figure showing an example of the recording format of the interference table shown in Fig.2.
[Drawing 4]It is a figure showing the modification of the recording format shown in Fig.3.
[Drawing 5]It is a flow chart for describing specific operation of the communications system shown in Fig.1.

[Translation done.]

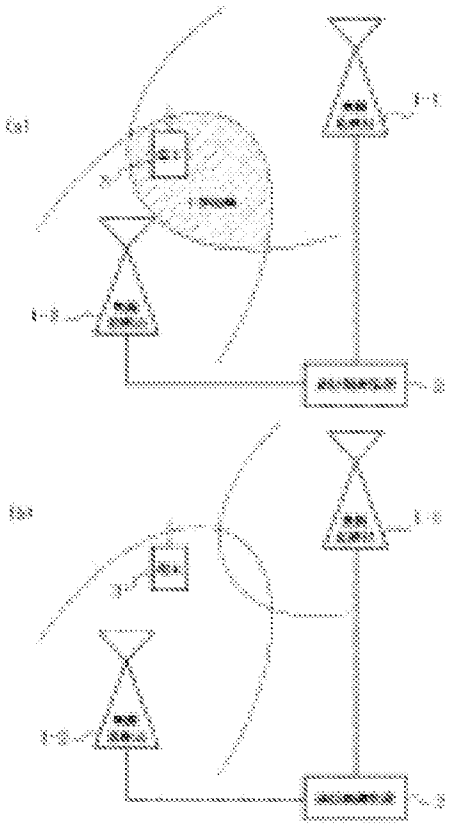
* NOTICES *

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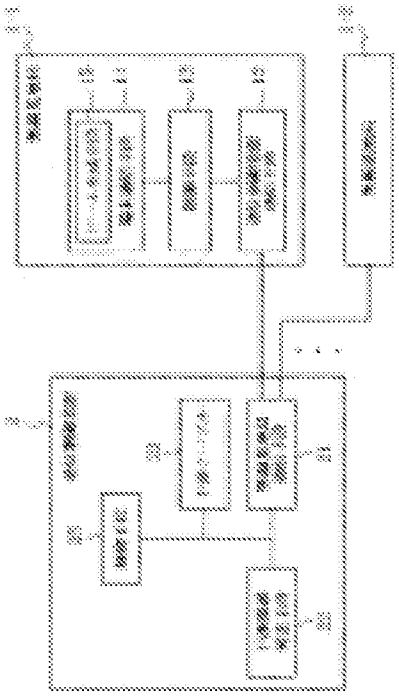
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

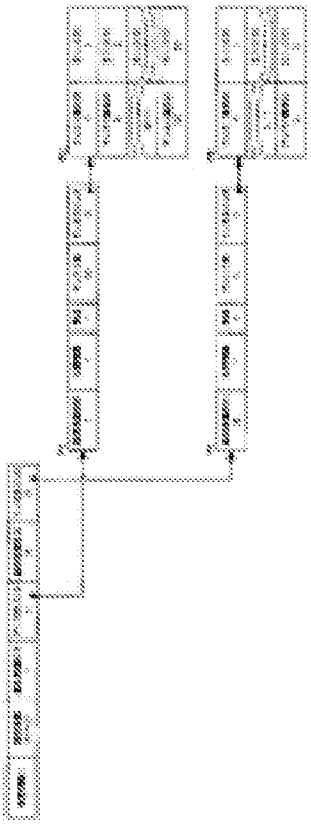
[Drawing 1]



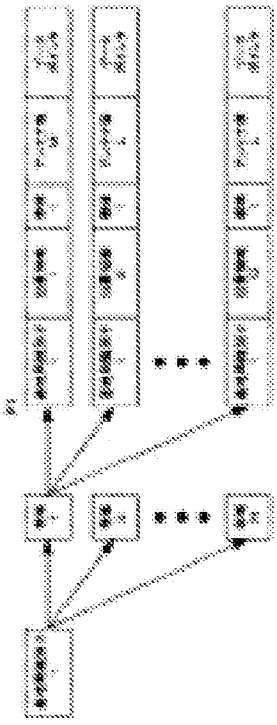
[Drawing 2]



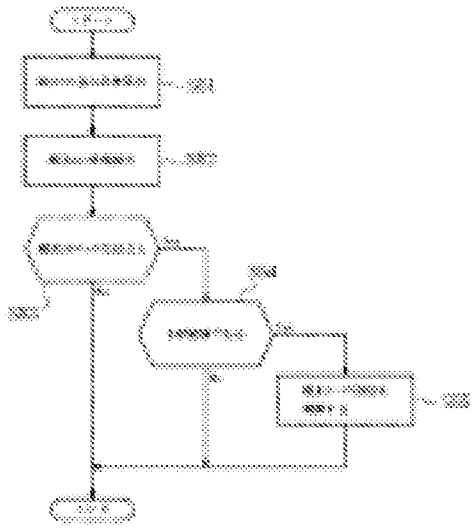
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2008-252330
(43)Date of publication of application : 16.10.2008

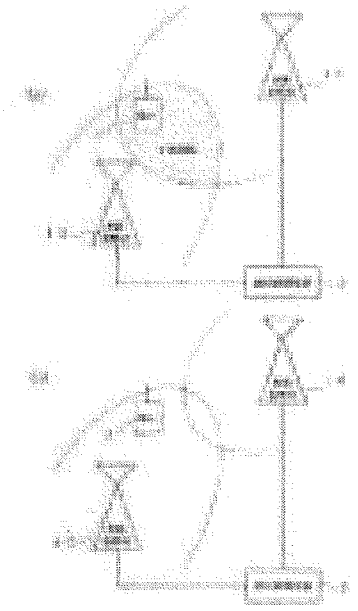
(51)Int.Cl. *H04Q 7/22 (2006.01)*
H04B 7/26 (2006.01)

(21)Application number : 2007-089084
(22)Date of filing : 29.03.2007

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MORITA KUGO

(54) COMMUNICATION CONTROL METHOD, COMMUNICATION SYSTEM, AND RADIO BASE STATION

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a communication control method, a communication system, and a radio base station by which a hand-over can speedily be made to an adjacent radio base station and stable communication can be carried out.
SOLUTION: The communication control method of the communication system includes a plurality of radio base stations 1 having adaptive array antennas. When a radio communication device 3 in communication with a first radio base station 1-1 enters an interference area of interference with a second radio base station adjacent to the first radio base station 1-1, transmission of the first radio base station 1-1 is controlled so as to perform a hand-over to the second radio base station 1-2.



(19)日本国特許庁(JP)　(12)公開特許公報(A)　(11)特許出願公開番号
特開2008-252330
(P2008-252330A)
(43)公開日　平成20年10月16日(2008.10.16)

(51)Int.Cl.			F I			テーマコード（参考）
H04Q	7/22	(2006.01)	H04B	7/26	108B	5K067
H04B	7/26	(2006.01)	H04B	7/26	B	

審査請求 未請求　請求項の数 7　OL　（全 11 頁）

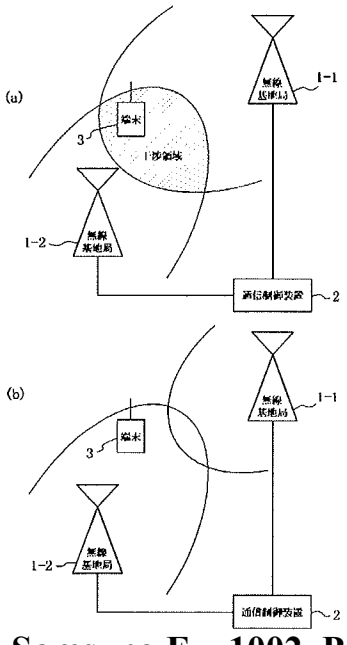
(21)出願番号　特願2007-89084 (P2007-89084)
(22)出願日　平成19年3月29日 (2007.3.29)

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最終頁に続く

(54)【発明の名称】通信制御方法、通信システムおよび無線基地局

(57)【要約】
【課題】隣接する無線基地局に迅速にハンドオーバでき、安定して通信できる通信制御方法、通信システムおよび無線基地局を提供する。
【解決手段】アダプティブアレイアンテナを備えた複数の無線基地局１を含む通信システムにおける通信制御方法であって、第１無線基地局１－１と通信中の無線通信装置３が、第１と無線基地局１－１と隣接する第２無線基地局との干渉領域に位置したら、第２無線基地局１－２へハンドオーバするように、第１無線基地局１－１の送信を制御する。
【選択図】図１



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【特許請求の範囲】
【請求項１】
アダプティブアレイアンテナを備えた複数の無線基地局を含む通信システムにおける通信制御方法であって、
無線通信装置と通信中の第１無線基地局において、前記無線通信装置からの送信信号の受信の有無を検出し、
前記無線通信装置からの送信信号を受信できなかった場合には、前記無線通信装置が前記第１無線基地局と隣接する第２無線基地局へハンドオーバするように、前記第１無線基地局の送信を制御する、ことを特徴とする通信制御方法。
【請求項２】
前記無線通信装置からの送信信号を受信できなかった場合に、前記第１無線基地局の送信を停止または送信出力を低減する、ことを特徴とする請求項１に記載の通信制御方法。
【請求項３】
アダプティブアレイアンテナを備えた複数の無線基地局と、当該複数の無線基地局を制御する通信制御装置とを含む通信システムにおける通信制御方法であって、
前記各無線基地局について、隣接する無線基地局から通信干渉を受ける干渉領域を示す位置情報と、少なくとも前記干渉領域に当該無線基地局がビームを向けるための重み係数と、を対応させて干渉テーブルに記憶し、
無線通信装置が前記複数の無線基地局のうち、第１無線基地局と通信中に、少なくとも、当該第１無線基地局が適用している重み係数を取得して、その取得した重み係数と前記干渉テーブルに記憶されている対応する無線基地局の重み係数との比較に基づいて、前記無線通信装置が干渉領域に位置するか否かを判定し、
その結果、前記無線通信装置が干渉領域に位置する場合には、当該無線通信装置が前記第１無線基地局と隣接する第２無線基地局へハンドオーバするように、前記第１無線基地局の送信を制御する、ことを特徴とする通信制御方法。
【請求項４】
前記無線通信装置と通信中の前記第１無線基地局において、前記無線通信装置からの送信信号の受信の有無を検出し、
前記無線通信装置からの送信信号を受信できなかった場合に、前記無線通信装置が干渉領域に位置するか否かを判定することを特徴とする請求項３に記載の通信制御方法。
【請求項５】
前記無線通信装置が干渉領域に位置する場合に、前記第１無線基地局の送信を停止または送信出力を低減する、ことを特徴とする請求項３または４に記載の通信制御方法。
【請求項６】
アダプティブアレイアンテナを備えた複数の無線基地局と、当該複数の無線基地局を制御する通信制御装置とを含む通信システムであって、
前記複数の無線基地局の各々は、
ビーム生成に適用している重み係数を前記通信制御装置へ送信するとともに、前記通信制御装置からの干渉領域判定結果を受信する通信制御装置通信手段を有し、
前記通信制御装置は、
前記各無線基地局から送信された前記重み係数を受信する受信手段と、
前記各無線基地局について、隣接する無線基地局から通信干渉を受ける干渉領域を示す位置情報と、少なくとも前記干渉領域に当該無線基地局がビームを向けるための重み係数と、を対応して記憶する干渉テーブルと、
無線通信装置が前記複数の無線基地局のうち、第１無線基地局と通信中に、少なくとも、当該第１無線基地局が適用している重み係数を取得して、その取得した重み係数と前記干渉テーブルに記憶されている対応する無線基地局の重み係数との比較に基づいて、前記無線通信装置が干渉領域に位置するか否かを判定する干渉領域判定手段と、
前記干渉領域判定手段による干渉領域判定結果を、前記第１無線基地局へ送信する送信

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前記干渉領域判定手段により、前記無線通信装置が前記干渉領域に位置すると判定された場合に、前記無線通信装置が前記第１無線基地局と隣接する第２無線基地局へハンドオーバするように、前記第１無線基地局における送信を制御するよう構成したことを特徴とする通信システム。

【請求項７】

アダプティブアレイアンテを備えた無線基地局であって、

通信中の無線通信装置からの送信信号の受信の有無を検出する信号検出手段と、

前記信号検出手段により、前記無線通信装置からの送信信号を受信できなかった場合に、当該無線通信装置が隣接する無線基地局へハンドオーバするように、送信を制御する送信制御手段と、

を有することを特徴とする無線基地局。

【発明の詳細な説明】

【技術分野】

【０００１】

本発明は、通信制御方法、通信システムおよび無線基地局に関するものである。

【背景技術】

【０００２】

従来、移動体通信システムとして、セルラーシステムが知られており、また、最近では、例えば、ＷｉＭＡＸ(Worldwide Interoperability for Microwave Access)などの高速無線通信の規格化も進められている。

【０００３】

セルラーシステムにおいては、隣接する無線基地局で異なる周波数帯域を用いることにより、隣接する無線基地局からの電波が干渉しないようにしている。このため、セルラーシステムでは、異なる複数の周波数帯域を使用して、無線通信網を構築している。

【０００４】

これに対し、ＷｉＭＡＸにおいては、同一周波数上で、上りおよび下りを時間分割して送受信するＴＤＤ(Time Division Duplexing)を採用している。このため、ＷｉＭＡＸでは、無線基地局間におけるフレーム構造を同期させることにより、他の端末からの送信波が、他の無線基地局と通信している端末の、無線基地局送信波の干渉波とならないようにしている。

【０００５】

しかしながら、ＷｉＭＡＸのような広帯域の周波数を使用する無線通信システムでは、有限な周波数の有効利用の観点から、セルラーシステムのように、隣接する無線基地局に異なる周波数帯域を割り当てることは困難になることが想定される。このため、隣接する無線基地局間において同一周波数帯域を用いると、無線基地局間がフレーム同期していることから、隣接する無線基地局間に通信干渉領域が生じることになる。

【０００６】

このように、通信干渉領域が生じると、この領域に存在する端末は、隣接する無線基地局からの送信波を同時に受信することになるため、それぞれの受信強度が同程度となる領域では、各々の送信波を分離することが困難となって、隣接する無線基地局にハンドオーバできず、不通状態になることが懸念される。

【０００７】

なお、干渉による不感領域を低減するものとして、複数の無線基地局アンテナにアダプティブアレーを適用して、複数の無線基地局の方向にヌルを形成するようにしたものが提案されている（例えば、特許文献１参照）。

【特許文献１】特開平１１－３０８０３７号公報

【発明の開示】

【発明が解決しようとする課題】

【０００８】

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末で合成して伝送品質を高める複局同時送受信のサイトダイバーシチ方式に関するもので、端末が一つの無線基地局と通信するシステムには適用できない。

【０００９】

したがって、かかる事情に鑑みてなされた本発明の目的は、隣接する無線基地局に迅速にハンドオーバでき、安定して通信できる通信制御方法、通信システムおよび無線基地局を提供することにある。

【課題を解決するための手段】

【００１０】

上記目的を達成する請求項１に係る通信制御方法の発明は、アダプティブアレイアンテナを備えた複数の無線基地局を含む通信システムにおける通信制御方法であって、

無線通信装置と通信中の第１無線基地局において、前記無線通信装置からの送信信号の受信の有無を検出し、

前記無線通信装置からの送信信号を受信できなかった場合には、前記無線通信装置が前記第１無線基地局と隣接する第２無線基地局へハンドオーバするように、前記第１無線基地局の送信を制御する、ことを特徴とするものである。

【００１１】

請求項２に係る発明は、請求項１に記載の通信制御方法において、

前記無線通信装置からの送信信号を受信できなかった場合に、前記第１無線基地局の送信を停止または送信出力を低減する、ことを特徴とするものである。

【００１２】

さらに、請求項３に係る通信制御方法の発明は、アダプティブアレイアンテナを備えた複数の無線基地局と、当該複数の無線基地局を制御する通信制御装置とを含む通信システムにおける通信制御方法であって、

前記各無線基地局について、隣接する無線基地局から通信干渉を受ける干渉領域を示す位置情報と、少なくとも前記干渉領域に当該無線基地局がビームを向けるための重み係数と、を対応させて干渉テーブルに記憶し、

無線通信装置が前記複数の無線基地局のうち、第１無線基地局と通信中に、少なくとも、当該第１無線基地局が適用している重み係数を取得して、その取得した重み係数と前記干渉テーブルに記憶されている対応する無線基地局の重み係数との比較に基づいて、前記無線通信装置が干渉領域に位置するか否かを判定し、

その結果、前記無線通信装置が干渉領域に位置する場合には、当該無線通信装置が前記第１無線基地局と隣接する第２無線基地局へハンドオーバするように、前記第１無線基地局の送信を制御する、ことを特徴とするものである。

【００１３】

請求項４に係る発明は、請求項３に記載の通信制御方法において、

前記無線通信装置と通信中の前記第１無線基地局において、前記無線通信装置からの送信信号の受信の有無を検出し、

前記無線通信装置からの送信信号を受信できなかった場合に、前記無線通信装置が干渉領域に位置するか否かを判定することを特徴とするものである。

【００１４】

請求項５に係る発明は、請求項３または４に記載の通信制御方法において、

前記無線通信装置が干渉領域に位置する場合に、前記第１無線基地局の送信を停止または送信出力を低減する、ことを特徴とするものである。

【００１５】

さらに、上記目的を達成する請求項６に係る通信システムの発明は、アダプティブアレイアンテナを備えた複数の無線基地局と、当該複数の無線基地局を制御する通信制御装置とを含む通信システムであって、

前記複数の無線基地局の各々は、

ビーム生成に適用している重み係数を前記通信制御装置へ送信するとともに、前記通信

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前記通信制御装置は、
前記各無線基地局から送信された前記重み係数を受信する受信手段と、
前記各無線基地局について、隣接する無線基地局から通信干渉を受ける干渉領域を示す位置情報と、少なくとも前記干渉領域に当該無線基地局がビームを向けるための重み係数と、を対応して記憶する干渉テーブルと、
無線通信装置が前記複数の無線基地局のうち、第１無線基地局と通信中に、少なくとも、当該第１無線基地局が適用している重み係数を取得して、その取得した重み係数と前記干渉テーブルに記憶されている対応する無線基地局の重み係数との比較に基づいて、前記無線通信装置が干渉領域に位置するか否かを判定する干渉領域判定手段と、
前記干渉領域判定手段による干渉領域判定結果を、前記第１無線基地局へ送信する送信手段と、を有し、
前記干渉領域判定手段により、前記無線通信装置が前記干渉領域に位置すると判定された場合に、前記無線通信装置が前記第１無線基地局と隣接する第２無線基地局へハンドオーバするように、前記第１無線基地局における送信を制御するよう構成したことを特徴とするものである。

【００１６】

さらに、上記目的を達成する請求項７に係る無線基地局に発明は、アダプティブアレイアンテを備えた無線基地局であって、
通信中の無線通信装置からの送信信号の受信の有無を検出する信号検出手段と、
前記信号検出手段により、前記無線通信装置からの送信信号を受信できなかった場合に、当該無線通信装置が隣接する無線基地局へハンドオーバするように、送信を制御する送信制御手段と、
を有することを特徴とするものである。

【発明の効果】

【００１７】

本発明によれば、無線通信装置と通信中に、該無線通信装置が干渉領域に位置すると、隣接する無線基地局へハンドオーバするように、送信を制御するようにしたので、無線通信装置が干渉領域に存在する時間（不通時間）を低減して、無線通信装置を隣接する無線基地局へ迅速にハンドオーバでき、安定して通信することが可能となる。

【発明を実施するための最良の形態】

【００１８】

以下、本発明の実施の形態について、図を参照して説明する。

【００１９】

図１は、本発明の一実施の形態に係る通信システムの原理を説明するための図である。図１に示す通信システムは、複数の無線基地局１－１，１－２，・・・と、これらを制御する通信制御装置２とを有している。各無線基地局１－１，１－２，・・・（以下、一つの無線基地局を指す場合には、無線基地局１とも記す）は、同一周波数帯域を使用して、無線基地局間でフレーム同期したＴＤＤにより、当該無線基地局１の通信エリアに存在する端末（無線通信装置）３と無線通信するようになっているとともに、各無線基地局１は、複数のアンテナを有し、通信している端末３に対して、アンテナの指向性を制御してリンク状況を改善するアダプティブアレイアンテナを採用している。

【００２０】

本実施の形態では、例えば、図１（ａ）に示すように、無線基地局１－１が端末３と通信中に、端末３からの送信信号を受信できなかった場合には、その旨を通信制御装置２に通知して、通信制御装置２において、端末３が干渉領域に位置するか否かを判定する。その結果、図１（ａ）に示すように、端末３が隣接する無線基地局１－２との干渉領域に位置する場合には、その旨を通信中の無線基地局１－１に送信し、これにより、無線基地局１－１において、端末３への送信を停止、または送信出力を低減して、図１（ｂ）に示すように、端末３が無線基地局１－２へハンドオーバするように、制御する。

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図２は、図１に示す通信システムにおける各無線基地局１および通信制御装置２の要部の概略構成を示す機能ブロック図である。各無線基地局１は、同様に構成されており、端末と無線通信する端末通信手段１１と、通信制御装置２と有線または無線により通信する通信制御装置通信手段１２と、全体の動作を制御する制御手段１３とを有している。端末通信手段１１は、通信中の端末からの受信信号に基づいて算出される重み係数に基づいて、アンテナの指向性を制御するビーム生成手段１５を有している。

【００２２】

通信制御装置２は、無線基地局１と通信する送信手段および受信手段を含む無線基地局通信手段２１と、干渉領域判定手段２２と、干渉テーブル２３と、全体を制御する制御手段２５とを有している。

【００２３】

干渉テーブル２３には、本実施の形態では、互いに隣接する無線基地局１－１および無線基地局１－２による干渉領域を示す位置情報と、該干渉領域に無線基地局１－１がビームを向けるための第１重み係数と、無線基地局１－２がビームを向けるための第２重み係数とを対応させて、例えば図３に示す記録フォーマットで、記憶しておく。

【００２４】

ここで、図３に示す記録フォーマットは、位置情報に対して、関連する無線基地局数と、無線基地局数に応じた識別子と、データポインタとを有している。各々の無線基地局の重み係数は、識別子に続くデータポインタが示すアドレスに記憶する。例えば、アドレスＰ１，Ｐ２で示すように、基地局識別子、位置情報、搬送波帯域情報、アンテナ数、データポインタを保持したアドレスを設け、そのデータポインタに、アドレスＰ３，Ｐ４で示すように、対応する無線基地局に配されたアンテナの識別子と対応させて重み係数を記憶する。なお、別に無線基地局の識別子毎のインディックスファイルを生成し、個々の無線基地局に関係する重み係数を有する情報にリンクできるようにしてもよい。例えば、無線基地局の識別子１に対して、重み情報として、アドレスＰ１をリンクさせる。

【００２５】

本実施の形態では、端末３と通信中の無線基地局の重み係数に対して、端末３が干渉領域に位置するか否かを判定するため、端末３と通信中の無線基地局から、該当する第１重み係数が存在するかを容易に検索できるようにするため、好ましくは、無線基地局毎にデータポインタ（例えば、アドレスＰ１）を集めた集合を作っておく。また、伝搬特性は、搬送波周波数に応じて異なるので、例えば、図４に示すように、搬送波周波数に応じて、探索の分岐ができるように構造化しておく。

【００２６】

以下、図５に示すフローチャートを参照しながら、本実施の形態の具体的動作について説明する。

【００２７】

例えば、無線基地局１－１が端末３と通信する場合には、無線基地局１－１は、端末３からの受信信号に基づいて、ビーム生成手段１５により端末３にビームを向けるのに適用する重み係数を算出するとともに（ステップＳ５１）、端末３に対して帯域を割り当てて（ステップＳ５２）、通信を開始する。

【００２８】

その後、通信中において、無線基地局１－１の端末通信手段１５により、端末３からの送信信号を受信でなかった場合には（ステップＳ５３）、その時点でビーム生成に適用している重み係数を、通信制御装置通信手段１２により通信制御装置２に送信して、通信制御装置２に、端末３が干渉領域に位置するか否かを問い合わせる。

【００２９】

通信制御装置２では、無線基地局通信手段２１を介して、無線基地局１－１からの干渉領域の問い合わせを受信したら、その時点において、隣接する無線基地局１－２がビーム生成に適用している重み係数を、無線基地局通信手段２１を介して、無線基地局１－２が

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局１－２から取得した実際の重み係数と、干渉テーブル２３に格納されている第１重み係数および第２重み係数との比較に基づいて、同じ組み合わせがあるか否かを検索し、同じ組み合わせあれば干渉領域に位置すると判定し、同じ組み合わせがなければ、干渉領域に位置していないと判定する（ステップＳ５４）。

【００３０】

ここで、端末３が無線基地局１－２との干渉領域に位置していると判定された場合には、その旨を、無線基地局通信手段２１を介して無線基地局１－１へ送信する。これにより、無線基地局１－１の端末制御手段１１において、端末３への送信を停止、または送信出力を低減するように送信を制御して（ステップＳ５５）、図１（ｂ）に示したように、端末３が無線基地局１－２へハンドオーバするように促す。

【００３１】

すなわち、干渉領域では、端末３は、無線基地局１－１および隣接する無線基地局１－２の受信強度が同程度となって、信号を混在して受信することになるため、どちらの信号も受信（解読）することができなくなるが、上述したように、無線基地局１－１から端末３への送信を停止、または送信出力を低減すると、端末３では、無線基地局１－１の受信強度は低くなるので、無線基地局１－２からの受信強度が変わらない場合には、無線基地局１－１の信号は、無線基地局１－２の信号に埋没することになる。その結果、端末３は、これまで無線接続していた無線基地局１－１の信号は受信できない代わりに、無線基地局１－２の信号を受信できるようになるので、無線基地局１－２に対して、無線基地局１－１からのハンドオーバ要求が上がることになる。これにより、端末３は、無線基地局１－１から無線基地局１－２へのハンドオーバを、スムーズに行うことが可能となる。

【００３２】

なお、無線基地局１－１は、端末３に対する送信電力の低減、もしくは停止を行った後、端末３の送信状況を追跡し、一定期間、他の無線基地局へのハンドオーバが確認できない場合には、送信電力を戻して、通信を再開する。また、ステップＳ５４において、端末３が無線基地局１－２との干渉領域に位置していないと判定された場合には、例えば、無線基地局１－１の端末制御手段１１において、端末３への送信出力を増大するように制御する。

【００３３】

したがって、本実施の形態において、各無線基地局１の端末通信手段１１は、当該無線基地局１と通信中の端末からの送信信号の受信の有無を検出する信号検出手段と、通信中の端末に対して送信を制御する送信制御手段とを構成している。

【００３４】

以上のように、本実施の形態では、無線基地局１－１が端末３と通信中に、端末３からの送信信号を受信できなかった場合には、通信制御装置２において、干渉テーブル２３を参照して、端末３が干渉領域に位置するか否かを判定し、干渉領域に位置する場合には、隣接する無線基地局１－２へハンドオーバするように、無線基地局１－１の送信を制御するようにしたので、端末３が干渉領域に存在する時間（不通時間）を低減して、端末３を隣接する無線基地局１－２へ迅速にハンドオーバすることができ、通信の安定性を確保することができる。

【００３５】

なお、本発明は、上記実施の形態にのみ限定されるものではなく、幾多の変形または変更が可能である。例えば、上記実施の形態では、隣接する無線基地局が同一周波数帯域を使用するものとしたが、使用周波数帯域が異なる場合でも、隣接する無線基地局からの送信波が妨害波となるような場合には、本発明を有効に適用することができる。また、上記実施の形態では、端末３と通信中の無線基地局１－１側において、端末３からの送信信号を受信できなかった場合、通信制御装置２において、干渉テーブル２３を用いて、端末３が干渉領域に位置するか否かを判定するようにしたが、干渉テーブル２３を用いることなく、端末３と通信中の無線基地局１－１側において、端末３からの送信信号を受信できな

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て、端末３の隣接する無線基地局へのハンドオーバを促すように構成することもできる。また、上記実施の形態において、端末３と通信中の無線基地局１－１側において、端末３からの送信信号の受信の有無を検出することなく、無線基地局１－１において適用している重み係数と干渉テーブルの記憶内容との比較に基づいて、端末３が干渉領域に位置するか否かを判定することもできる。

【００３６】

また、上述した実施の形態では、干渉テーブル２３に、互いに隣接する無線基地局１－１および無線基地局１－２による干渉領域を示す位置情報と、該干渉領域に無線基地局１－１がビームを向けるための第１重み係数と、無線基地局１－２がビームを向けるための第２重み係数とを対応させて記憶したが、各無線基地局について、隣接する無線基地局から通信干渉を受ける干渉領域を示す位置情報と、少なくとも当該無線基地局が干渉領域にビームを向けるための重み係数と、を対応させて記憶するようにしてもよい。この場合には、通信中の無線基地局１－１から取得した重み係数と、干渉テーブル２３に記憶されている対応する無線基地局１－１の重み係数との比較に基づいて、例えば、アンテナ毎に重み係数の差分値を算出し、重み係数の差分値の分散が一定値内の場合は、端末３は干渉領域に位置していると判定すればよい。この場合、隣接するどの無線基地局が干渉を引き起こす可能性のある電波を送出しているか限定できないが、他の無線基地局との干渉を起す可能性がある領域に端末３が存在する可能性は高いことを意味することになる。なお、この判定方法を採用する場合には、好ましくは、無線基地局１－１が端末３に対する送信を制御して、端末３が無線基地局１－２にハンドオーバした場合には、干渉と判断した際の無線基地局１－１の重み係数と、ハンドオーバ先の無線基地局１－２の重み係数とを対応させて、干渉テーブル２３に登録する。

【図面の簡単な説明】

【００３７】

【図１】本発明の一実施の形態に係る通信システムの原理を説明するための図である。

【図２】図１に示す通信システムにおける各無線基地局および通信制御装置の要部の概略構成を示す機能ブロック図である。

【図３】図２に示す干渉テーブルの記録フォーマットの一例を示す図である。

【図４】図３に示す記録フォーマットの変形例を示す図である。

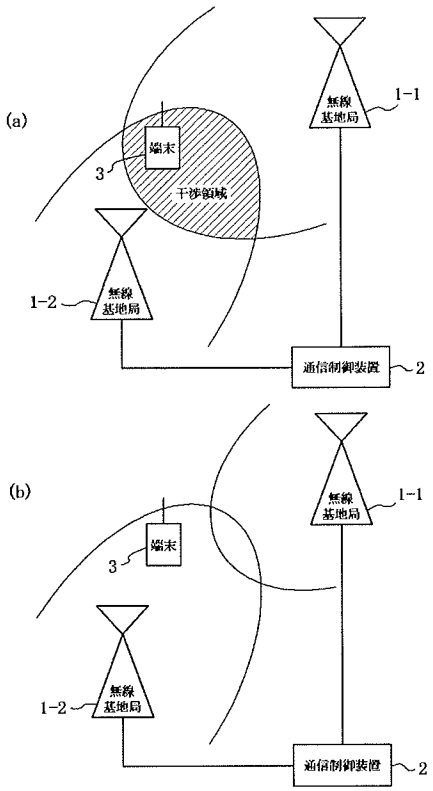
【図５】図１に示す通信システムの具体的動作を説明するためのフローチャートである。

【符号の説明】

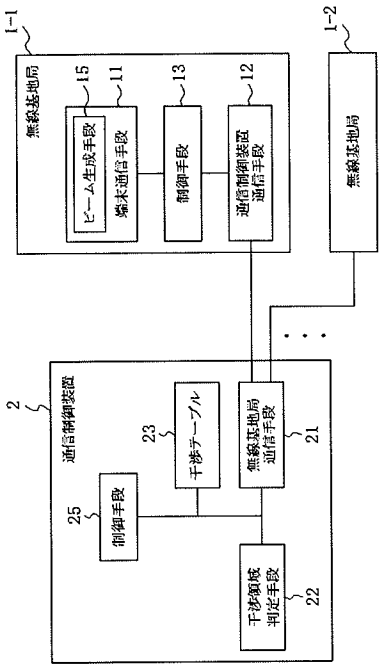
【００３８】

１－１，１－２　無線基地局
２　通信制御装置
３　端末（無線通信装置）
１１　端末通信手段
１２　通信制御装置通信手段
１３　制御手段
１５　ビーム生成手段
２１　無線基地局通信手段
２２　干渉領域判定手段
２３　干渉テーブル
２５　制御手段

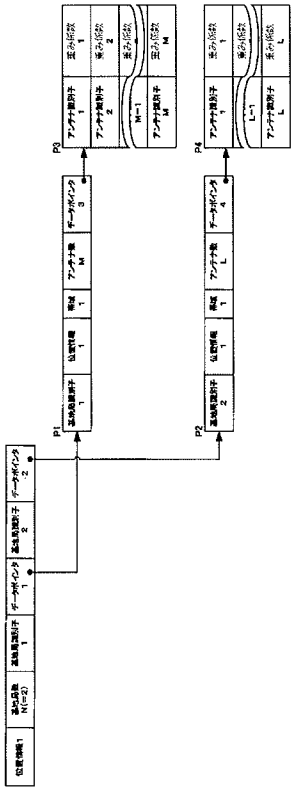
【図１】


(a)
無線基地局
1-1
端末
3
干渉領域
無線基地局
1-2
通信制御装置
2
(b)
無線基地局
1-1
端末
3
無線基地局
1-2
通信制御装置
2

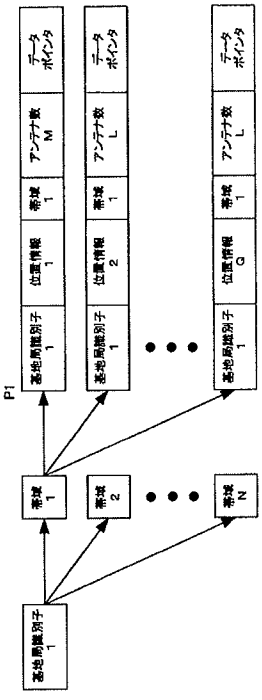
【図２】


1-1
無線基地局
15
ビーム生成手段
11
端末通信手段
13
制御手段
12
通信制御装置通信手段
1-2
無線基地局
2
通信制御装置
23
干渉テーブル
無線基地局通信手段
21
25
制御手段
干渉領域判定手段
22

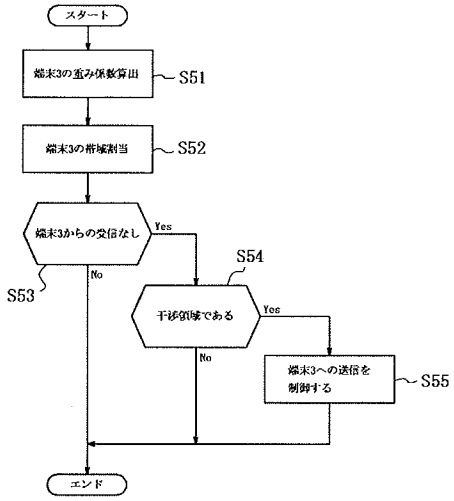
【図３】



【図４】


P1
基地局識別子 1
位置情報 1
帯域 1
アンテナ数 M
データポインタ
基地局識別子 1
位置情報 2
帯域 1
アンテナ数 L
データポインタ
基地局識別子 1
位置情報 G
帯域 1
アンテナ数 L
データポインタ
帯域 1
帯域 2
帯域 N
基地局識別子 1

【図５】


スタート
端末3の重み係数算出
S51
端末3の帯域割当
S52
端末3からの受信なし
Yes
No
S53
S54
干渉領域である
Yes
No
端末3への送信を
制御する
S55
エンド

フロントページの続き

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Ｆターム(参考) 5K067 AA03 EE02 EE10 EE16 EE24 HH22 HH23

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
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13263835
Filing Date	2011-10-10
First Named Inventor	Ezekiel Kruglick
Art Unit	2646
Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

U.S.PATENTS Remove

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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	2006086910	JP	A	2006-03-30	TOSHIBA CORP		☒
	2	2008252330	JP	A	2008-10-16	KYOCERA CORP		☒
	3	2010121885	WO	A1	2010-10-28	ALCA-TEL LUCENT		☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13263835
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	2646
	Examiner Name	BEAMER, TEMICA M
	Attorney Docket Number	2796.737BS

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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]
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[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.

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	Application Number	13263835
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	2646
	Examiner Name	BEAMER, TEMICA M
	Attorney Docket Number	2796.737BS

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.

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

☐ A certification statement is not submitted herewith.

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	/David S. Lee/	Date (YYYY-MM-DD)	2014-12-15
Name/Print	David S. Lee	Registration Number	38,222

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.**

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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.

Electronic Acknowledgement Receipt

EFS ID:	20956075
Application Number:	13263835
International Application Number:	
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Customer Number:	86636
Filer:	David S. Lee
Filer Authorized By:	
Attorney Docket Number:	2796.737BS
Receipt Date:	15-DEC-2014
Filing Date:	10-OCT-2011
Time Stamp:	10:47:57
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	Amendment/Req. Reconsideration-After Non-Final Reject	US-811342-02-US-NAT_20141215_Third_OA_Response.pdf	123296 2ef09519145610b79ee75552b907694f4c620c01	no	17

Warnings:	
Information:	

2	Foreign Reference	JP2006-086910.pdf	3430652 a8a0136dafeaf4427855c0d00363db575dfc06f3	no	42
Warnings:					
Information:					
3	Foreign Reference	WO2010121885A.pdf	8892242 7a1987310479bb76428254588e29b3f81e0b9c58	no	54
Warnings:					
Information:					
4	Foreign Reference	JP2008-252330.pdf	2239377 38fa89665829d2cff64adb94adcc9fbfe43f812a	no	35
Warnings:					
Information:					
5	Information Disclosure Statement (IDS) Form (SB08)	US-811342-02-US-NAT_20141215_IDS.pdf	612254 20ab43840dd012f9b31b5d24355ff9da0003c471	no	4
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Information:					

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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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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/263,835	Filing Date 10/10/2011	☐ 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 **12/15/2014**

	(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))	* 29	Minus	** 32	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 5	Minus	***5	= 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
/JACQUELYN WILLIAMS/

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13263835
Filing Date	2011-10-10
First Named Inventor	Ezekiel Kruglick
Art Unit	2646
Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

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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
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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
	1	20090111469	A1	2009-04-30	Lee et al.	Corresponds with KR 1020090041777

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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	1020090041777	KR	A	2009-04-29		Corresponds with US 20090111469	☐
	2	1020060038729	KR	A	2006-05-04			☒

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13263835
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	2646
	Examiner Name	BEAMER, TEMICA M
	Attorney Docket Number	2796.737BS

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]
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Art Unit	2646
Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

CERTIFICATION STATEMENT

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☐ See attached certification statement.

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

☐ A certification statement is not submitted herewith.

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	/David S. Lee/	Date (YYYY-MM-DD)	2015-01-30
Name/Print	David S. Lee	Registration Number	38,222

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

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(11) 공개번호 10-2009-0041777
(43) 공개일자 2009년04월29일

(51) 국제특허분류(Int. Cl.)
H04B 7/26 (2006.01)
(21) 출원번호 10-2007-0107446
(22) 출원일자 2007년10월24일
심사청구일자 없음

(71) 출원인
삼성전자주식회사
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(72) 발명자
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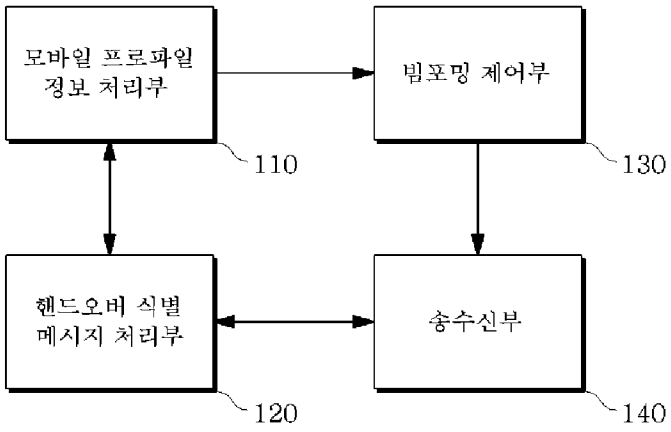
전체 청구항 수 : 총 12 항

(54) 발명의 명칭 동적 빔포밍 방식에 기반한 핸드오버 장치 및 방법

(57) 요 약

본 발명은, 동적 빔포밍 방식에 기반한 핸드오버 장치 및 방법에 관한 것으로, 본 발명의 동적 빔포밍 방식에 기반한 핸드오버 장치는, 이동 노드 및 기지국을 포함하는 이동통신 시스템에 적용되는 동적 빔포밍 방식에 기반한 핸드오버 장치에 있어서, 상기 이동 노드의 위치에 따른 모바일 프로파일 정보를 처리하고, 모바일 프로파일 정보에 따른 빔포밍 제어 신호를 생성하는 모바일 프로파일 정보 처리부, 상기 이동 노드의 핸드오버 필요성에 대응하여 상기 모바일 프로파일 정보를 반영하는 제1 핸드오버 식별 메시지를 생성하는 핸드오버 식별 메시지 처리부, 상기 제1 핸드오버 식별 메시지를 전송하는 송수신부 및 상기 빔포밍 제어 신호에 따라 상기 송수신부의 전송용 빔포밍을 제어하는 빔포밍 제어부를 포함한다.

대 표 도 - 도1



특허청구의 범위

청구항 1

이동 노드 및 기지국을 포함하는 이동통신 시스템에 적용되는 동적 빔포밍 방식에 기반한 핸드오버 장치에 있어서,

상기 이동 노드의 위치에 따른 모바일 프로파일 정보를 처리하고, 모바일 프로파일 정보에 따른 빔포밍 제어 신호를 생성하는 모바일 프로파일 정보 처리부

상기 이동 노드의 핸드오버 필요성에 대응하여 상기 모바일 프로파일 정보를 반영하는 제1 핸드오버 식별 메시지를 생성하는 핸드오버 식별 메시지 처리부

상기 제1 핸드오버 식별 메시지를 전송하는 송수신부 및

상기 빔포밍 제어 신호에 따라 상기 송수신부의 전송용 빔포밍을 제어하는 빔포밍 제어부

를 포함하는 동적 빔포밍 방식에 기반한 핸드오버 장치.

청구항 2

제1항에 있어서,

상기 송수신부는, 상기 이동 노드로부터 제2 핸드오버 식별 메시지를 수신하고, 상기 제2 핸드오버 식별 메시지는, 상기 모바일 프로파일 정보에 반영되는

동적 빔포밍 방식에 기반한 핸드오버 장치.

청구항 3

제2항에 있어서,

상기 제2 핸드오버 식별 메시지는, 상기 이동 노드의 현재 위치 및 상기 이동 노드의 향후 예상 위치를 포함하는

동적 빔포밍 방식에 기반한 핸드오버 장치.

청구항 4

제3항에 있어서,

상기 제2 핸드오버 식별 메시지는, 상기 이동 노드의 속도를 더 포함하는

동적 빔포밍 방식에 기반한 핸드오버 장치.

청구항 5

제1항에 있어서,

상기 제1 핸드오버 식별 메시지는, 상기 기지국으로 전송되고, 상기 이동 노드의 현재 위치 및 상기 이동 노드의 향후 예상 위치를 포함하는

동적 빔포밍 방식에 기반한 핸드오버 장치.

청구항 6

제5항에 있어서,

상기 제1 핸드오버 식별 메시지는, 상기 이동 노드의 속도를 더 포함하는

동적 빔포밍 방식에 기반한 핸드오버 장치.

청구항 7

제1항에 있어서,

상기 제1 핸드오버 식별 메시지는, 상기 이동 노드로 전송되고, 상기 기지국의 위치 정보를 포함하는

동적 빔포밍 방식에 기반한 핸드오버 장치.

청구항 8

제1항에 있어서,

상기 빔포밍 제어 신호는, 상기 모바일 프로파일 정보 내 상기 이동 노드의 현재 위치 및 상기 이동 노드의 향후 예상 위치를 이용하여 생성되는

동적 빔포밍 방식에 기반한 핸드오버 장치.

청구항 9

이동 노드 및 기지국을 포함하는 이동통신 시스템에 적용되는 동적 빔포밍 방식에 기반한 핸드오버 방법에 있어서,

상기 이동 노드의 핸드오버 요청에 따라, 상기 이동 노드의 위치에 관한 정보를 이용하여 모바일 프로파일 정보를 구성하는 모바일프로파일정보구성단계 및

상기 모바일 프로파일 정보에 따른 빔포밍 동작을 수행하는 빔포밍단계

를 포함하는 동적 빔포밍 방식에 기반한 핸드오버 방법.

청구항 10

제9항에 있어서,

상기 이동 노드로부터 제2 핸드오버 식별 메시지를 수신하는 핸드오버식별메시지수신단계 및

상기 제2 핸드오버 식별 메시지에 포함된 정보를 이용하여 상기 모바일 프로파일 정보를 갱신하는 모바일프로파일정보갱신단계

를 포함하는 동적 빔포밍 방식에 기반한 핸드오버 방법.

청구항 11

제10항에 있어서,

상기 제2 핸드오버 식별 메시지는, 상기 이동 노드의 현재 위치 및 상기 이동 노드의 향후 예상 위치를 포함하는

동적 빔포밍 방식에 기반한 핸드오버 방법.

청구항 12

제11항에 있어서,

상기 제2 핸드오버 식별 메시지는, 상기 이동 노드의 속도를 더 포함하는

동적 빔포밍 방식에 기반한 핸드오버 방법.

명 세 서

발명의 상세한 설명

기 술 분 야

[0001] 본 발명은 핸드오버 장치 및 방법에 관한 것으로, 보다 상세하게는 동적 빔포밍 방식에 기반한 핸드오버 장치 및 방법에 관한 것이다.

배 경 기 술

[0002] 차량 통신 네트워크는 고속의 이동성으로인하여 빈번한 네트워크 변화를 그 특성으로 한다.

[0003] 빈번한 네트워크 토폴로지 변화로 인하여 통신 경로 단절이 빈번하게 되고, 이로 인하여 전반적인 네트워크 성능이 저하되는 문제점이 있다.

발명의 내용

해결 하고자하는 과제

[0004] 따라서, 본 발명은 상술한 바와 같이 종래기술의 문제점을 해결하기 위해 안출된 것으로서, 차량의 위치에 따른 빔포밍을 수행하고, 이를 통하여 고속의 이동성을 지원하는 네트워크를 구성할 수 있는 동적 빔포밍 방식에 기반한 핸드오버 장치 및 방법을 제공하는 것을 목적으로 한다.

과제 해결수단

[0005] 전술한 목적을 달성하기 위하여 본 발명은 동적 빔포밍 방식에 기반한 핸드오버 장치 및 방법을 제안한다.

[0006] 보다 구체적으로는 본 발명의 일 양상에 따르면 전술한 목적은, 이동 노드 및 기지국을 포함하는 이동통신 시스템에 적용되는 동적 빔포밍 방식에 기반한 핸드오버 장치에 있어서, 상기 이동 노드의 위치에 따른 모바일 프로파일 정보를 처리하고, 모바일 프로파일 정보에 따른 빔포밍 제어 신호를 생성하는 모바일 프로파일 정보 처리부, 상기 이동 노드의 핸드오버 필요성에 대응하여 상기 모바일 프로파일 정보를 반영하는 제1 핸드오버 식별 메시지를 생성하는 핸드오버 식별 메시지 처리부, 상기 제1 핸드오버 식별 메시지를 전송하는 송수신부 및 상기 빔포밍 제어 신호에 따라 상기 송수신부의 전송용 빔포밍을 제어하는 빔포밍 제어부를 포함하는 동적 빔포밍 방식에 기반한 핸드오버 장치에 의해 달성된다.

[0007] 보다 구체적으로는 본 발명의 일 양상에 따르면 전술한 목적은, 이동 노드 및 기지국을 포함하는 이동통신 시스템에 적용되는 동적 빔포밍 방식에 기반한 핸드오버 방법에 있어서, 상기 이동 노드의 핸드오버 요청에 따라, 상기 이동 노드의 위치에 관한 정보를 이용하여 모바일 프로파일 정보를 구성하는 모바일프로파일정보구성단계 및 상기 모바일 프로파일 정보에 따른 빔포밍 동작을 수행하는 빔포밍단계를 포함하는 동적 빔포밍 방식에 기반한 핸드오버 방법에 의해 달성된다.

효 과

[0008] 전술한 바와 같이 본 발명에 따르면, 동적 빔포밍을 통하여 네트워크 내 노드간 연결성을 향상시키고, 핸드오버 동작 시 동적 빔포밍에 대한 부가적인 제어 오버헤드를 감소시키는 효과가 있다.

발명의 실시를 위한 구체적인 내용

[0009] 이하에서는 첨부한 도면을 참조하여 본 발명의 바람직한 실시예를 상세히 설명한다. 본 발명을 설명함에 있어 관련된 공지 기능 또는 구성에 대한 구체적인 설명이 본 발명의 요지를 불필요하게 흐릴 수 있다고 판단되는 경

우에는 그 상세한 설명을 생략할 것이다. 또한, 후술되는 용어들은 본 발명에서의 기능을 고려하여 정의된 용어들로서 이는 사용자, 운용자의 의도 또는 관례 등에 따라 달라질 수 있다.그러므로 그 정의는 본 명세서 전반에 걸친 내용을 토대로 내려져야 할 것이다.

[0010] 도 1은 본 발명의 일 실시예에 따른 동적 빔포밍 방식에 기반한 핸드오버 장치를 나타낸 블록도로서, 본 발명의 동적 빔포밍 방식에 기반한 핸드오버 장치는, 모바일 프로파일 정보(Mobile profile information) 처리부(110), 핸드오버 식별 메시지(Handover indication message) 처리부(120), 빔포밍 제어부(130) 및 송수신부(140)를 포함한다. 여기서, 동적 빔포밍 방식에 기반한 핸드오버 장치는 복수개의 이동 노드(Mobile node) 및 복수개의 기지국(Base station)을 포함하는 이동통신 시스템에서의 기지국일 수 있으나 이에 한정되지 않는다.

[0011] 모바일 프로파일 정보 처리부(110)는, 이동 노드의 위치에 따른 모바일 프로파일 정보를 처리하고, 모바일 프로파일 정보를 핸드오버 식별 메시지 처리부(120)로 출력하고, 모바일 프로파일 정보에 따른 빔포밍 제어 신호를 생성하며, 빔포밍 제어 신호를 빔포밍 제어부(130)에 출력하는 역할을 한다. 여기서, 모바일 프로파일 정보는, 미리 구성되어 기지국 내에 저장되어 있을 수도 있고, 해당 기지국이 서비스 중인 이동 노드로부터 위치 정보를 수신하여 구성할 수도 있으나 이에 한정되지 않는다. 또한, 모바일 프로파일 정보 처리부(110)는, 핸드오버 식별 메시지 처리부(120)로부터 제2 핸드오버 식별 메시지 내 정보를 입력받고, 제2 핸드오버 식별 메시지 내 정보를 이용하여 모바일 프로파일 정보를 생성 또는 갱신할 수 있다.

[0012] 또한, 핸드오버 식별 메시지 처리부(120)는, 모바일 프로파일 정보 처리부(110)로부터 모바일 프로파일 정보를 입력받고, 이동 노드의 핸드오버 필요성에 대응하여 모바일 프로파일 정보를 반영하는 제1 핸드오버 식별 메시지를 생성하고, 제1 핸드오버 식별 메시지를 송수신부(140)로 출력하는 역할을 한다. 여기서, 제1 핸드오버 식별 메시지는, 타 기지국의 위치 정보, 서비스 중인 이동 노드의 현재 위치 및 서비스 중인 이동 노드의 향후 예상 위치를 포함할 수 있으나 이에 한정되지 않는다. 또한, 핸드오버 식별 메시지 처리부(120)는, 송수신부(140)로부터 제2 핸드오버 식별 메시지를 입력받고, 제2 핸드오버 식별 메시지 내 정보를 모바일 프로파일 정보 처리부(110)로 출력할 수 있다.

[0013] 여기서 제1 핸드오버 식별 메시지는 망시작 방식에서 이전 기지국이 이동 노드와 새로운 기지국으로 보내는 식별 메시지를, 제2 핸드오버 식별 메시지는 이동노드시작방식에서 이동 노드가 기지국으로 보내는 식별 메시지를 각각 나타낸다.

[0014] 한편, 빔포밍 제어부(130)는, 모바일 프로파일 정보 처리부(110)로부터 빔포밍 제어 신호를 입력받고, 빔포밍 제어 신호에 따라 송수신부(140)의 빔포밍 방식을 조정하는 역할을 한다. 예를 들면, 빔포밍 제어부(130)는, 빔포밍 제어 신호를 통하여 이동 노드의 향후 예상 위치에 따라 송수신부(140)내 스마트 안테나가 위치 지향성 빔을 형성할 수 있도록 제어할 수 있다.

[0015] 또한, 송수신부(140)는, 핸드오버 식별 메시지 처리부(120)로부터 제1 핸드오버 식별 메시지를 입력받고, 빔포밍 제어부(130)의 제어에 따른 위치 지향성 빔을 형성하여 제1 핸드오버 식별 메시지를 전송하는 역할을 한다. 또한, 송수신부(140)는, 이동 노드로부터제2 핸드오버 식별 메시지를 입력받고, 제2 핸드오버 식별 메시지를 핸드오버 식별 메시지 처리부(120)로 출력할 수도 있다. 여기서, 제2 핸드오버 식별 메시지는, 이동 노드가 핸드오버 발생 이벤트를 감지한 경우에 이동 노드에 의해 생성되며, 이동 노드의 속도, 이동 노드의 현재 위치 및 이동 노드의 향후 예상 위치를 포함할 수 있으나 이에 한정되지 않는다.

[0016] 도 2는 본 발명의 일 실시예에 의한 동적 빔포밍 방식에 기반한 핸드오버 장치의 동작 중 이동 노드 시작(Mobile-initiated) 방식에 따른 동작을 설명하기 위한 신호 흐름도로서, 이를 참조하여 본 발명의 동적 빔포밍 방식에 기반한 핸드오버 장치의 동작에 관하여 설명하면 다음과 같다. 여기서, 이동 노드의 일례로서 차량(Vehicle)을, 본 발명의 동적 빔포밍 방식에 기반한 핸드오버 장치의 일례로서 기지국을 사용하여 설명하고 있으나 이에 한정되지 않는다.

[0017] 먼저, 이동하고 있는 차량이 이전 기지국(Old base station)의 서비스 경계 지역에 진입하면서 핸드오버 발생(Handover trigger)을 준비하게 된다(S201).

[0018] 그 후, 차량은 이전 기지국으로 제2 핸드오버 식별 메시지를 통하여 핸드오버를 요청하게 된다(S203). 여기서, 제2 핸드오버 식별 메시지는, 차량의 현재 속도, 차량의 현재 위치, 차량의 향후 예상 위치를 포함할 수 있다. 또한, 차량의 향후 예상 위치는, 네비게이션 시스템 탑재 차량의 경우, 차량의 현재 속도, 목적지, 도로 정보

등을 이용하여 도출할 수 있다.

[0019] 그 후, 이전 기지국은, 제2 핸드오버 식별 메시지를 통하여 수신한 차량의 예상 위치를 이용하여 목적이 되는 신규 기지국(New base station)을 결정한다(S205). 이전 기지국은, 신규 기지국 결정에 있어서 미리 보유하고 있는 주변 기지국 위치 정보를 이용할 수 있다.

[0020] 그 후, 이전 기지국은, 제2 핸드오버 식별 메시지 내 정보를 이용하여 결정된 신규 기지국으로 핸드오버를 요청하게 된다(S207). 여기서, 핸드 오버 요청 시 제2 핸드오버 식별 메시지 내에 포함된 차량의 현재 속도, 차량의 현재 위치, 차량의 향후 예상 위치도 전달될 수 있다. 이 때, 신규 기지국 내 모바일 프로파일 정보 처리부(110)는, 핸드오버 요청 시 수신된 차량의 현재 속도, 차량의 현재 위치, 차량의 향후 예상 위치를 이용하여 모바일 프로파일 정보를 구성하거나 갱신할 수 있다.

[0021] 그 후, 신규 기지국은, 핸드오버를요청한 이전 기지국으로 핸드오버가 가능하다는응답을 보낸다(S209).

[0022] 그 후, 이전 기지국은, 차량으로 신규 기지국의 위치 정보를 포함하는 핸드오버 응답을 보낸다(S211).

[0023] 그 후, 신규 기지국 내 모바일 프로파일 정보 처리부(110)는, 모바일 프로파일 정보를 이용하여 빔포밍 제어 신호를 생성하고, 신규 기지국 내 빔포밍 제어부(130)는, 빔포밍 제어 신호에 따라 차량 위치 정보에 따른 적응적(Adaptive) 빔포밍을 수행하게 된다(S213).

[0024] 도 3은 본 발명의 일 실시예에 의한 동적 빔포밍 방식에 기반한 핸드오버 장치의 동작 중 망 시작(Network-initiated) 방식에 따른 동작을 설명하기 위한 신호 흐름도로서, 이를 참조하여 본 발명의 동적 빔포밍 방식에 기반한 핸드오버 장치의 동작에 관하여 설명하면 다음과 같다.여기서, 이동 노드의 일례로서 차량(Vehicle)을, 본 발명의 동적 빔포밍 방식에 기반한 핸드오버 장치의 일례로서 기지국을 사용하여 설명하고 있으나 이에 한정되지 않는다.

[0025] 먼저, 이동하고 있는 차량이 이전 기지국(Old base station)의 서비스 경계 지역에 진입하고, 이에 따라, 이전 기지국이 핸드오버 발생(Handover trigger)을 준비하게 된다(S301).

[0026] 그 후, 이전 기지국은, 모바일 프로파일 정보를 이용하여 목적이 되는 신규 기지국을 결정한다(S303). 모바일 프로파일 정보는, 차량의 현재 속도, 차량의 현재 위치, 차량의 향후 예상 위치뿐만 아니라 미리 보유하고 있는 주변 기지국 위치 정보를 포함할 수 있다.

[0027] 그 후, 이전 기지국은, 제1 핸드오버 식별 메시지를 차량 및 결정된 신규 기지국으로 전송한다(S305). 여기서, 차량으로 전송되는 제1 핸드오버 식별 메시지는, 신규 기지국의 위치 정보를 포함할 수 있으며, 신규 기지국으로 전송되는 제1 핸드오버 식별 메시지는, 차량의 현재 속도,차량의 현재 위치, 차량의 향후 예상 위치를 포함할 수 있다.

[0028] 그 후, 신규 기지국 내 모바일 프로파일 정보 처리부(110)는, 제1 핸드오버 식별 메시지의 정보를 모바일 프로파일 정보에 반영하며, 이러한 모바일 프로파일 정보를 이용하여 빔포밍 제어 신호를 생성하고, 신규 기지국 내 빔포밍 제어부(130)는, 빔포밍 제어 신호에 따라 차량 위치 정보에 따른 적응적(Adaptive) 빔포밍을 수행하게 된다(S307).

[0029] 도 4는 본 발명의 일 실시예에 의한 동적 빔포밍 방식에 기반한 핸드오버 방법을 나타낸 동작 흐름도로서, 이에 관하여 설명하면 다음과 같다.

[0030] 또한, 기지국 내 송수신부(140)는, 이동 노드로부터 제2 핸드오버 식별 메시지를 입력받고, 제2 핸드오버 식별 메시지를 핸드오버 식별 메시지 처리부(120)로 출력한다(S401). 여기서, 제2 핸드오버 식별 메시지는, 이동 노드가 핸드오버 발생 이벤트를 감지한 경우에 이동 노드에 의해 생성되며, 이동 노드의 속도, 이동 노드의 현재 위치 및 이동 노드의 향후 예상 위치를 포함할 수 있으나 이에 한정되지 않는다.

[0031] 그 후, 기지국 내 모바일 프로파일 정보 처리부(110)는, 핸드오버 식별 메시지 처리부(120)로부터 제2 핸드오버 식별 메시지 내 정보를 입력받고, 제2 핸드오버 식별 메시지 내 정보를 이용하여 모바일 프로파일 정보를 생성 또는 갱신할 수 있다(S403).

[0032] 그 후, 모바일 프로파일 정보 처리부(110)는, 이동 노드의 위치에 따른 모바일 프로파일 정보에 따라 빔포밍 제

어 신호를 생성한다. 이 때, 기지국 내 빔포밍 제어부(130)는, 모바일 프로파일 정보 처리부(110)로부터 빔포밍 제어 신호를 입력받고, 빔포밍 제어 신호에 따라 송수신부(140)의 빔포밍 방식을 조정한다. 예를 들면, 빔포밍 제어부(130)는, 빔포밍 제어 신호를 통하여 이동 노드의 향후 예상 위치에 따라 송수신부(140) 내 스마트 안테나가 위치 지향성 빔을 형성할 수 있도록 제어할 수 있다(S405).

[0033] 이제까지 본 발명에 대하여 그 바람직한 실시예들을 중심으로 살펴보았다. 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자는 본 발명이 본 발명의 본질적인 특성에서 벗어나지 않는 범위에서 변형된 형태로 구현될 수 있음을 이해할 수 있을 것이다. 그러므로 개시된 실시예들은 한정적인 관점이 아니라 설명적인 관점에서 고려되어야 한다. 본 발명의 범위는 전술한 설명이 아니라 특허청구범위에 나타나 있으며, 그와 동등한 범위 내에 있는 모든 차이점은 본 발명에 포함된 것으로 해석되어야 할 것이다.

도면의 간단한 설명

[0034] 도 1은 본 발명의 일 실시예에 따른 동적 빔포밍 방식에 기반한 핸드오버 장치를 나타낸 블록도,

[0035] 도 2는 본 발명의 일 실시예에 의한 동적 빔포밍 방식에 기반한 핸드오버 장치의 동작 중 이동 노드 시작 방식에 따른 동작을 설명하기 위한 신호 흐름도,

[0036] 도 3은 본 발명의 일 실시예에 의한 동적 빔포밍 방식에 기반한 핸드오버 장치의 동작 중 망 시작 방식에 따른 동작을 설명하기 위한 신호 흐름도,

[0037] 도 4는 본 발명의 일 실시예에 의한 동적 빔포밍 방식에 기반한 핸드오버 방법을 나타낸 동작 흐름도.

[0038] <도면의 주요부분에 대한 부호의 설명>

[0039] 110 : 모바일 프로파일 정보 처리부

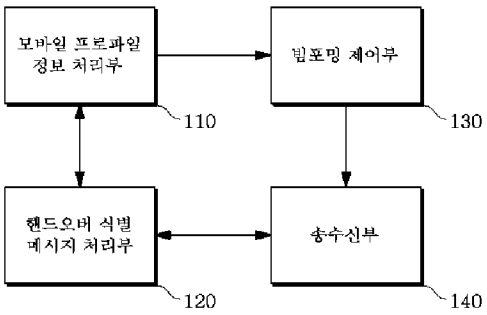
[0040] 120 : 핸드오버 식별 메시지 처리부

[0041] 130 : 빔포밍 제어부

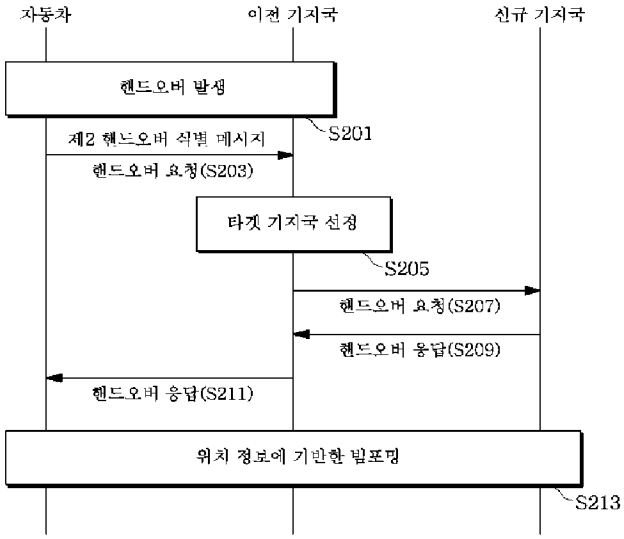
[0042] 140 : 송수신부

도면

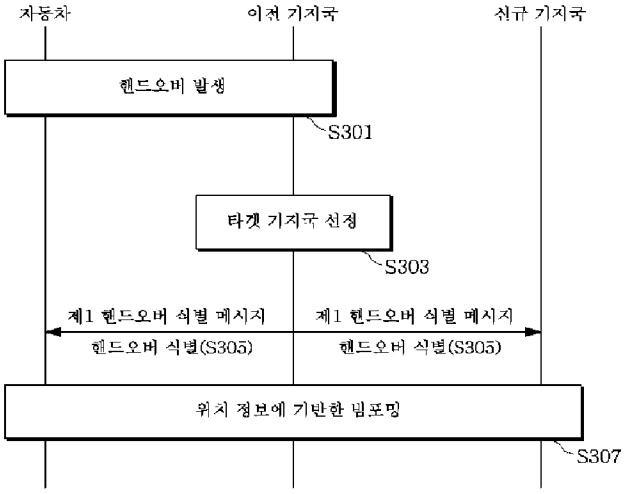
도면1



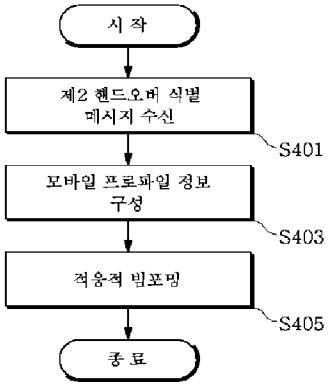
도면2


자동차
이전 기지국
신규 기지국
핸드오버 발생
S201
제2 핸드오버 식별 메시지
핸드오버 요청(S203)
타겟 기지국 선정
S205
핸드오버 요청(S207)
핸드오버 응답(S209)
핸드오버 응답(S211)
위치 정보에 기반한 빔포밍
S213

도면3


자동차
이전 기지국
신규 기지국
핸드오버 발생
S301
타겟 기지국 선정
S303
제1 핸드오버 식별 메시지
핸드오버 식별(S305)
제1 핸드오버 식별 메시지
핸드오버 식별(S305)
위치 정보에 기반한 빔포밍
S307

도면4



(19) KOREAN INTELLECTUAL PROPERTY OFFICE

KOREAN PATENT ABSTRACTS

(11) Publication number: 1020060038729 A
(43) Publication date: 04.05.2006

(21) Application number: 1020040087853
(22) Application date: 01.11.2004

(51) Int. Cl: H04Q 7/36

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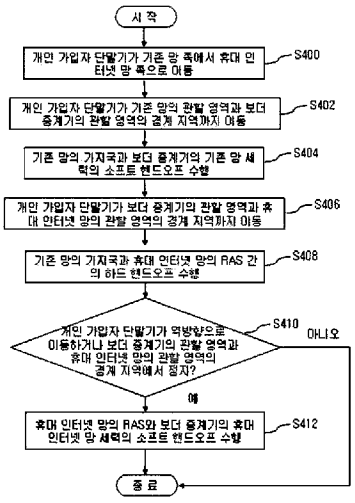
(54) METHOD FOR SUPPLYING HARD HANDOFF BETWEEN A PORTABLE INTERNET NETWORK AND OTHER KIND OF NETWORK BY USING A BORDER REPEATER AND A SYSTEM THEREFOR, SPECIALLY RELATED TO FORMING AN INTER-HOUSEHOLD HARD HANDOFF BUFFERING AREA BY INSTALLING THE BORDER REPEATER WHICH CAN SIMULTANEOUSLY PROVIDE COMMUNICATION BETWEEN BOTH BASE STATIONS IN A BORDER AREA BETWEEN THE INTERNET NETWORK AND THE OTHER KIND OF THE NETWORK

(57) Abstract:

PURPOSE: A method for supplying hard handoff between a portable Internet network and other kind of network by using a border repeater and a system therefor are provided to install the border repeater which configures an overlay environment by simultaneously servicing signals provided from each network in a border area between the Internet network and the other kind of network, to form a hard handoff buffering area between both networks, thus effective hard handoff can be serviced to a PSS(Personal Subscriber Station) which moves to a target-side communication network from a serving-side communication network.

CONSTITUTION: A PSS moves to a portable Internet network(S400). If the PSS moves up to a border area between a jurisdictional area of an existing network and a jurisdictional area of a border repeater (S402), soft or softer handoff is carried out between an existing base station and the border repeater(S404). If the PSS moves up to a border point between the jurisdictional area of the border repeater and a jurisdictional area of a portable Internet network RAS(Radio Access Station)(S406), hard handoff is carried out between the base station and the RAS(S408). If the PSS slightly moves to the base station or stops at the border point between the border repeater and the RAS(S410), a stable service is provided through soft or softer handoff between the RAS and the border repeater in a buffering area of the border repeater(S412).

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공개특허 10-2006-0038729

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(51) Int. Cl.
H04Q 7/36

(11) 공개번호 10-2006-0038729
(43) 공개일자 2006년05월04일

(21) 출원번호 10-2004-0087853
(22) 출원일자 2004년11월01일

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심사청구 : 있음

발명의 명칭보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망간의 하드 핸드오프를 제공하는 방법 및 시스템

요약

본 발명은 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법 및 시스템에 관한 것이다.

본 발명은, 휴대 인터넷 망(Portable Internet Network)과 다른 종류의 망의 경계 지역에 설치된 보더(Border) 중계기를 이용하여 서빙(Serving)측 통신망에서 타겟(Target)측 통신망으로 이동하는 개인 가입자 단말기에 하드 핸드오프(Hard Handoff)를 제공하는 방법에 있어서, (a) 상기 개인 가입자 단말기가 상기 서빙측 통신망의 관할 영역에서 상기 보더 중계기의 관할 영역을 거쳐 상기 타겟측 통신망의 관할 영역 쪽으로 이동하는 경우, 상기 서빙측 통신망의 관할 영역과 상기 보더 중계기의 관할 영역의 경계 지역에서 상기 서빙측 통신망의 서빙측 기지국과의 통신을 종료하지 않고 상기 보더 중계기와 통신을 시작하는, 상기 서빙측 기지국 및 상기 보더 중계기 간의 소프트 핸드오프를 수행하는 단계; 및 (b) 상기 개인 가입자 단말기가 상기 보더 중계기의 관할 영역과 상기 타겟측 통신망의 관할 영역의 경계 지역까지 이동했을 때, 상기 서빙측 기지국과의 통신을 종료하고 상기 타겟측 통신망의 타겟측 기지국과 통신을 시작하는, 상기 서빙측 기지국 및 상기 타겟측 기지국 간의 하드 핸드오프를 수행하는 단계를 포함하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법 및 이를 수행하기 위한 시스템에 관한 것이다.

대표도

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도2

색인어

하드 핸드오프, 소프트 핸드오프, 보더 중계기, 개인 가입자 단말기, 휴대 인터넷 망, 기지국, RAS

명세서

도면의 간단한 설명

도 1은 종래의 세대 간 하드 핸드오프를 수행하기 위한 망 구성을 대략적으로 나타낸 도면,

도 2는 본 발명의 바람직한 실시예에 따른 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템을 개략적으로 나타낸 블록 구성도,

도 3은 본 발명의 바람직한 실시예에 따른 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 과정을 설명하기 위한 망 구성도,

도 4는 본 발명의 바람직한 실시예에 따른 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 과정을 개략적으로 나타낸 순서도이다.

<도면의 주요 부분에 대한 부호의 설명>

200 : 개인 가입자 단말기	210 : CDMA-2000 RAN
211 : BTS	212 : BSC
213 : PCF	220 : DCN
221 : PDSN	222 : HA
223 : AAA 서버	230 : 휴대 인터넷 RAN
231 : RAS	232 : ACR
240 : 인터넷	251 : 보더 중계기

발명의 상세한 설명

발명의 목적

발명이 속하는 기술분야 및 그 분야의 종래기술

본 발명은 보더(Border) 중계기를 이용하여 휴대 인터넷(PI : Portable Internet 또는 WiBro : Wireless Broadband) 망과 다른 종류의 망 간의 하드 핸드오프(Hard-Handoff)를 제공하는 방법 및 시스템에 관한 것이다. 더욱 상세하게는, 휴대 인터넷 망과 다른 종류의 망의 경계 지역에 각 망에서 제공하는 신호를 동시에 서비스하여 오버레이(Overlay) 환경을 구성하는 보더 중계기를 설치함으로써, 양 망 간의 하드 핸드오프 버퍼 지역을 만들어 서빙측 통신망에서 타겟측 통신망으로 이동하는 개인 가입자 단말기에 효율적인 하드 핸드오프를 제공하는 방법 및 시스템에 관한 것이다.

이동통신 기술의 발달로 인해 부호 분할 다중 접속(CDMA : Code Division Multiple Access) 이동통신 시스템에서 제공하는 서비스는 음성 서비스뿐만이 아니라, 써킷(Circuit) 데이터, 패킷(Packet) 데이터 등과 같은 데이터를 전송하는 멀티미디어 통신 서비스로 발전해 가고 있다.

통상적으로 CDMA 방식의 이동통신 시스템은 크게 개인 가입자 단말기, 무선 기지국(BS : Base Station) 및 이동 교환국(MSC : Mobile Switching Center)을 포함하여 구성된다. 또한, 무선 기지국은 기지국 제어기(BSC : Base Station Controller), 기지국 전송기(BTS : Base Transceiver Station), 중계기(Repeater) 등으로 구성되고, 이동 교환국은 홈 위치 등록기(HLR : Home Location Register), 방문자 위치 등록기(VLR : Visitor Location Register) 등으로 구성되어 있다.

이와 같이 구성된 이동통신 시스템의 가장 큰 특징 중의 하나는 개인 가입자 단말기의 이동성을 보장하는데 있으며, 이러한 개인 가입자 단말기의 이동성을 보장하기 위해 위치 등록(Registration) 기술과 핸드오프(Handoff) 기술 등이 개발되었다.

여기서, 위치 등록은 개인 가입자 단말기가 자신의 위치(소속된 무선 기지국)와 상태 등의 정보를 이동 교환국에게 수시로 알려줌으로써 이동통신 시스템의 부하(Load)를 줄이고, 개인 가입자 단말기 착신호의 신뢰성을 증가시키는 작업을 말한다. 개인 가입자 단말기에서 이동 교환국으로 전송된 각종 정보는 이동 교환국의 홈 위치 등록기나 방문자 위치 등록기에 저장되어 관리된다.

또한, 핸드오프(Handoff)는 개인 가입자 단말기가 현재 서비스를 제공받고 있는 기지국 또는 섹터의 서비스 영역을 벗어나도 계속적으로 통화가 유지될 수 있도록 개인 가입자 단말기와 기지국 간의 통화로를 절체해 주는 기술을 말한다.

이러한 핸드오프의 종류로는 소프트(Soft) 핸드오프와, 소프터(Softer) 핸드오프 및 하드(Hard) 핸드오프 등이 있다.

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'소프트 핸드오프'는 개인 가입자 단말기가 현재의 기지국과의 연결을 해제하기 전에 새로운 기지국과 연결하여 동시에 두 기지국과 통신하다가 새로운 기지국으로부터의 신호가 현재의 기지국으로부터의 신호보다 더 커짐에 따라 현재의 기지국과의 연결을 해제하는 방식이다. 따라서 새로운 기지국과 채널을 설정해야 하기 때문에 핸드오프 처리에 걸리는 시간이 많이 걸리고, 동시에 두 기지국의 채널 자원을 사용하게 되므로 채널 자원의 낭비도 심하다는 단점이 있다.

'소프터 핸드오프'는 개인 가입자 단말기가 동일 기지국 내의 섹터 간을 가로지를 때 일어나는 핸드오프를 말한다. 즉, 소프터 핸드오프시에는 채널 요소의 변경이 불필요하므로 핸드오프 처리에 소요되는 시간을 감소시킬 수 있으며, 채널 자원의 낭비도 줄일 수 있다.

이에 비해 '하드 핸드오프'는 통화 중 기지국 간 이동시 순간적으로 통화의 절단을 발생시키는 방식으로, 통화자가 통화의 지장을 느끼지 못하는 순간에 다음 기지국으로 통화를 재연결시켜 주는 방식이다. 이러한 하드 핸드오프는 순간적인 통화의 절단을 동반하기 때문에 소프트 핸드오프 방식보다 성공률이 낮다는 문제점이 있다.

한편, 최근에는 정보통신의 발달로 ITU-R에서 표준으로 제정하고 있는 제 3 세대 이동 통신 시스템인 IMT-2000(International Mobile Telecommunication 2000)(예컨대, CDMA2000 1X, 3X, EV-DO, WCDMA(WideBand CDMA) 등)이 상용화되고 있다. IMT-2000은 CDMA 2000 1X, 3X, EV-DO, WCDMA(WideBand CDMA) 등으로 기존의 IS-95A, IS-95B 망에서 진화한 IS-95C 망을 이용하여 IS-95A, IS-95B 망에서 지원 가능한 데이터 전송 속도인 14.4 Kbps나 56 Kbps보다 훨씬 빠른 최고 144 Kbps의 전송 속도로 무선 인터넷을 제공할 수 있는 서비스이다. 특히 IMT-2000 서비스를 이용하면 기존의 음성 및 WAP 서비스 품질의 향상은 물론 각종 멀티미디어 서비스(AOD, VOD 등)를 보다 빠른 속도로 제공할 수 있다.

현재 전세계적으로 사용되는 무선 인터넷 사용 기술은 크게 전술한 휴대 전화망을 기반으로 하는 제 3 세대 셀룰러 시스템과 IP 기반의 패킷 전송을 기반으로 하는 무선 랜(WLAN : Wireless Local Area Network)을 들 수 있다.

기존의 셀룰러 시스템은 뛰어난 이동성과 핸드오프를 지원하며 음성 통화에 필요한 데이터 전송 속도를 보장하고 부가적으로 패킷 데이터 서비스를 지원한다. 하지만, 기존의 이동 통신 시스템은 기지국 구축 비용이 높기 때문에 무선 인터넷의 이용 요금이 높고, 이동 통신 단말기의 화면 크기가 작기 때문에 이용할 수 있는 컨텐츠에 제약이 있으며, 패킷 데이터 서비스를 하기 위한 충분한 전송 속도를 보장하기에는 한계가 있다.

이에 반해서 WLAN의 경우는 셀룰러 시스템에 비해서 월등한 데이터 전송 속도를 보장하지만, 전파 간섭 때문에 이동성에 문제가 있으며 좁은 사용 영역(Coverage) 등의 문제로 공중 서비스의 제공에 한계가 있게 된다.

이에 WLAN에 버금가는 전송 속도를 가지면서 셀룰러 시스템의 이동성과 핸드오프를 지원하며 저렴한 요금으로 초고속 무선 인터넷 서비스를 이용할 수 있는 휴대 인터넷 서비스(Portable internet Service) 시스템이 대두되었다.

3.5 세대로 지칭되는 휴대 인터넷 서비스는 노트북, PDA, Handheld PC 등 다양한 형태의 휴대용 개인 가입자 단말기를 이용하여 실내 및 실외의 정지 환경에서와 보행 속도 및 중저속 이동 수준의 이동 환경에서 인터넷에 접속하여 다양한 정보 및 컨텐츠 이용이 가능한 서비스이다. 또한, 시속 60 km/h의 이동성을 제공하며, 하향 전송 속도는 24.8 Mbps이나 상향 전송 속도는 5.2 Mbps로 상하향 비대칭 전송 특성을 갖는 IP(Internet Protocol) 기반의 무선 데이터 시스템이다.

휴대 인터넷 시스템은 2.3 GHz 주파수 대역을 사용하며, 차세대 핵심 기술이라 할 수 있는 직교 주파수 분할 다중 접속 방식(OFDM : Orthogonal Frequency Division Multiple Access)/TDMA(Time Division Multiple Access)와 시분할 듀플렉싱(TDD : Time Division Duplexing) 등의 방식을 택하고 있다. 여기서, OFDMA/TDMA란 전체 대역폭에 펴져 있는 모든 부반송파를 일정 시간 동안 한 사용자에게 할당하고 다음 일정 시간 동안 또 다른 사용자에게 할당하는 TDMA와 유사한 다중 접속 방식이다. 또한 무선 자원의 효율적 운용을 위해 AMC(Adaptive Modulation Coding), MIMO(Multi Input Multi Output)와 스마트 안테나(Smart Antenna) 등의 기술을 채용하기 위한 표준화 작업이 현재 진행 중에 있다.

이처럼 새로운 시스템이 도입됨에 따라 기존 망과 새로운 망의 연동 기능이 필요하게 되었다. 사용자들은 네트워크의 형태에 제한되지 않는 다양한 서비스를 요구하고 있으므로, 현재 이러한 사용자들의 요구를 충족시키기 위한 연동망의 구축이 가시화되어 나타나고 있다. 이러한 연동망 구축에 대하여는 3G 이동통신과 WLAN에 대한 연구가 가장 활발히 진행되고 있다. 그러나 이들 네트워크는 독립적으로 발전하여 왔으며, 서로 다른 규격 및 표준을 사용하고 있다. 따라서 각 네트워크의 연동을 위해서는 아키텍처(Architecture), 프로토콜 구조, 이동성, 서비스 품질, 인증, 보안 및 과금 등과 같은 다양한 사항들이 고려되어야 하며, 각 사항에 대한 수정 및 보완이 수반되어야 한다.

한편, 현재 CDMA 통신 시스템은 최내 307 Kbps의 데이터 전송 속도를 갖는 IS-95C 나 CDMA-2000 1X, WCDMA로 불리는 2.5세대(2.5G, 이하 '1X'라 칭함) 시스템과 전술한 휴대 인터넷이 공존하여 서비스를 할 것이다.

그런데 이러한 1X 망과 휴내 인터넷 망은 커버리지(Coverage) 측면에서 차이가 있다. 즉, 1X 단독 망만이 존재하는 지역이 있을 수 있으며, 1X 망과 휴대 인터넷 망이 공존하는 지역이 있을 수 있고, 그리고 휴대 인터넷 망만이 존재하는 지역이 있을 수 있다. 따라서 1X 망과 휴대 인터넷 망 간의 핸드오프가 필수적인 상황이다.

패킷 호에 대한 기존 1X 망과 휴대 인터넷 망 간 소프트 핸드오프는 시스템 내부의 프로토콜이 상이하므로 구현이 어려우며, 특히 Radio Configuration의 변화, 경계 지역의 주파수 배치 문제 등으로 인해 하드 핸드오프 요소를 배제하기 어려워 소프트 핸드오프를 구현하더라도 품질 향상의 효과를 크게 기대할 수 없어 기존에 구현되어 실현되고 있는 세대 간 하드 핸드오프를 이용해야 하는 상황이다.

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그런데 이러한 세대 간 하드 핸드오프는 서빙측의 기지국 자원을 해지한 후에 타겟측 기지국 자원을 점유하게 되기 때문에 소프트 핸드오프에 비해 실패율이 높으며, 특히 하드 핸드오프의 경계 지역에서는 서빙측에서 타겟측으로 핸드오프 한 후 다시 서빙측으로 후진(Backward)하는 핑퐁 현상이 발생하기 때문에 품질 열화가 발생하게 된다는 문제점이 있다.

도 1은 종래의 세대 간 하드 핸드오프를 수행하기 위한 망 구성을 대략적으로 나타낸 도면이다.

도 1을 보면, 기존 망(112)과 휴대 인터넷 망(122)을 모두 지원하는 개인 가입자 단말기(100)가 기존 망(112)과 휴대 인터넷 망(122)의 경계 지역에서 기존 망(112)의 기지국(110)에 동조한 후 휴대 인터넷 망(122) 쪽으로 이동하여 휴대 인터넷 망(122)의 RAS(Radio Access Station)(120) 세력이 커지는 경우, 휴대 인터넷 망(122)의 RAS(120)의 비컨(Beacon)를 잡고 기존 망(112)의 기지국(110)과 휴대 인터넷 망(122)의 RAS(120)의 세대 간 하드 핸드오프가 발생된다. 이후 다시 기존 망(112)의 기지국(110) 세력이 커지면 개인 가입자 단말기(100)는 기존 망(112)의 기지국(110)의 비컨을 잡게 되므로 다시 기존 망(112)의 기지국(110)으로 역행하는 역행(Backward) 하드 핸드오프를 시도하게 된다. 이러한 동작을 반복하게 되면 기존 망(112)과 휴대 인터넷 망(122)의 경계에서 핑퐁(Ping Pong) 현상이 발생하여 품질이 저하된다는 문제가 발생한다. 이러한 하드 핸드오프의 핑퐁 현상이 발생되면, 이동통신 시스템의 부하가 커지게 되고 빈번한 핸드오프에 의하여 통화가 단절되고 교환기 사이의 제어 신호가 손실되게 되므로 통신 경로가 단절되거나 해제되는 확률이 높아지는 문제점이 있다.

발명이 이루고자 하는 기술적 과제

이러한 문제점을 해결하기 위해 본 발명은, 휴대 인터넷 망(PI : Portable Internet 또는 WiBro : Wireless Broadband)과 다른 종류의 망의 경계 지역에 각 망에서 제공하는 신호를 동시에 서비스하여 오버레이(Overlay) 환경을 구성하는 보더 중계기(Border Repeater)를 설치함으로써, 양 망 간의 하드 핸드오프 버퍼 지역을 만들어 서빙측(Serving) 통신망에서 타겟측(Target) 통신망으로 이동하는 개인 가입자 단말기에 효율적인 하드 핸드오프(Hard-Handoff)를 제공하는 방법 및 시스템을 제공하는 것을 목적으로 한다.

발명의 구성 및 작용

상기한 목적을 달성하기 위해 본 발명은, 휴대 인터넷 망(Portable Internet Network)과 다른 종류의 망의 경계 지역에 설치된 보더(Border) 중계기를 이용하여 서빙(Serving)측 통신망에서 타겟(Target)측 통신망으로 이동하는 개인 가입자 단말기에 하드 핸드오프(Hard Handoff)를 제공하는 방법에 있어서, (a) 상기 개인 가입자 단말기가 상기 서빙측 통신망의 관할 영역에서 상기 보더 중계기의 관할 영역을 거쳐 상기 타겟측 통신망의 관할 영역 쪽으로 이동하는 경우, 상기 서빙측 통신망의 관할 영역과 상기 보더 중계기의 관할 영역의 경계 지역에서 상기 서빙측 통신망의 서빙측 기지국과의 통신을 종료하지 않고 상기 보더 중계기와 통신을 시작하는, 상기 서빙측 기지국 및 상기 보더 중계기 간의 소프트 핸드오프를 수행하는 단계; 및 (b) 상기 개인 가입자 단말기가 상기 보더 중계기의 관할 영역과 상기 타겟측 통신망의 관할 영역의 경계 지역까지 이동했을 때, 상기 서빙측 기지국과의 통신을 종료하고 상기 타겟측 통신망의 타겟측 기지국과 통신을 시작하는, 상기 서빙측 기지국 및 상기 타겟측 기지국 간의 하드 핸드오프를 수행하는 단계를 포함하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법을 제공하는 것을 특징으로 한다.

또한, 본 발명의 다른 목적에 의하면, 서빙(Serving)측 통신망에서 타겟(Target)측 통신망으로 이동하는 개인 가입자 단말기에 하드 핸드오프(Hard Handoff)를 제공하는 시스템에 있어서, 상기 서빙측 통신망 및 상기 타겟측 통신망의 경계 지역에 설치되어 상기 서빙측 통신망에서 제공하는 신호 및 상기 타겟측 통신망에서 제공하는 신호를 동시에 처리하는 보더(Border) 중계기; 상기 개인 가입자 단말기가 상기 서빙측 통신망의 관할 영역에서 상기 보더 중계기의 관할 영역을 거쳐 상기 타겟측 통신망의 관할 영역 쪽으로 이동하는 경우, 상기 서빙측 통신망의 관할 영역과 상기 보더 중계기의 관할 영역의 경계 지역에서 상기 서빙측 통신망과의 통신을 종료하지 않고 상기 보더 중계기와 통신을 시작하는 소프트 핸드오프를 수행하는 서빙측 기지국; 및 상기 개인 가입자 단말기가 상기 보더 중계기의 관할 영역과 상기 타겟측 통신망의 관할 영역의 경계 지역까지 이동했을 때, 상기 서빙측 기지국과의 통신을 종료하고 상기 타겟측 통신망의 타겟측 기지국과 통신을 시작하도록 제어하는, 상기 서빙측 기지국 및 상기 타겟측 기지국 간의 하드 핸드오프를 수행하도록 제어하는 서빙측 제어기 및 타겟측 제어기를 포함하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템을 제공하는 것을 특징으로 한다.

이하, 본 발명의 바람직한 실시예를 첨부된 도면들을 참조하여 상세히 설명한다. 우선 각 도면의 구성요소들에 참조부호를 부가함에 있어서, 동일한 구성요소들에 대해서는 비록 다른 도면상에 표시되더라도 가능한 한 동일한 부호를 가지도록 하고 있음에 유의해야 한다. 또한, 본 발명을 설명함에 있어, 관련된 공지 구성 또는 기능에 대한 구체적인 설명이 본 발명의 요지를 흐릴 수 있다고 판단되는 경우에는 그 상세한 설명은 생략한다.

도 2는 본 발명의 바람직한 실시예에 따른 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템을 개략적으로 나타낸 블록 구성도이다.

도 2에 도시된 바와 같이, 본 발명의 바람직한 실시예에 따른 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 네트워크 구조는 기존 CDMA-2000 무선 접속망(RAN : Radio Access Network)(210), 데이터 통신망(DCN : Data Communications Network)(220) 및 휴대 인터넷(PI : Portable Network 또는 WiBro : Wireless Broadband) 무선 접속망(230) 등을 포함할 수 있다. 그리고, 기존 CDMA-2000 무선 접속망(210)의 구성 요소로 기지국 전송기(BTS : Base Transceiver Station)(211), 기지국 제어기(BSC : Base Station Controller)(212) 및 패킷 제어기(PCF : Packet Control Function)(213) 등을 포함할 수 있고, 데이터 통신망(220)은 패킷 데이터 서빙 노드(PDSN : Packet Data Serving Node)(221), HA(Home Agent)(222) 및 인증 서버(AAA 서버 : Authentication, Authorization, Accounting Server, 이하 'AAA 서버'라 칭함)(223) 등을 포함할 수 있고, 휴대 인터넷 무선 접속망(230)의 구성 요소

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로 라디오 액세스 스테이션(RAS : Radio Access Station, 이하 'RAS'라 칭함)(231), 여러 개의 RAS(231)을 수용하는 액세스 콘트롤 라우터인 ACR(Access Control Router)(232) 등을 포함할 수 있다.

본 발명은 휴대 인터넷 망과 다른 종류의 망 사이에서 하드 핸드오프 기능을 제공하는 시스템 및 이를 이용한 하드 핸드오프 방법을 제시하고 있다. 여기서, 다른 종류의 망은 CDMA(Code Division Multiple Access) 2000망, GSM(Global System for Mobile)망 또는 W-CDMA(Wideband CDMA) 망 등을 포함되며, 이에 한정되지는 않는다. 본 명세서에서는 설명 및 이해의 편의를 위해 다른 종류의 망을 CDMA 2000 망으로 하여 설명하겠으나 이에 한정되지 않는다는 것은 명백하다.

본 발명의 바람직한 실시예에 따른 개인 가입자 단말기(200)는 기지국(211) 및 RAS(Radio Access Station)(231)에 대해 무선으로 전화 통화 및 위치 등록을 수행할 뿐만 아니라 본 발명의 바람직한 실시예에 따른 소프트 핸드오프 및 하드 핸드오프를 위한 전계 강도를 측정하여 송출하는 무선 통신 단말기이다. 본 발명의 바람직한 실시예에 따른 개인 가입자 단말기(200)는 핸드오프를 수행할 상이한 망에서의 통신을 모두 지원하는 단말기이다.

한편, 본 발명의 바람직한 실시예에 따른 개인 가입자 단말기(200)는 PDA(Personal Digital Assistant), 셀룰러폰, PCS(Personal Communication Service)폰, 핸드 헬드 PC(Hand-Held PC), GSM(Global System for Mobile)폰, W-CDMA(Wideband CDMA)폰, CDMA-2000폰 및 MBS(Mobile Broadband System)폰 등이 될 수 있다.

본 발명의 바람직한 실시예에 따른 기지국(211)은 기저 대역 신호 처리, 유무선 변환, 무선 신호의 송수신 등을 수행하여 개인 가입자 단말기(200)와 직접적으로 연동하는 망 종단(Endpoint) 장치이다. 본 발명의 바람직한 실시예에 따른 기지국(211)은 각기 셀(Cell) 단위로 배치되어 있고 개인 가입자 단말기(200)에서 발생하는 통화 요청을 기지국 제어기(212)로 전송하거나 자신이 관할하는 셀 영역에 존재하는 개인 가입자 단말기(200)의 위치를 파악하여 위치 등록을 수행한다. 또한, 기지국(211)은 개인 가입자 단말기(200)에 대해 무선 통신 호(Call) 또는 통신 경로(Path)를 유지하는 기능을 한다.

본 발명의 바람직한 실시예에 따른 기지국 제어기(212)는 기지국(211)을 제어하며, 개인 가입자 단말기(200)에 대한 무선 채널 할당 및 해제, 개인 가입자 단말기(200) 및 기지국(211)의 송신 출력 제어, 셀간 소프트 핸드오프(Soft Handoff) 및 하드 핸드오프(Hard Handoff) 결정, 트랜스코딩(Transcoding) 및 보코딩(Vocoding), GPS(Global Positioning System) 클럭 분배, 기지국(211)에 대한 운용 및 유지 보수 등의 기능 등을 수행한다.

한편, 여기서 기존 망이 동기식인 경우에 기지국(211)은 BTS(Base Transceiver Station), 기지국 제어기(212)는 BSC(Base Station Controller)가 될 것이고, 비동기식인 경우에 기지국(211)은 RTS(Radio Transceiver Subsystem), 기지국 제어기(212)는 RNC(Radio Network Controller)가 될 것이다.

본 발명의 바람직한 실시예에 따른 PCF(213)는 기지국 제어기(212) 및 PDSN(221)과 연결되어 PDSN(221)과의 접속을 설정/유지/해제하는 기능을 수행하고, 기지국 제어기(212)에게 패킷 데이터 전송을 위한 무선 자원(Radio Resource) 할당을 요구하며, 과금 정보를 수집하여 PDSN(221)으로 전송하는 역할을 한다. 또한, PDSN(221)으로부터 수신한 패킷 데이터가 개인 가입자 단말기(200)로 전송될 때까지 버퍼링 기능 및 개인 가입자 단말기(200)의 상태 관리 기능을 수행한다.

한편, 본 발명의 바람직한 실시예에 따른 기지국 제어기(212) 및 PCF(213)는 휴대 인터넷 무선 접속망(230)으로부터 핸드오프 호가 도착하면, 휴대 인터넷 무선 접속망(230)의 접속 정보를 활용하여 ACR(232)에 대한 IP를 룩업(Look Up)하여 IP 정보를 획득하거나 또는 휴대 인터넷 무선 접속망(230)의 접속 정보를 PDSN(221)으로 전달할 수 있어야 한다.

본 발명의 바람직한 실시예에 따른 PDSN(221)은 개인 가입자 단말기(200)에 대한 이전 망 구분 기능, CDMA 2000 호와 휴대 인터넷 호를 구분하여 CDMA 2000 호에 대해서만 PPP(Point to Point Protocol) 처리를 수행하는 기능 및 개인 가입자 단말기(200)에 대해 IP 어드레스 할당을 수행하기 위한 DHCP 서버 기능 등을 수행한다.

본 발명의 바람직한 실시예에 따른 HA(222)는 인터넷(230) 등의 외부 패킷 데이터 서비스 서버로부터 패킷을 전송하는 라우팅(Routing)을 수행하며, AAA 서버(223)는 RAS(231)와 연동하여 개인 가입자 단말기(200)에서 이용한 패킷 데이터에 대한 과금을 수행하고, 개인 가입자 단말기(200)로부터의 접속을 인증한다.

본 발명의 바람직한 실시예에 따른 RAS(231)는 ACR(232)로부터 수신한 데이터를 무선으로 개인 가입자 단말기(200)에 전송하게 되며, 저전력 RF/IF 모듈 및 콘트롤러 기능, OFDMA/TDD 패킷 스케줄링과 채널 다중화 기능, 서비스 특성 및 전파 환경에 따른 MAC 프레임 가변 제어 기능, 50 Mbps급 고속 트래픽 실시간 제어 기능, 핸드오프 기능 등을 갖는다.

본 발명의 바람직한 실시예에 따른 ACR(232)은 다수 개의 RAS(231)를 수용하는 액세스 콘트롤 라우터로서 RAS(231) 간의 핸드오프 제어 기능, ACR(232) 간의 핸드오프 기능, 패킷 라우팅 기능, 인터넷 접속 기능 등을 가지며, IP 네트워크에 접속된다.

본 발명의 바람직한 실시예에 따른 기지국(211) 또는 RAS(231)가 서빙측 기지국으로 동작할 경우, 개인 가입자 단말기(200)가 서빙측 통신망의 관할 영역에서 보더 중계기(251)의 관할 영역을 거쳐 타겟측 통신망의 관할 영역 쪽으로 이동하는 경우, 서빙측 통신망의 관할 영역과 보더 중계기(251)의 관할 영역의 경계 지역에서 서빙측 통신망과의 통신을 종료하지 않고 보더 중계기(251)와 통신을 시작하는 소프트 핸드오프를 수행하게 된다. 여기서, 서빙측은 개인 가입자 단말기(200)가 핸드오프하기 전의 시스템을 지칭하고, 타겟측은 개인 가입자 단말기(200)가 핸드오프한 후의 시스템을 지칭한다.

또한, 본 발명의 바람직한 실시예에 따른 기지국(211) 또는 RAS(231)가 타겟측 기지국으로 동작할 경우, 개인 가입자 단말기(200)가 보더 중계기(251)의 관할 영역과 타겟측 통신망의 관할 영역의 경계 지역에서 서빙측 통신망 쪽으로 역이동하는 경우, 서빙측 통신망의 관할 영역과 보더 중계기(251)의 관할 영역의 경

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게 지역까지는 타겟측 통신망과의 통신을 종료하지 않고 보더 중계기(251)와 통신을 시작하는 소프트 핸드오프를 수행하게 된다. 또한, 개인 가입자 단말기(200)가 보더 중계기(251)의 관할 영역과 타겟측 통신망의 관할 영역의 경계 지역에서 정지하고 있는 경우에도 타겟측 기지국과의 통신을 종료하지 않고 보더 중계기(251)와 통신을 시작하는 소프트 핸드오프를 수행한다.

한편, 본 발명의 바람직한 실시예에 따른 기지국 제어기(212) 또는 ACR(232)은, 개인 가입자 단말기(200)가 보더 중계기(251)의 관할 영역과 타겟측 통신망의 관할 영역의 경계 지역까지 이동했을 때, 서빙측 기지국과의 통신을 종료하고 타겟측 기지국과 통신을 시작하는 서빙측 기지국 및 타겟측 기지국 간의 하드 핸드오프를 수행하도록 제어한다.

본 발명의 바람직한 실시예에 따른 보더 중계기(251)는 서빙측 통신망 및 타겟측 통신망의 경계 지역에 설치되어 운용된다. 보더 중계기(251)는 서빙측 통신망에서 제공하는 신호 및 타겟측 통신망에서 제공하는 신호를 동시에 서비스하여 오버레이(Overlay) 환경을 구성한다. 즉, 본 발명의 바람직한 실시예에 따른 보더 중계기(251)는 서빙측 통신망과 타겟측 통신망의 경계 지역에서 서빙측 기지국과 타겟측 기지국의 커버리지를 동시에 제공함으로써 세대 간 하드 핸드오프 버퍼 지역을 만들어주는 것이 되는 것이다.

본 발명의 바람직한 실시예에 따른 보더 중계기(251)는, 개인 가입자 단말기(200)가 보더 중계기(251)의 관할 영역과 타겟측 통신망의 관할 영역의 경계 지역에서 정지하고 있는 경우, 타겟측 기지국과의 통신을 종료하지 않고 보더 중계기(251)와 통신을 시작하는 타겟측 기지국 및 보더 중계기(251) 간의 소프트 핸드오프를 수행한다.

또한, 본 발명의 바람직한 실시예에 따른 보더 중계기(251)는 서빙측 통신망과 타겟측 통신망 사이의 효율적인 핸드오프를 위해 도입된 것이므로 무선 표지국의 식별을 가능하게 하기 위해 알파벳의 문자 또는 문자와 숫자의 결합으로 무선 표지국을 지정하는 부호인 비컨 신호(Beacon Signal)를 제공하지 않는다.

도 3은 본 발명의 바람직한 실시예에 따른 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 과정을 설명하기 위한 망 구성도이다.

도 3에 도시된 바와 같이, 개인 가입자 단말기(200)가 기존 망 기지국(211)에 동조한 후 휴대 인터넷 망쪽으로 이동시, 기존 망의 기지국(211)과 보더 중계기(251) 기존 망 세력의 Soft(er) 핸드오프를 거쳐, (나) 지점에서 세대 간 하드 핸드오프가 이루어 진다. 이후 개인 가입자 단말기(200)가 반대 방향인 기존 망의 기지국(211) 쪽으로 조금씩 이동하거나 (나) 지점에 정지하고 있을 때, 본 발명의 바람직한 실시예에서는 기존 망으로 역방향(Backward) 세대 간 하드 핸드오프를 수행하지 않고, (가) 지점 이전까지는 보더 중계기(251) 버퍼(Buffer) 지역에서 RAS(231)와 보더 중계기(251) 휴대 인터넷 망 세력의 Soft(er) 핸드오프를 통해 안정된 서비스를 제공하며, 핑퐁을 방지할 수 있게 된다.

한편, 개인 가입자 단말기(200)가 휴대 인터넷 망 RAS(231)에 동조한 후 기존 망 쪽으로 이동시, 기존 망의 기지국(211)과 보더 중계기(251) 휴대 인터넷 망 세력의 Soft(er) 핸드오프를 거쳐 (가)지점에서 세대 간 하드 핸드오프가 이루어진다. 이후 단말이 반대 방향인 RAS(231) 쪽으로 조금씩 이동하거나 (가) 지점에 정지하고 있을 때, 본 발명의 바람직한 실시예에서는 휴대 인터넷 망으로 역방향 세대 간 하드 핸드오프를 수행하지 않고, (나)지점 이전까지는 보더 중계기(251) 버퍼지역에서 기지국(211)과 보더 중계기(251) 기존 망 세력의 Soft(er) 핸드오프를 통해 안정된 서비스를 제공하며 핑퐁을 방지할 수 있게 된다.

도 4는 본 발명의 바람직한 실시예에 따른 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 과정을 개략적으로 나타낸 순서도이다.

이하에서는 설명의 편의를 위해, 도 2 및 도 3에서 기존 망(210)을 서빙측으로 휴대 인터넷 망(230)을 타겟측으로 하여 설명하기로 한다.

우선, 개인 가입자 단말기(200)가 기존 망(210)의 기지국(211)에 동조한 후 휴대 인터넷 망(230) 쪽으로 이동한다(S400). 개인 가입자 단말기(200)가 기존 망의 관할 영역(210)과 보더 중계기(251)의 관할 영역(250)의 경계 지역까지 이동하게 되면(S402), 즉, 도 3에서 (가) 지점까지 이동하게 되면 기존 기지국(211)과 보더 중계기(251)의 기존 세력의 소프트(또는 소프터) 핸드오프가 이루어진다(S404).

개인 가입자 단말기(200)가 계속 이동하여 보더 중계기(251)의 관할 영역(250)과 휴대 인터넷 망 RAS(231)의 관할 영역(230)의 경계 지점인 (나) 지점까지 이동하게 되면(S406) 기지국 제어기(212) 및 ACR(232)에서는 기존 망의 기지국(211)과 휴대 인터넷 망의 RAS(231) 간의 하드 핸드오프를 수행하도록 제어한다(S408).

이후 개인 가입자 단말기(200)가 반대 방향인 기존 망의 기지국(211)쪽으로 조금 이동하거나 또는 보더 중계기(251)의 관할 영역(250)과 휴대 인터넷 망의 RAS(231)의 관할 영역(230)의 경계 지점인 (나) 지점에 정지하고 있을 때(S410), 기지국 제어기(212) 및 RAS(231)에서는 기존 망으로 역방향(Backward) 세대 간 하드 핸드오프를 수행하도록 하지 않고, (가) 지점 이전까지는 보더 중계기(251) 버퍼(Buffer)지역에서 휴대 인터넷 망의 RAS(231)와 보더 중계기(251)의 휴대 인터넷 세력 간 소프트(또는 소프터) 핸드오프를 통해 안정된 서비스를 제공하게 한다(S412).

이상, 기존 망(210)을 서빙측으로 휴대 인터넷 망(230)을 타겟측으로 하여 설명하였으나, 이와 반대의 경우인 기존 망(210)이 타겟측이고 휴대 인터넷 망(230)이 서빙측인 경우에도 양자의 입장만 바뀔 뿐 핸드오프 처리 절차는 동일하게 이루어질 것은 명백하다.

이상의 설명은 본 발명을 예시적으로 설명한 것에 불과한 것으로, 본 발명이 속하는 기술분야에서 통상의 지식을 가지는 자라면 본 발명의 본질적인 특성에서 벗어나지 않는 범위에서 다양한 변형이 가능할 것이다. 따라서, 본 명세서에 개시된 실시예들은 본 발명을 한정하기 위한 것이 아니라 설명하기 위한 것이고, 이러한 실시예에 의하여 본 발명의 사상과 범위가 한정되는 것은 아니다. 본 발명의 범위는 아래의 청구범위에 의하여 해석되어야 하며, 그와 동등한 범위 내에 있는 모든 기술은 본 발명의 권리범위에 포함되는 것으로 해석되어야 할 것이다.

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발명의 효과

이상에서 설명한 바와 같이 본 발명에 의하면, 휴대 인터넷 망과 다른 종류의 망의 경계 지역에서 양 기지국과의 통신을 동시에 제공할 수 있는 보더 중계기를 설치하여 세대 간 하드 핸드오프 버퍼 지역을 만들어 줌으로써, 세대 간 하드 핸드오프의 가장 큰 문제인 핑퐁 현상을 방지하여 통화 품질의 향상을 가져온다는 효과가 있다.

청구의 범위

청구항 1

휴대 인터넷 망(Portable Internet Network)과 다른 종류의 망의 경계 지역에 설치된 보디(Border) 중계기를 이용하여 서빙(Serving)측 통신망에서 타겟(Target)측 통신망으로 이동하는 개인 가입자 단말기에 하드 핸드오프(Hard Handoff)를 제공하는 방법에 있어서,

(a) 상기 개인 가입자 단말기가 상기 서빙측 통신망의 관할 영역에서 상기 보디 중계기의 관할 영역을 거쳐 상기 타겟측 통신망의 관할 영역 쪽으로 이동하는 경우, 상기 서빙측 통신망의 관할 영역과 상기 보디 중계기의 관할 영역의 경계 지역에서 상기 서빙측 통신망의 서빙측 기지국과의 통신을 종료하지 않고 상기 보디 중계기와 통신을 시작하는, 상기 서빙측 기지국 및 상기 보디 중계기 간의 소프트 핸드오프를 수행하는 단계; 및

(b) 상기 개인 가입자 단말기가 상기 보더 중계기의 관할 영역과 상기 타겟측 통신망의 관할 영역의 경계 지역까지 이동했을 때, 상기 서빙측 기지국과의 통신을 종료하고 상기 타겟측 통신망의 타겟측 기지국과 통신을 시작하는, 상기 서빙측 기지국 및 상기 타겟측 기지국 간의 하드 핸드오프를 수행하는 단계

를 포함하는 것을 특징으로 하는 보디 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 2

제 1 항에 있어서,

(c) 상기 개인 가입자 단말기가 상기 보더 중계기의 관할 영역과 상기 타겟측 통신망의 관할 영역의 경계 지역에서 상기 서빙측 통신망으로 역이동하는 경우, 상기 서빙측 통신망의 관할 영역과 상기 보더 중계기의 관할 영역의 경계 지역까지는 상기 타겟측 기지국과의 통신을 종료하지 않고 상기 보더 중계기와 통신을 시작하는, 상기 타겟측 기지국 및 상기 보더 중계기 간의 소프트 핸드오프를 수행하는 단계

를 추가로 포함하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 3

제 1 항 또는 제 2 항에 있어서,

(d) 상기 개인 가입자 단말기가 상기 보더 중계기의 관할 영역과 상기 타겟측 통신망의 관할 영역의 경계 지역에서 정지하고 있는 경우, 상기 타겟측 기지국과의 통신을 종료하지 않고 상기 보더 중계기와 통신을 시작하는, 상기 타겟측 기지국 및 상기 보더 중계기 간의 소프트 핸드오프를 수행하는 단계

를 추가로 포함하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 4

제 1 항 내지 제 3 항 중 어느 한 항에 있어서,

상기 서빙측 통신망은 CDMA 2000 1X 망, WCDMA 망 또는 IS-95 A/B(2G) 망이고, 상기 타겟측 통신망은 상기 휴대 인터넷 망인 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 5

제 4 항에 있어서,

상기 서빙측 기지국은 BTS(Base Transceiver Station) 또는 RTS(Radio Transceiver Subsystem)이고, 상기 타겟측 기지국은 RAS(Radio Access Station)인 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 6

제 4 항에 있어서,

상기 하드 핸드오프는 상기 서빙측 통신망의 기지국 제어기(BSC : Base Station Controller) 또는 RNC(Radio Network Controller) 및 상기 타겟측 통신망의 액세스 콘트롤 라우터(ACR : Access Control Router)에서 처리하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 7

제 1 항 내지 제 3 항 중 어느 한 항에 있어서,

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상기 서빙측 통신망은 상기 휴대 인터넷 망이고, 상기 타겟측 통신망은 CDMA 2000 1X 망, WCDMA 망 또는 IS-95 A/B(2G) 망인 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 8

제 7 항에 있어서,

상기 서빙측 기지국은 RAS(Radio Access Station)이고, 상기 타겟측 기지국은 BTS(Base Transceiver Station) 또는 RTS(Radio Transceiver Subsystem)인 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 9

제 7 항에 있어서,

상기 하드 핸드오프는 상기 서빙측 통신망의 액세스 콘트롤 라우터(ACR : Access Control Router) 및 상기 타겟측 통신망의 기지국 제어기(BSC : Base Station Controller) 또는 RNC(Radio Network Controller)에서 처리하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 10

제 1 항 내지 제 3 항 중 어느 한 항에 있어서,

상기 보더 중계기는 상기 서빙측 통신망에서 제공하는 신호 및 상기 타겟측 통신망에서 제공하는 신호를 동시에 처리하여 오버레이(Overlay) 환경을 구성하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 11

제 1 항 내지 제 3 항 중 어느 한 항에 있어서,

상기 보더 중계기는 비컨 신호(Beacon Signal)를 제공하지 않는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 방법.

청구항 12

서빙(Serving)측 통신망에서 타겟(Target)측 통신망으로 이동하는 개인 가입자 단말기에 하드 핸드오프(Hard Handoff)를 제공하는 시스템에 있어서,

상기 서빙측 통신망 및 상기 타겟측 통신망의 경계 지역에 설치되어 상기 서빙측 통신망에서 제공하는 신호 및 상기 타겟측 통신망에서 제공하는 신호를 동시에 처리하는 보더(Border) 중계기;

상기 개인 가입자 단말기가 상기 서빙측 통신망의 관할 영역에서 상기 보더 중계기의 관할 영역을 거쳐 상기 타겟측 통신망의 관할 영역 쪽으로 이동하는 경우, 상기 서빙측 통신망의 관할 영역과 상기 보더 중계기의 관할 영역의 경계 지역에서 상기 서빙측 통신망과의 통신을 종료하지 않고 상기 보더 중계기와 통신을 시작하는 소프트 핸드오프를 수행하는 서빙측 기지국; 및

상기 개인 가입자 단말기가 상기 보더 중계기의 관할 영역과 상기 타겟측 통신망의 관할 영역의 경계 지역까지 이동했을 때, 상기 서빙측 기지국과의 통신을 종료하고 상기 타겟측 통신망의 타겟측 기지국과 통신을 시작하도록 제어하는, 상기 서빙측 기지국 및 상기 타겟측 기지국 간의 하드 핸드오프를 수행하도록 제어하는 서빙측 제어기 및 타겟측 제어기

를 포함하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 13

제 12 항에 있어서,

상기 개인 가입자 단말기가 상기 보더 중계기의 관할 영역과 상기 타겟측 통신망의 관할 영역의 경계 지역에서 상기 서빙측 통신망으로 역이동하는 경우, 상기 서빙측 통신망의 관할 영역과 상기 보더 중계기의 관할 영역의 경계 지역까지는 상기 타겟측 통신망과의 통신을 종료하지 않고 상기 보더 중계기와 통신을 시작하는 소프트 핸드오프를 수행하는 타겟측 기지국

을 추가로 포함하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 14

제 12 항 또는 제 13 항에 있어서,

상기 타겟측 기지국 및 상기 보더 중계기에서는, 상기 개인 가입자 단말기가 상기 보더 중계기의 관할 영역과 상기 타겟측 통신망의 관할 영역의 경계 지역에서 정지하고 있는 경우, 상기 타겟측 기지국과의 통신을 종료하지 않고 상기 보더 중계기와 통신을 시작하는, 상기 타겟측 기지국 및 상기 보더 중계기 간의 소프트 핸드오프를 수행하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 15

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제 12 항 내지 제 14 항 중 어느 한 항에 있어서,

상기 서빙측 통신망은 CDMA 2000 1X 망, WCDMA 망 또는 IS-95 A/B(2G) 망이고, 상기 타겟측 통신망은 상기 휴대 인터넷 망인 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 16

제 15 항에 있어서,

상기 서빙측 기지국은 BTS(Base Transceiver Station) 또는 RTS(Radio Transceiver Subsystem)이고, 상기 타겟측 기지국은 RAS(Radio Access Station)인 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 17

제 15 항에 있어서,

상기 하드 핸드오프는 상기 서빙측 통신망의 기지국 제어기(BSC : Base Station Controller) 또는 RNC(Radio Network Controller) 및 상기 타겟측 통신망의 액세스 콘트롤 라우터(ACR : Access Control Router)에서 처리하는 것을 특징으로 하는 보더 중계기를 이용하여 휴내 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 18

제 12 항 내지 제 14 항 중 어느 한 항에 있어서,

상기 서빙측 통신망은 상기 휴대 인터넷 망이고, 상기 타겟측 통신망은 CDMA 2000 1X 망, WCDMA 망 또는 IS-95 A/B(2G) 망인 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 19

제 18 항에 있어서,

상기 서빙측 기지국은 RAS(Radio Access Station)이고, 상기 타겟측 기지국은 BTS(Base Transceiver Station) 또는 RTS(Radio Transceiver Subsystem)인 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 20

제 18 항에 있어서,

상기 하드 핸드오프는 상기 서빙측 통신망의 액세스 콘트롤 라우터(ACR : Access Control Router) 및 상기 타겟측 통신망의 기지국 제어기(BSC : Base Station Controller) 또는 RNC(Radio Network Controller)에서 처리하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 21

제 12 항 내지 제 14 항 중 어느 한 항에 있어서,

상기 보더 중계기는 상기 서빙측 통신망 신호 및 상기 타겟측 통신망 신호를 동시에 처리하여 오버레이(Overlay) 환경을 구성하는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 22

제 12 항 내지 제 14 항 중 어느 한 항에 있어서,

상기 보더 중계기는 비컨 신호(Beacon Signal)를 제공하지 않는 것을 특징으로 하는 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

청구항 23

제 12 항에 있어서,

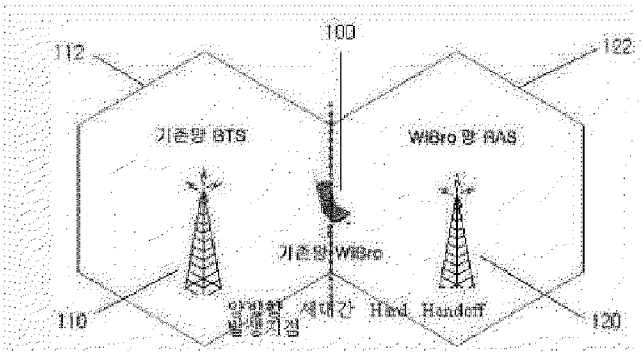
상기 서빙측 통신망 및 타겟측 통신망에서 무선으로 전화 통화 및 위치 등록을 수행하고, 상기 소프트 핸드오프 및 상기 하드 핸드오프를 위한 전계 강도를 측정하여 송출하는 개인 가입자 단말기

를 추가로 포함하는 것을 보더 중계기를 이용하여 휴대 인터넷 망과 다른 종류의 망 간의 하드 핸드오프를 제공하는 시스템.

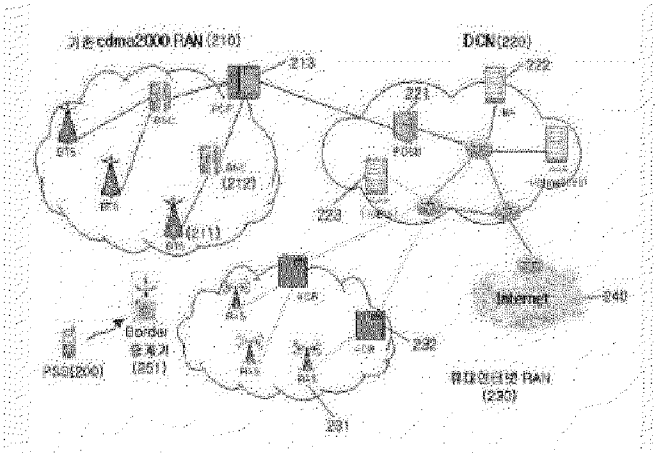
Samsung Ex. 1002, Page 433 of 615

도면

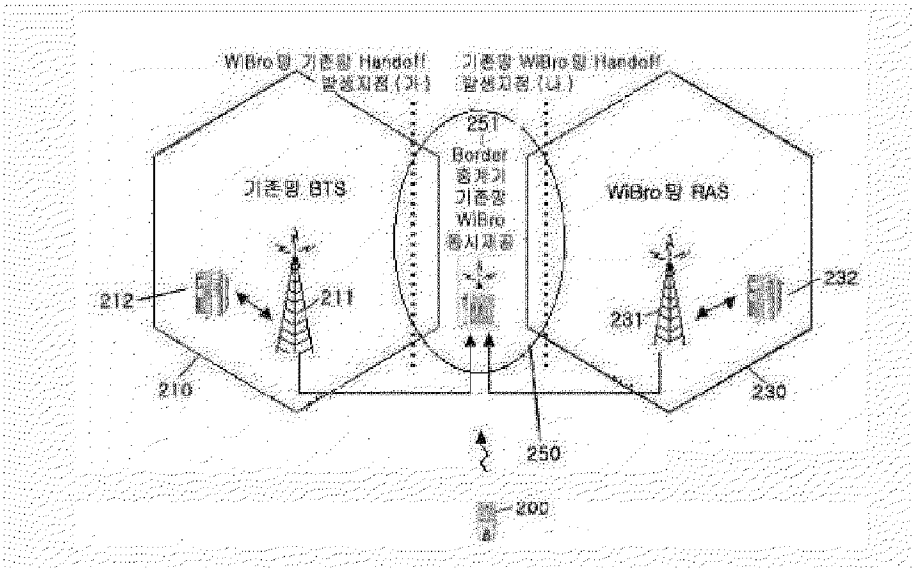
도면1


100
112
122
기존망 BTS
WiBro 망 RAS
기존망 WiBro
110
120
Hard Handoff

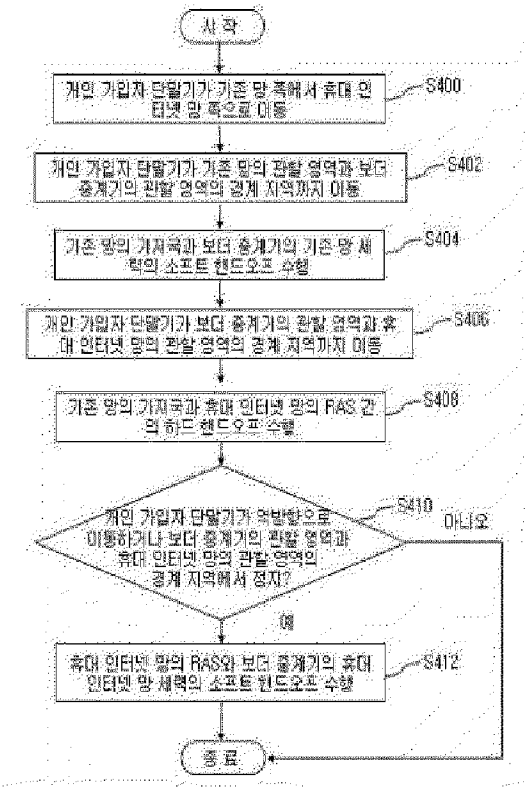
도면2


DCN(220)
213
222
221
223
Internet
240
Border
232
231

도면3



도면4



Samsung Ex. 1002, Page 435 of 615

Electronic Acknowledgement Receipt

EFS ID:	21356095
Application Number:	13263835
International Application Number:	
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Customer Number:	86636
Filer:	David S. Lee
Filer Authorized By:	
Attorney Docket Number:	2796.737BS
Receipt Date:	30-JAN-2015
Filing Date:	10-OCT-2011
Time Stamp:	14:01:49
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	Information Disclosure Statement (IDS) Form (SB08)	US-811342-02-US-NAT_20150130_IDS.pdf	612260 440d27471183f8a22fca4c043aa65b56a55f0755	no	4

Warnings:	
Information:	

2	Foreign Reference	US-811342-05-KR-NAT_KR1020090041777A_FP2.pdf	219036 f1e90a1324d5366491a1b90f74571dc608b61837	no	9
Warnings:					
Information:					
3	Foreign Reference	US-811342-05-KR-NAT_KR1020060038729A_FP3.pdf	554584 2ca864eef85bd1c2096271f507cfa03db44297dc	no	12
Warnings:					
Information:					
			Total Files Size (in bytes):	1385880	

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

86636 7590 03/18/2015
BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER
BEAMER, TEMICA M

ART UNIT	PAPER NUMBER
2646	

DATE MAILED: 03/18/2015

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

TITLE OF INVENTION: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$960	$960	06/18/2015

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)

86636 7590 03/18/2015
BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

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.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

TITLE OF INVENTION: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$960	$960	06/18/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS
BEAMER, TEMICA M	2646	455-436000

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 credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ 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: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Samsung Ex. 1002, Page 439 of 615

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

86636 7590 03/18/2015

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER	
BEAMER, TEMICA M	

ART UNIT	PAPER NUMBER
2646	

DATE MAILED: 03/18/2015

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

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

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

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/263,835	Applicant(s) KRUGLICK, EZEKIEL	
	Examiner TEMICA M. BEAMER	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 *amendment filed 12/15/2014*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-3, 5-16, 18-28 and 30-32 (renumbered as claims 1-29)*. 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 _____.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

WEST Search History for Application 13263835

Creation Date: 2015030914:30

Interference Searches

Query	DB	Op.	Plur.	Thes.	Date
(coverage and information and (handoff or handover) and mapping and previous $ 2 and confirmation).clm.	PGPB	OR	YES		03-16-2014
(coverage and information and (handoff or handover) and mapping and previous $ 2 and confirmation).clm.	PGPB	OR	YES		03-09-2015
(h04w36/32.cpc. h04w36/30.cpc. h04w36/18.cpc. h04w36/08.cpc. h04w36/14.cpc. h04w36/12.cpc.)	PGPB	OR	YES		03-09-2015

Prior Art Searches

Query	DB	Op.	Plur.	Thes.	Date
455/$.ccls. or 370/$.ccls.	PGPB, USPT	OR	YES		03-16-2014
(handoff or handover) same coverage same available near5 resources	PGPB, USPT	OR	YES		03-16-2014
((handoff or handover) same coverage same available near5 resources) and (handoff or handover) near5 request$3	PGPB, USPT	OR	YES		03-16-2014
(20020187780 20080273506).pn.	PGPB, USPT	OR	YES		03-16-2014
((handoff or handover) same coverage same available near5 resources and (handoff or handover) near5 request$3) and (confirmation or ack$12) same (handoff or handover)	PGPB, USPT	OR	YES		03-16-2014
(availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover)	PGPB, USPT	OR	YES		03-16-2014
((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover)) and (455/$.ccls. or 370/$.ccls.)	PGPB, USPT	OR	YES		03-16-2014
((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover) and 455/$.ccls. or 370/$.ccls.) and coverage near10 map$4	PGPB, USPT	OR	YES		03-16-2014
		OR	YES		03-16-2014

((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover) and 455/$.ccls. or 370/$.ccls. and coverage near10 map$4) and (previous or prior) near12 (location or position or area or coverage)	PGPB, USPT				
((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover)) and predict$3 same (handoff or handover) same history	PGPB, USPT	OR	YES		03-16-2014
(20120149430 20020187780).pn.	PGPB, USPT	OR	YES		03-09-2015
((20120149430 20020187780).pn.) and (confirm$5 or ack$12)	PGPB, USPT	OR	YES		03-09-2015
455/$.ccls.	PGPB, USPT	OR	YES		03-09-2015
(455/$.ccls.) and (handover or handoff) near10 confirmation	PGPB, USPT	OR	YES		03-09-2015
(455/$.ccls. and (handover or handoff) near10 confirmation) and (handover or handoff) near8 request$3	PGPB, USPT	OR	YES		03-09-2015
(455/$.ccls. and (handover or handoff) near10 confirmation and (handover or handoff) near8 request$3) and coverage	PGPB, USPT	OR	YES		03-09-2015
(455/$.ccls. and (handover or handoff) near10 confirmation and (handover or handoff) near8 request$3 and coverage) and map$4 same coverage	PGPB, USPT	OR	YES		03-09-2015
455/$.ccls. or 370/$.ccls.	PGPB, USPT	OR	YES		03-09-2015
(handoff or handover) same coverage same available near5 resources	PGPB, USPT	OR	YES		03-09-2015
((handoff or handover) same coverage same available near5 resources) and (handoff or handover) near5 request$3	PGPB, USPT	OR	YES		03-09-2015
(20020187780 20080273506).pn.	PGPB, USPT	OR	YES		03-09-2015
((handoff or handover) same coverage same available near5 resources and (handoff or handover) near5 request$3) and (confirmation or ack$12) same (handoff or handover)	PGPB, USPT	OR	YES		03-09-2015
(availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover)	PGPB, USPT	OR	YES		03-09-2015
		OR	YES		03-09-2015

((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover)) and (455/$.ccls. or 370/$.ccls.)	PGPB, USPT				
((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover) and 455/$.ccls. or 370/$.ccls.) and coverage near10 map$4	PGPB, USPT	OR	YES		03-09-2015
((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover) and 455/$.ccls. or 370/$.ccls. and coverage near10 map$4) and (previous or prior) near12 (location or position or area or coverage)	PGPB, USPT	OR	YES		03-09-2015
((availab$5 or coverage or load$3) near10 (destination or neighbor or adjacent) same (handoff or handover)) and predict$3 same (handoff or handover) same history	PGPB, USPT	OR	YES		03-09-2015
(h04w36/32.cpc. h04w36/30.cpc. h04w36/18.cpc. h04w36/08.cpc. h04w36/14.cpc. h04w36/12.cpc.)	PGPB, USPT	OR	YES		03-09-2015
(((h04w36/32.cpc. h04w36/30.cpc. h04w36/18.cpc. h04w36/08.cpc. h04w36/14.cpc. h04w36/12.cpc.)) or (455/$.ccls. or 370/$.ccls.)) and ((handoff or handover) same coverage same available near5 resources)	PGPB, USPT	OR	YES		03-09-2015

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	**Art Unit**
	TEMICA M BEAMER	2646

CPC								
Symbol							**Type**	**Version**
H04W		36	/	32			F	2013-01-01
H04W		16	/	28			A	2013-01-01
H04W		36	/	0055			A	2013-01-01
			/					
			/					
			/					
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			/					
			/					

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

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	29	
/TEMICA M BEAMER/ Primary Examiner.Art Unit 2646	3/9/2015	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	**Art Unit**
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US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
455	436	H	0	4	W	36 / 00 (2009.01.01)						

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
455	440	442	67.11	226.2	

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	29	
/TEMICA M BEAMER/ Primary Examiner.Art Unit 2646	3/9/2015	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

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☐ 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
1	1	-	17												
2	2	16	18												
3	3	17	19												
-	4	18	20												
4	5	19	21												
5	6	20	22												
6	7	21	23												
7	8	22	24												
8	9	23	25												
9	10	24	26												
10	11	25	27												
11	12	26	28												
12	13	-	29												
13	14	27	30												
14	15	28	31												
15	16	29	32												

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 29	
/TEMICA M BEAMER/ Primary Examiner.Art Unit 2646 (Primary Examiner)	3/9/2015 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 4

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	**Art Unit**
	TEMICA M BEAMER	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	06/17/2013	12/30/2013	03/16/2014	09/12/2014	03/09/2015				
1	1	✓	✓	=	✓	=				
2	2	✓	✓	=	✓	=				
3	3	✓	✓	=	✓	=				
-	4	✓	-	-	-	-				
4	5	✓	✓	=	✓	=				
5	6	✓	✓	=	✓	=				
6	7	✓	✓	=	✓	=				
7	8	✓	✓	=	✓	=				
8	9	✓	✓	=	✓	=				
9	10	✓	✓	=	=	=				
10	11	✓	✓	=	=	=				
11	12	✓	✓	=	=	=				
12	13	✓	✓	=	=	=				
13	14	✓	✓	=	✓	=				
14	15	✓	✓	=	✓	=				
15	16	✓	✓	=	✓	=				
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16	18	✓	✓	=	✓	=				
17	19	✓	✓	=	-	=				
18	20	✓	✓	=	✓	=				
19	21	✓	✓	=	✓	=				
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22	24	✓	✓	=	=	=				
23	25	✓	✓	=	=	=				
24	26	✓	✓	=	✓	=				
25	27	✓	✓	=	✓	=				
26	28	✓	✓	=	✓	=				
-	29	✓	-	-	-	-				
27	30	✓	✓	=	✓	=				
28	31	✓	✓	=	✓	=				
29	32	✓	✓	=	✓	=				

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13263835	KRUGLICK, EZEKIEL
	Examiner	Art Unit
	TEMICA M BEAMER	2646

CPC- SEARCHED		
Symbol	Date	Examiner
h04w36/32,30, 18, 08, 14, 12	3/9/2015	TMB

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
455	436-443, 67.11, 226.2	6/17/2013	TMB
	updated search	12/30/2013	TMB
	updated search	3/16/2014	TMB
	updated search	9/11/2014	TMB
	updated search	3/9/2015	TMB

SEARCH NOTES		
Search Notes	Date	Examiner
WEST	6/17/2013	TMB
WEST	3/16/2014	TMB
WEST	9/11/2014	TMB
WEST	3/9/2015	TMB

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
455	436, 440, 442, 67.11, 226.2	3/16/2014	TMB
	PGPUB search	3/16/2014	TMB
	updated	3/9/2015	TMB

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Application Number	13263835
Filing Date	2011-10-10
First Named Inventor	Ezekiel Kruglick
Art Unit	2646
Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

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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
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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
/T.B./	1	20090111469	A1	2009-04-30	Lee et al.	Corresponds with KR 1020090041777

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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]
/T.B./	1	1020090041777	KR	A	2009-04-29		Corresponds with US 20090111469	☐
/T.B./	2	1020060038729	KR	A	2006-05-04			☒

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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		☐

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EXAMINER SIGNATURE

Examiner Signature	/Temica Beamer/	Date Considered	03/09/2015

*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.

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Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

CERTIFICATION STATEMENT

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☐ 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.

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

☐ A certification statement is not submitted herewith.

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	/David S. Lee/	Date (YYYY-MM-DD)	2015-01-30
Name/Print	David S. Lee	Registration Number	38,222

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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.

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Filing Date	2011-10-10
First Named Inventor	Ezekiel Kruglick
Art Unit	2646
Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

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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
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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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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	2006086910	JP	A	2006-03-30	TOSHIBA CORP		☒
	2	2008252330	JP	A	2008-10-16	KYOCERA CORP		☒
	3	2010121885	WO	A1	2010-10-28	ALCA-TEL LUCENT		☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.B./

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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		☐

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EXAMINER SIGNATURE

Examiner Signature	/Temica Beamer/	Date Considered	03/09/2015

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☐ See attached certification statement.

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☐ A certification statement is not submitted herewith.

SIGNATURE

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Signature	/David S. Lee/	Date (YYYY-MM-DD)	2014-12-15
Name/Print	David S. Lee	Registration Number	38,222

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

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(Not for submission under 37 CFR 1.99)

Application Number	13263835
Filing Date	2011-10-10
First Named Inventor	Ezekiel Kruglick
Art Unit	2646
Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

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	2	2007066882	WO	A1	2007-06-14	LG ELECTRONICS INC.		☐
	3	2010123417	WO	A1	2010-10-28	TELEFONAKTIEBOLAGET LM ERICSSON		☐

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	Art Unit	2646
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(Not for submission under 37 CFR 1.99)

Application Number	13263835
Filing Date	2011-10-10
First Named Inventor	Ezekiel Kruglick
Art Unit	2646
Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

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Signature	/David S. Lee/	Date (YYYY-MM-DD)	2015-03-30
Name/Print	David S. Lee	Registration Number	38,222

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Electronic Patent Application Fee Transmittal

Application Number:	13263835
Filing Date:	10-Oct-2011
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Filer:	David S. Lee
Attorney Docket Number:	2796.737BS

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

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:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

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EFS ID:	21909289
Application Number:	13263835
International Application Number:	
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Customer Number:	86636
Filer:	David S. Lee
Filer Authorized By:	
Attorney Docket Number:	2796.737BS
Receipt Date:	30-MAR-2015
Filing Date:	10-OCT-2011
Time Stamp:	10:42:07
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$180
RAM confirmation Number	8991
Deposit Account	504888
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Warnings:					
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4	Information Disclosure Statement (IDS) Form (SB08)	US-811342-02-US-NAT_20150330_IDS.pdf	612425 dd624a4785f1601552eabe44d17e46412870e0af	no	4
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(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 643 785 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.04.2006 Bulletin 2006/14

(51) Int Cl.:
H04Q 7/38 *(2006.01)*

(21) Application number: **04292325.0**

(22) Date of filing: **29.09.2004**

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

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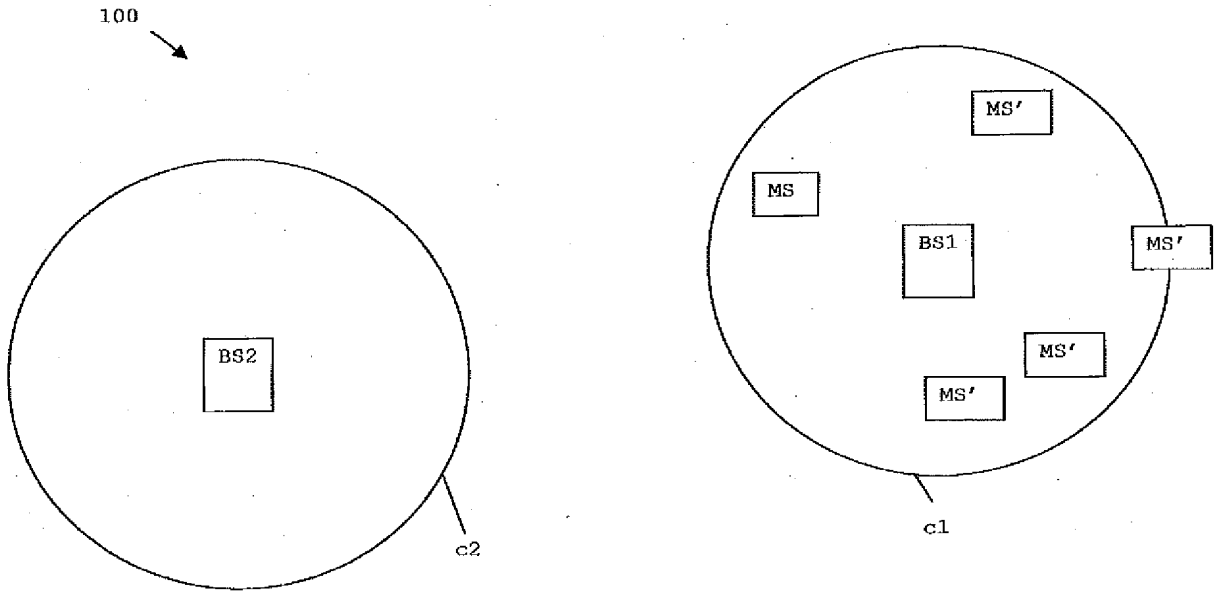
(54) Method of operating a radio system, radio system and radio base station

(57) The present invention relates to a method of operating a radio system (100) comprising at least a first and a second radio base station (BS1, BS2) and at least one mobile station (MS), wherein a handover of said mobile station (MS) from said first radio base station (BS1) to said second radio base station (BS2) is performed.

Said handover comprises the following steps:

- detecting a position of said mobile station (MS), and
- performing said handover depending on said position of said mobile station (MS).

Fig. 1a



EP 1 643 785 A1

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Description

[0001] The present invention relates to a method of operating a radio system comprising at least a first and a second radio base station and at least one mobile station, wherein a handover of said mobile station from said first radio base station to said second radio base station is performed.

[0002] The present invention further relates to a radio system according to the preamble of claim 8 and a radio base station according to the preamble of claim 10.

[0003] Although handover procedures are per se known in prior art, existing solutions have several disadvantages including lacking flexibility in that e.g. directed handovers triggered by a radio base station are not possible.

[0004] Therefore, it is an object of the present application to improve the aforementioned method, a radio system and a radio base station.

[0005] According to the present invention, concerning said method this object is achieved by detecting a position of said mobile station and by performing said handover depending on said position of said mobile station.

[0006] According to an advantageous embodiment of the present invention, said step of detecting a position of said mobile station comprises an angle determination and/or evaluating ranging information.

[0007] A further advantageous embodiment of the present invention is characterized by dynamically extending a range of said second radio base station, wherein said extending is preferably performed depending on said position information of said mobile station.

[0008] Another advantageous embodiment of the present invention is characterized by said step of dynamically extending a range of said second radio base station comprising a step of increasing a transmission power of said second radio base station, in particular for selected sub-carriers and/or antenna segments.

[0009] Yet another advantageous embodiment of the present invention proposes using adaptive array antennas for said step of dynamically extending a range of said second radio base station. Adaptive array antennas enable a modification of a beam characteristic during operation e.g. by controlling a phase of a signal delivered to each antenna being part of said array antenna.

[0010] According to a further advantageous embodiment of the present invention, said first radio base station initiates said handover.

[0011] As proposed by yet another advantageous embodiment of the present invention said inventive method is used for performing load sharing between said radio base stations, i.e. frequently used radio base stations are enabled to hand over mobile stations to preferably neighbouring radio base stations to reduce their traffic load.

[0012] This advantageously increases an overall number of mobile stations that can be served within a radio system. A further advantage of the inventive method is an improvement of the quality of service (QoS) provided within said radio system without increasing the number of radio base stations within the radio system.

[0013] Regarding the above mentioned radio base station, a further solution to the object of the present invention is given by the characterizing features of claim 10.

[0014] The inventive radio base station is characterized in that a position of said mobile station can be detected, and in that said handover can be performed depending on said position of said mobile station.

[0015] According to a further advantageous embodiment of the present invention, said radio base station is capable of performing the inventive method according to one of the claims 2 to 7.

[0016] Still another solution to the object of the present invention regarding the above mentioned radio system is given by the characterizing features of claim 8.

[0017] According to a further variant of the present invention, said radio system is capable of performing the inventive method according to one of the claims 2 to 7.

[0018] Further features and advantages of the present invention are given in the following detailed description with reference to the drawing, wherein

Fig. 1a depicts a first embodiment of the present invention in a first state, and

Fig. 1b depicts the embodiment of Fig. 1a in a second state.

[0019] The radio system 100 depicted in Fig. 1a comprises a first and a second radio base station BS1, BS2. Each of said radio base stations BS1, BS2 constitutes a radio cell c1, c2 a size of which - inter alia - depends on a radio range of the corresponding radio base station BS1, BS2. The shape of the radio cells c1, c2 is further influenced by a configuration of an antenna module (not shown) of the respective radio base station BS1, BS2.

[0020] As can be gathered from Fig. 1a, there are various mobile stations MS, MS' within the radio cell c1 of the first radio base station BS1. In order to reduce a traffic load imparted on said first radio base station BS1 by said various mobile stations MS, MS', a handover of a specific mobile station MS is performed from said first radio base station BS1 to said second radio base station BS2, which is described in detail below.

[0021] According to the scenario depicted in Fig. 1a, the radio cell c2 of said second radio base station BS2 has a circular shape and does not include the mobile station MS. Thus said mobile station MS which is to be handed over from said first radio base station BS1 to said second radio base station BS2 is out of a radio range of the second radio base station BS2. Consequently, with this radio cell configuration of said second radio base station BS2, a handover is not possible.

[0022] In order to enable the desired handover, the first radio base station BS1 detects a position of said mobile station MS and transmits information related to

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said position to the second radio base station BS2. Such a transmission may e.g. be performed via a control network connecting both radio base stations BS1, BS2, which is not displayed in Fig. 1a.

[0023] Detecting the position of said mobile station MS is achieved by evaluating ranging information and performing an angle determination within said first radio base station BS1. I.e., the position of said mobile station MS may be expressed by using polar coordinates denoting a distance of said mobile station MS from the first radio base station BS1 and an angle range in which the mobile station is located.

[0024] After receiving said information related to the position of the mobile station MS which is to be handed over, said second radio base station BS2 performs a dynamic range extension of its radio range by changing a beam characteristic of an antenna module (not shown) provided within said second radio base station BS2. Said antenna module comprises adaptive array antennas to enable the above described changing of the beam characteristic.

[0025] As a result, the second radio base station BS2 constitutes a radio cell c2' having a non-circular, basically elliptic beam-like shape as depicted in Fig. 1b.

[0026] The shape of said radio cell c2' is hereby controlled by said second radio base station BS2 according to the information related to the position of said mobile station MS so as to enable the establishment of a radio link between said second radio base station BS2 and said mobile station MS.

[0027] As a consequence, after the aforedescribed dynamic range extension of the second radio base station BS2, the mobile station MS is now located within a radio range of the second radio base station BS2, cf. Fig. 1b, and a corresponding radio link can be established between said mobile station MS and said second radio base station.

[0028] Finally, the desired handover of the mobile station MS from the first radio base station BS1 to the second radio base station BS2 can be conducted which leads to a reduction of the number of mobile stations MS' to be handled by the first radio base station BS1.

[0029] Thus, the inventive method enables to perform directed handovers which are not possible within state-of-the-art systems having a constant radio range. This way, it is possible to reduce a traffic load of highly frequented radio base stations by implementing a sophisticated load sharing wherein mobile stations are handed over to substantially unused neighbouring radio base stations.

[0030] This advantageously increases an overall number of mobile stations MS, MS' that can be served within the inventive radio system 100.

[0031] A further advantage of the inventive method is an improvement of the quality of service (QoS) provided within said radio system 100 without increasing the number of radio base stations within the radio system 100.

[0032] According to a further embodiment of the present invention, the shape of a radio cell of a radio base station BS2 may also be changed by increasing a transmission power of said radio base station BS2. This measure basically does not affect the circular shape of a corresponding radio cell, but a radius of said radio cell can thereby be increased.

[0033] It is also possible to combine an increase of transmission power with the aforedescribed modification of the beam characteristic of an antenna module. However, said modifications are to be performed according to said position information determined prior to the handover in order to enable a precise shaping of the radio cell so as to include the desired mobile station MS in the radio cell of the target radio base station BS2.

[0034] Furthermore, it is possible to limit the change of the shape of the radio cell to certain sub-carriers, e.g. in the case of multi-carrier modulation formats, and/or frequency ranges of said radio base station BS2. This allows to maintain a circular radio cell shape for other sub-carriers or frequency ranges, respectively, which may have been assigned to other mobile stations (not shown) within the radio range of the second radio base station BS2 prior to the described handover procedure.

[0035] Another advantageous embodiment of the present invention proposes to use the position information of a mobile station MS for providing location based services within the inventive radio system 100.

[0036] Although the inventive method is well suited to be performed within radio systems 100 operating according to the IEEE 802.16 standard, it is not limited to such radio systems. Generally, any radio system and/or base station which provides for position detection of mobile stations or which at least can receive such position information from other systems, can be operated according to the method of the present invention.

[0037] By implementing a handover procedure according to the present invention, radio system operators have an increased benefit from the dynamic resource allocation e.g. concerning said radio base stations.

Claims

1. Method of operating a radio system (100) comprising at least a first and a second radio base station (BS1, BS2) and at least one mobile station (MS), wherein a handover of said mobile station (MS) from said first radio base station (BS1) to said second radio base station (BS2) is performed, **characterized in that** said handover comprises the following steps:

   - detecting a position of said mobile station (MS) ,
   - performing said handover depending on said position of said mobile station (MS).

2. Method according to claim 1, **characterized in that**

BNSDOCID: <EP_____1643785A1_I_>

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said step of detecting a position of said mobile station (MS) comprises an angle determination and/or evaluating ranging information.

3. Method according to one of the preceding claims, **characterized by** dynamically extending a range of said second radio base station (BS2), preferably depending on said position information of said mobile station (MS) .

4. Method according to claim 3, **characterized by** said step of dynamically extending a range of said second radio base station (BS2) comprising a step of increasing a transmission power of said second radio base station (BS2), in particular for selected sub-carriers and/or antenna segments.

5. Method according to claim 3 or 4, **characterized by** using adaptive array antennas for said step of dynamically extending a range of said second radio base station (BS2).

6. Method according to one of the preceding claims, **characterized in that** said first radio base station (BS1) initiates said handover.

7. Method according to one of the preceding claims, **characterized by** using said method for performing load sharing between said radio base stations (BS1, BS2).

8. Radio system (100) comprising at least a first and a second radio base station (BS1, BS2) and at least one mobile station (MS), wherein a handover of said mobile station (MS) from said first radio base station (BS1) to said second radio base station (BS2) can be performed, **characterized in that** a position of said mobile station (MS) can be detected, and **in that** said handover can be performed depending on said position of said mobile station (MS).

9. Radio system (100) according to claim 8, **characterized by** being capable of performing the method according to one of the claims 2 to 7.

10. Radio base station (BS1, BS2) for a radio system (100) comprising at least a first and a second radio base station (BS1, BS2) and at least one mobile station (MS), wherein a handover of said mobile station (MS) from said first radio base station (BS1) to said second radio base station (BS2) can be performed, **characterized in that** a position of said mobile station (MS) can be detected, and **in that** said handover can be performed depending on said position of said mobile station (MS).

11. Radio base station (BS1, BS2) according to claim 10, **characterized in that** said radio base station (BS1, BS2) is capable of performing the method according to one of the claims 2 to 7.

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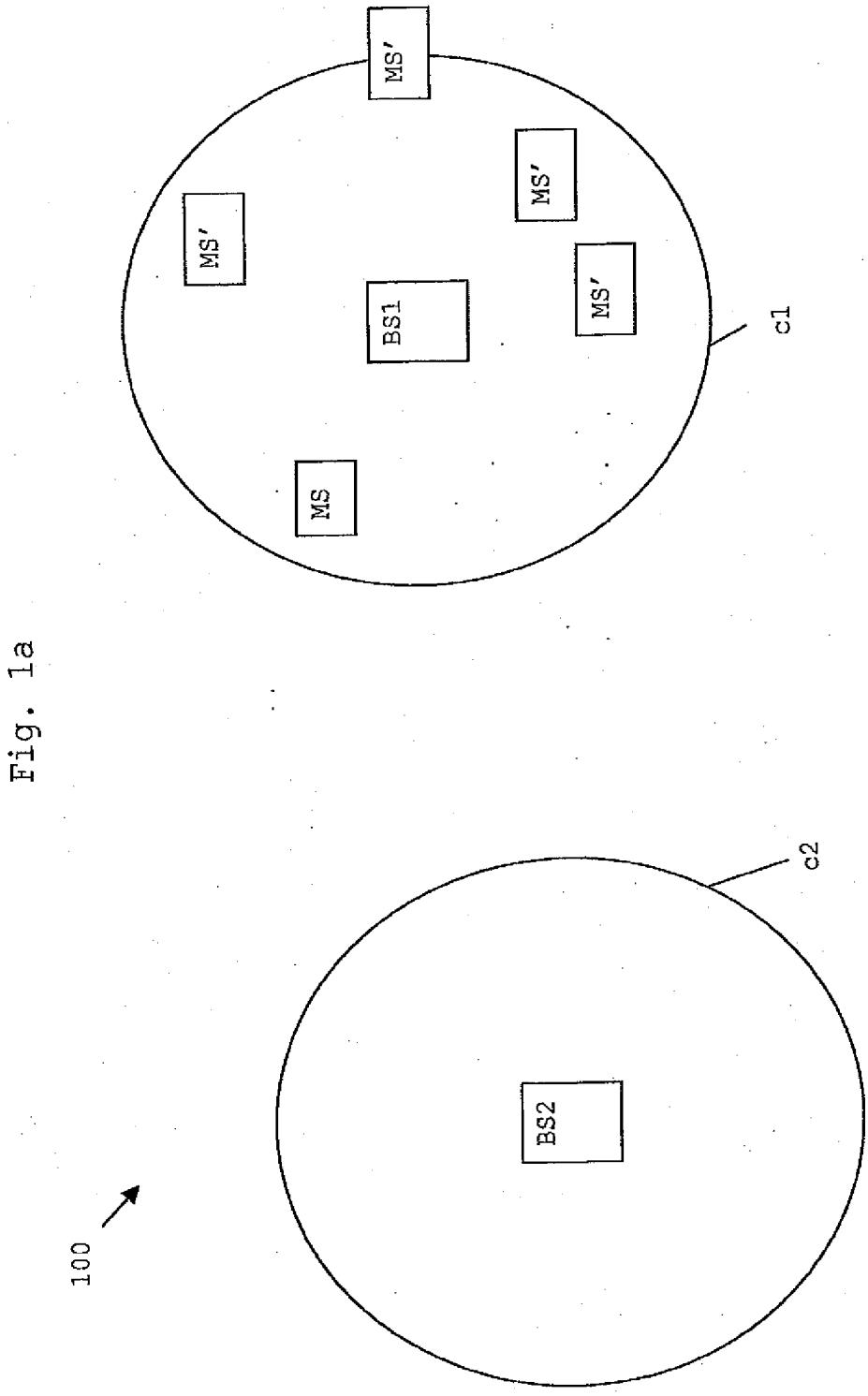


Fig. 1a

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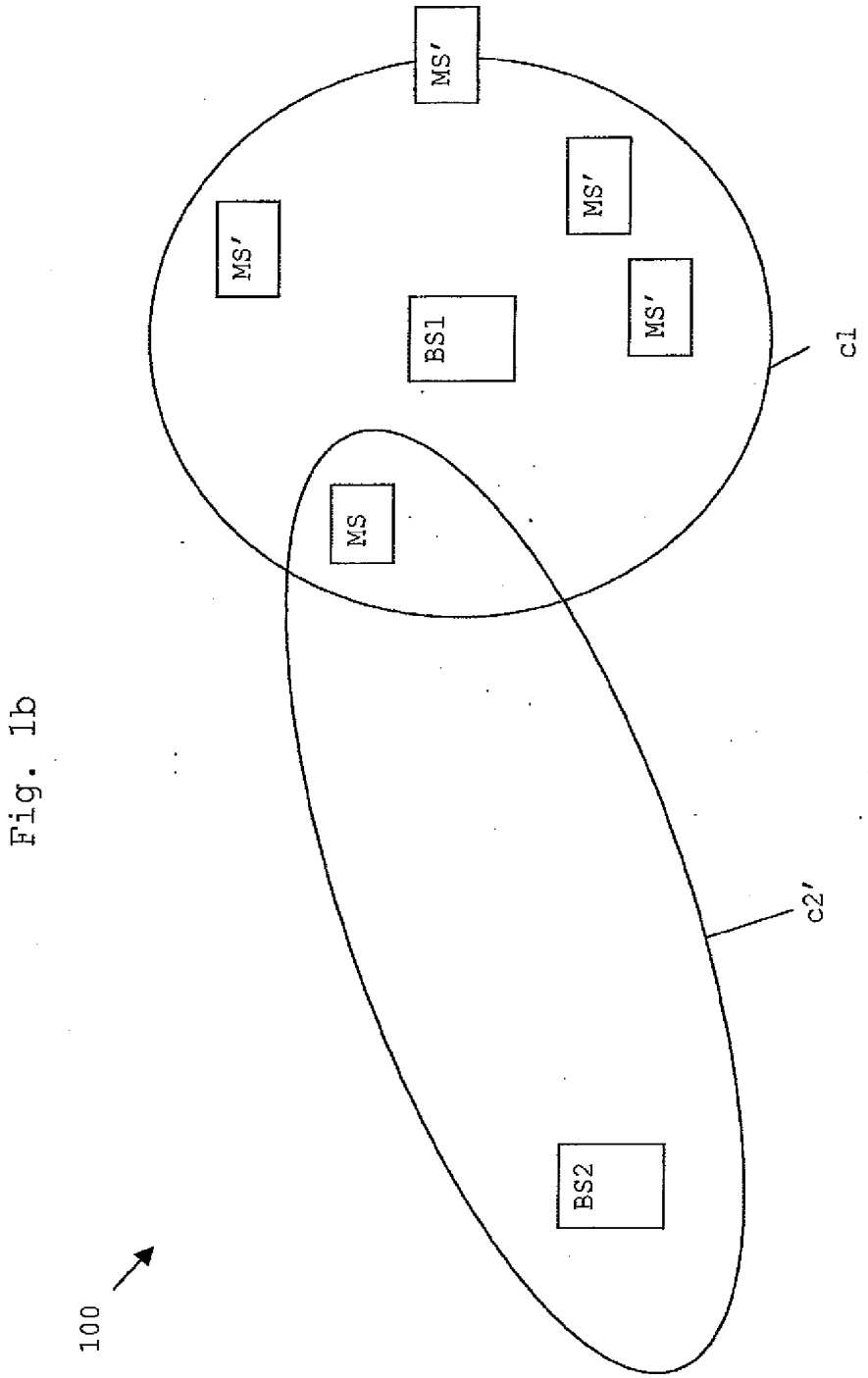


Fig. 1b

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 29 2325

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

H04Q
H04B
H01Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 March 2005	Pérez, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 29 2325

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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11-03-2005

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 June 2007 (14.06.2007)

PCT

(10) International Publication Number
WO 2007/066882 A1

(51) International Patent Classification:
H04B 7/26 (2006.01)

(21) International Application Number:
PCT/KR2006/003697

(22) International Filing Date:
15 September 2006 (15.09.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/732,080 31 October 2005 (31.10.2005) US
10-2006-0063135 5 July 2006 (05.07.2006) KR

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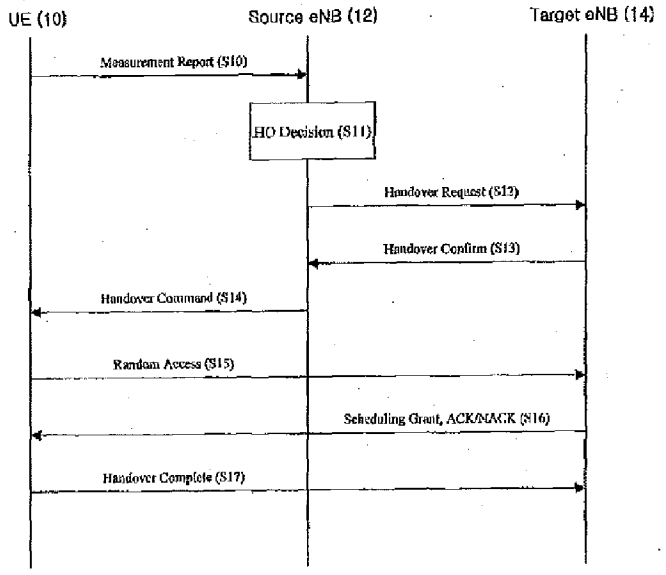
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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN,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

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

[Continued on next page]

(54) Title: METHOD OF TRANSMITTING AND RECEIVING RADIO ACCESS INFORMATION IN A WIRELESS MOBILE COMMUNICATIONS SYSTEM



(57) Abstract: In a wireless mobile communications system, a method of transmitting and receiving radio access information that allows a faster and an efficient way of establishing a radio connection between a terminal and a target base station while performing a handover for the terminal to a cell of the target base station. The network transmits in advance, the radio access information and the like, to the terminal so that the terminal can be connected with the target cell in a faster manner which minimizes the total time for the handover process.

WO 2007/066882 A1

Published:

— *with international search report*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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

Description

METHOD OF TRANSMITTING AND RECEIVING RADIO ACCESS INFORMATION IN A WIRELESS MOBILE COMMUNICATIONS SYSTEM

Technical Field

[1] The present invention relates to wireless (radio) mobile communications systems, and in particular, relates to a method of transmitting and receiving radio connection information that allows a terminal to access a target base station (i.e., target eNB) in a faster and more efficient manner while performing a handover for the terminal to a cell of the target base station.

Background Art

[2] The universal mobile telecommunications system (UMTS) is a third-generation mobile communications system evolving from the global system for mobile communications system (GSM), which is the European standard. The UMTS is aimed at providing enhanced mobile communications services based on the GSM core network and wideband code-division multiple-access (W-CDMA) technologies.

[3] Figure 1 shows an exemplary diagram illustrating an Universal Mobile Telecommunication System (UMTS) network of a conventional mobile communication system. The UMTS is comprised of, largely, a user equipment (UE) or terminal, a UMTS Terrestrial Radio Access Network (UTRAN), and a core network (CN). The UTRAN comprises at least one Radio Network Sub-system (RNS), and each RNS is comprised of one Radio Network Controller (RNC) and at least one base station (Node B) which is controlled by the RNC. For each Node B, there is at least one cell.

[4] Figure 2 is an exemplary diagram illustrating a structure of a Radio Interface Protocol (RIP) between a UE and the UTRAN. Here, the UE is associated with a 3rd Generation Partnership Project (3GPP) wireless access network standard. The structure of the RIP is comprised of a physical layer, a data link layer, and a network layer on the horizontal layers. On the vertical plane, the structure of the RIP is comprised of a user plane, which is used for transmitting data, and a control plane, which is used for transmitting control signals. The protocol layers of FIG. 2 can be categorized as L1 (first layer), L2 (second layer), and L3 (third layer) based on an Open System Interconnection (OSI) model. Each layer will be described in more detail as follows.

[5] The first layer (L1), namely, the physical layer, provides an upper layer with an information transfer service using a physical channel. The physical layer is connected to an upper layer called a medium access control (MAC) layer through a transport channel. Data is transferred between the MAC layer and the physical layer through the

transport channel. Data is also transferred between different physical layers, i.e. between physical layers of a transmitting side and a receiving side, through the physical channel.

[6] The MAC layer of the second layer (L2) provides an upper layer called a radio link control (RLC) layer with a service through a logical channel. The RLC layer of the second layer supports reliable data transfer and performs segmentation and con catenation of a service data unit (SDU) received from an upper layer.

[7] A radio resource control (RRC) layer at a lower portion of the L3 layer is defined in the control plane and controls logical channels, transport channels, and physical channels for configuration, re-configuration and release of radio bearers (RBs). A RB is a service provided by the second layer for data transfer between the terminal and the UTRAN. The configuration of the RBs includes defining characteristics of protocol layers and channels required to provide a specific service, and configuring respective specific parameters and operation methods.

[8] A RRC connection and a signaling connection will be described in more detail as follows.

[9] In order to perform communications, a terminal needs to have a RRC connection with the UTRAN and a signaling connection with the Core Network (CN). The terminal transmits and/or receives a terminal's control information with the UTRAN or the CN via the RRC connection and the signaling connection.

[10] Figure 3 shows an exemplary diagram for explaining how a RRC connection is established.

[11] In Figure 3, to establish the RRC connection, the terminal transmits a RRC Connection Request Message to the RNC, and then the RNC transmits a RRC Connection Setup Message to the terminal in response to the RRC Connection Request Message. After receiving the RRC Connection Setup Message by the terminal, the terminal transmits a RRC Connection Setup Complete Message to the RNC. If the above steps are successfully completed, the terminal establishes the RRC connection with the RNC. After the RRC connection is established, the terminal transmits an Initial Direct Transfer (IDT) message to the RNC for initializing a process of the signaling connection.

[12] A Random Access Channel of a WCDMA will be described in more detail as follows.

[13] The Random Access Channel (RACH) is used to transfer a short length data on an uplink, and some of the RRC message (i.e., RRC Connection Request Message, Cell Update Message, URA Update Message) is transmitted via the RACH. The RACH is mapped to a Common Control Channel (CCCH), a Dedicated Control Channel (DCCH) and a Dedicated Traffic Channel (DTCH), and then the RACH is mapped to a

Physical Random Access Channel.

[14] Figure 4 shows how the physical random access channel (PRACH) power ramping and message transmission may be performed.

[15] Referring to Figure 4, the PRACH, which is an uplink physical channel, is divided into a preamble part and a message part. The preamble part is used to properly control a transmission power for a message transmission (i.e., a power ramping function] and is used to avoid a collision between multiple terminals. The message part is used to transmit a MAC PDU that was transferred from the MAC to the Physical channel.

[16] When the MAC of the terminal instructs a PRACH transmission to the physical layer of the terminal, the physical layer of the terminal first selects one access slot and one (preamble) signature, and transmits the preamble on the PRACH to an uplink. Here, the preamble is transmitted within a particular the length of access slot duration (e.g., 1.33ms). One signature is selected among the 16 different signatures within a first certain length of the access slot, and it is transmitted.

[17] If the preamble is transmitted from the terminal, a base station transmits a response signal via an Acquisition indicator channel (AICH) which is a downlink physical channel. The AICH, in response to the preamble, transmits a signature that was selected within the first certain length of the access slot. Here, the base station transmits an ACK response or a NACK response to the terminal by means of the transmitted signature from the AICH.

[18] If the ACK response is received, the terminal transmits a 10ms or 20 ms length of the message part using an OVSF code that correspond with the transmitted signature. If the NACK response is received, the MAC of the terminal instructs the PRACH transmission again to the physical layer of the terminal after a certain time period. Also, if no AICH is received with respect to the transmitted preamble, the terminal transmits a new preamble with a higher power compared to that used for the previous preamble after a predetermined access slot.

[19] Figure 5 illustrates an exemplary structure of an Acquisition Indicator Channel (AICH).

[20] As shown in Figure 5, the AICH, which is a downlink physical channel, transmits 16 symbol signatures (Si, i = 0,...., 15) for the access slot having a length of 5120 chips. The terminal may select any arbitrary signature (Si) from S0 signature to S15 signature, and then transmits the selected signature during the first 4096 chips length. The remaining 1024 chips length is set as a transmission power off period during which no symbol is transmitted. Also, as similar to Figure 5, the preamble part of the uplink PRACH transmits 16 symbol signatures (Si, i = 0,...., 15) during the first 4096 chips length.

[21] An Evolved Universal Mobil Telecommunication System (E-UMTS) will be

described in more detail as follows.

[22] Figure 6 shows an exemplary structure of an Evolved Universal Mobile Telecommunications System (E-UMTS). The E-UMTS system is a system that has evolved from the UMTS system, and its standardization work is currently being performed by the 3GPP standards organization.

[23] The E-UMTS network generally comprises at least one mobile terminal (i.e., user equipment: UE), base stations (i.e., Node Bs), a control plane server (CPS) that performs radio (wireless) control functions, a radio resource management (RRM) entity that performs radio resource management functions, a mobility management entity (MME) that performs mobility management functions for a mobile terminal, and an access gateway (AG) that is located at an end of the E-UMTS network and connects with one or more external networks. Here, it can be understood that the particular names of the various network entities are not limited to those mentioned above.

[24] The various layers of the radio interface protocol between the mobile terminal and the network may be divided into L1 (Layer 1), L2 (Layer 2), and L3 (Layer 3) based upon the lower three layers of the Open System Interconnection (OSI) standard model that is known the field of communication systems. Among these layers, a physical layer that is part of Layer 1 provides an information transfer service using a physical channel, while a Radio Resource Control (RRC) layer located in Layer 3 performs the function of controlling radio resources between the mobile terminal and the network. To do so, the RRC layer exchanges RRC messages between the mobile terminal and the network. The functions of the RRC layer may be distributed among and performed within the Node B, the CPS/RRM and/or the MME.

[25] Figure 7 shows an exemplary architecture of the radio interface protocol between the mobile terminal and the UTRAN (UMTS Terrestrial Radio Access Network). The radio interface protocol of Figure 7 is horizontally comprised of a physical layer, a data link layer, and a network layer, and vertically comprised of a user plane for transmitting user data and a control plane for transferring control signaling. The radio interface protocol layer of Figure 2 may be divided into L1 (Layer 1), L2 (Layer 2), and L3 (Layer 3) based upon the lower three layers of the Open System Interconnection (OSI) standards model that is known the field of communication systems.

[26] Particular layers of the radio protocol control plane of Figure 7 and of the radio protocol user plane of Figure 8 will be described below. The physical layer (i.e., Layer 1) uses a physical channel to provide an information transfer service to a higher layer. The physical layer is connected with a medium access control (MAC) layer located thereabove via a transport channel, and data is transferred between the physical layer and the MAC layer via the transport channel. Also, between respectively different physical layers, namely, between the respective physical layers of the transmitting side

(transmitter) and the receiving side (receiver), data is transferred via a physical channel.

[27] The MAC layer of Layer 2 provides services to a radio link control (RLC) layer (which is a higher layer) via a logical channel. The RLC layer of Layer 2 supports the transmission of data with reliability. It should be noted that the RLC layer in Figure 7 is depicted in dotted lines, because if the RLC functions are implemented in and performed by the MAC layer, the RLC layer itself may not need to exist. The PDCP layer of Layer 2 performs a header compression function that reduces unnecessary control information such that data being transmitted by employing Internet protocol (IP) packets, such as IPv4 or IPv6, can be efficiently sent over a radio (wireless) interface that has a relatively small bandwidth.

[28] The radio resource control (RRC) layer located at the lowermost portion of Layer 3 is only defined in the control plane, and handles the control of logical channels, transport channels, and physical channels with respect to the configuration, re-configuration and release of radio bearers (RB). Here, the RB refers to a service that is provided by Layer 2 for data transfer between the mobile terminal and the UTRAN.

[29] As for channels used in downlink transmission for transmitting data from the network to the mobile terminal, there is a broadcast channel (BCH) used for transmitting system information, and a shared channel (SCH) used for transmitting user traffic or control messages. Also, as a downlink transport channel, there is a downlink Shared Control Channel (SCCH) that transmits necessary control information for the terminal to receive the downlink SCH. The downlink SCCH transmission includes information regarding a data variation, a data channel coding technique, and a data size where the data is transmitted to the downlink SCH.

[30] As for channels used in uplink transmission for transmitting data from the mobile terminal to the network, there is a random access channel (RACH) used for transmitting an initial control message, and a shared channel (SCH) used for transmitting user traffic or control messages. Also, in an uplink transport channel, there is an uplink Shared Control Channel (SCCH) that transmits necessary control information for the terminal to receive the uplink SCH. The uplink SCCH transmission includes information regarding a data variation, a data channel coding technique, and a data size where the data is transmitted to the uplink SCH.

Disclosure of Invention

Technical Problem

[31] In the related art, when the mobile terminal moves from a source cell to a target cell, the mobile terminal uses a RACH to transmit a cell update message to the target cell. Namely, in order to transmit the cell update message, the terminal uses the RACH

for an uplink time synchronization with the target cell and for an uplink resource allocation. However, due to a collision possibility of the RACH, the message transmission my be delayed, and a handover processing time is increased because of the possibility of RACH collision.

Technical Solution

[32] The present invention has been developed in order to solve the above described problems of the related art. As a result, the present invention provides a method of transmitting and receiving control radio connection information that allows a faster and an efficient way of accessing a terminal to a target base station while performing a handover for the terminal to a cell of the target base station.

Brief Description of the Drawings

[33] Figure 1 shows an exemplary diagram illustrating an Universal Mobile Telecommunication System (UMTS) network of a conventional mobile communication system.

[34] Figure 2 shows an exemplary diagram illustrating a structure of a Radio Interface Protocol (RIP) between a UE and the UTRAN.

[35] Figure 3 shows an exemplary diagram for explaining how a RRC connection is established.

[36] Figure 4 shows how the physical random access channel (PRACH) power ramping and message transmission may be performed.

[37] Figure 5 illustrates an exemplary structure of an Acquisition Indicator Channel (AICH).

[38] Figure 6 shows an overview of an E-UMTS network architecture.

[39] Figures 7 and 8 show an exemplary structure (architecture) of a radio interface protocol between a mobile terminal and a UTRAN according to the 3GPP radio access network standard.

[40] Figure 9 shows an exemplary diagram for transmitting and receiving radio connection information according to an exemplary embodiment of the present invention.

Mode for the Invention

[41] One aspect of the present invention is the recognition by the present inventors regarding the problems and drawbacks of the related art described above and explained in more detail hereafter. Based upon such recognition, the features of the present invention have been developed.

[42] In the related art, when the mobile terminal moves from a source cell to a target cell, the mobile terminal uses a RACH to transmit a cell update message to the target cell. However, because of a possibility for a RACH collision (i.e. the same signature is being selected from multiple terminals that use of the RACH), the processing time for

the handover process may be delayed.

[43] In contrast, the features of the present invention provide that the terminal receives necessary information from a source cell in advance (i.e., before the terminal transmits a RACH setup request to a network) in order to utilize the RACH in a later step. As a result, the terminal can connect with the target cell with minimal delays.

[44] It should be noted that the features of the present invention may be related to issues regarding the long-term evolution (LTE) of the 3GPP standard. As such, the 3GPP standard and its related sections or portions thereof, as well as various developing enhancements thereof pertain to the present invention. For example, in present invention, a source enhanced Node B (eNB) may manage the source cell described above and a target enhanced Node B (eNB) may manage the target cell.

[45] Figure 9 shows an exemplary diagram for transmitting and receiving radio connection information according to an exemplary embodiment of the present invention.

[46] As illustrated in Figure 9, the UE (or terminal) (10) may transmit a measurement report to the source eNB (12) by measuring a condition of a downlink physical channel for other cells periodically or upon the occurrence of event (i.e., user command, setting information, etc) (S10). As the measurement report is transmitted to the source eNB with a result for the measured condition of the downlink physical channel for other cells, the eNB may determine which cell, that the UE will be moved to, has a better channel condition compared to the current cell.

[47] Using the measurement report which contains information about the condition of the downlink physical channel for other cells, the source eNB (12) may determine whether to perform a handover for the UE (10) from a current cell to the other cell, or whether to keep the UE in current cell (S11).

[48] If the UE (10) needs to perform handover from the source eNB to an other particular cell, the source eNB (12) may transmit a handover request message to the target eNB (14) in order to request a handover for the UE to the target eNB. (S12) Here, the handover request message may include a UE identification (ID) and/or a buffer state of the UE.

[49] If the target eNB (14) allows the handover to be performed for the UE upon receiving the handover request from the source eNB (12), the target eNB (14) may transmit a handover confirm message to the source eNB (12) (S13). The handover confirm message may include information that may be necessary in the course of connecting the UE (10) to the target cell. Namely, the necessary information may include information used in the RACH which is used for performing a radio access procedure from the UE to the target eNB. For example, when the RACH is being used while the UE accesses to the target eNB, the UE may utilize a preamble which is

selected from signatures contained in the UE. System information transmitted from the eNB may include signatures related information. So, the UE may transmit the preamble to the eNB after selecting one of the signatures. However, in some cases, one or more UEs could select a same signature because there are a limited number of signatures. Therefore, if two or more UEs transmit the preamble of the same signature to the eNB at the same time, the eNB can not possibly determine which UE transmitted such preamble. To avoid this from happening, the UE should not transmit a preamble that is selected from the signatures used in the RACH during the handover, but rather, the UE may transmit a preamble of a previously defined signature through the handover confirm message from the target eNB. Here, the target eNB may acknowledge the mapping relationship between an UE's ID and the signature, where the UE's ID is transmitted from the Handover Request Message. Therefore, when the UE transmits the preamble to the target eNB for establishing a radio connection to the target cell, the target eNB may determine an ID of the UE using the preamble. Also, the Handover Confirm message may include a transmission characteristic of the preamble that is transmitted from the UE (10) to the target eNB (14). The transmission characteristic may relate to frequency and time used in transmitting the preamble information.

[50] If the source eNB (12) receives the Handover confirm message of the UE from the target eNB (14), the source eNB (12) may transmit a Handover Command message to t he UE (10). (S14) The Handover Command message may include necessary information which comes from the target eNB, for establishing the radio connection to the target eNB. Also, the Handover Command message may include information of the signature and the preamble which is to be used in the access procedure to the target eNB.

[51] The UE (10), which received the handover command message from the source eNB (12), may utilize the RACH for establishing the radio connection between the UE and the target eNB. (S15) Here, the preamble transmission of the UE is based upon information in the handover command message received from the source eNB (12). Also, if the information includes system information of the target eNB (14), the UE (10) may perform a radio accessing procedure without reading broadcast system information from the target eNB (14). For example, when the UE performs to establish the radio connection with a new cell, the UE usually reads system information of the corresponding eNB after time synchronization of the downlink. Since the system information includes information related to a radio access request message from the UE to an uplink, the radio accessing is performed after reading the system information. However, according to the present invention, the UE (10) may perform the radio access procedure without reading the system information in the target cell, as the

system information of the target eNB is previously transmitted to the source eNB in advance and the system information was included in the handover command message.

[52] The target eNB (14) may receive the preamble of the UE. Since the target eNB (14) already allocates a signature used in the preamble to the UE in the use of handover, the UE can be identified by the preamble. The target eNB (14) may allocate the uplink radio resource to the UE (10) for the UE to access the target eNB and to transmit the handover complete message to the target eNB. (S16) Also, the allocated radio resources information may be transmitted to the UE (10) via a downlink SCH. Alternatively, the allocated radio resources information may be transmitted via a downlink SCCH. Further, the allocated radio resources may be transmitted within an ACK/NACK signaling.

[53] The UE (10) may transmit the handover complete message to the target eNB (14) based on a scheduling grant of the target eNB. (S17) If the scheduling grant includes information of allocated radio resources upon an allocation request of the uplink radio resources of the UE, the scheduling grant may be transmitted with the ACK/NACK signaling of the preamble transmitted from the UE (10). In this case, the Handover complete message from the UE may include a buffer state of the UE or its related information. If the allocated uplink radio resources, which is transmitted from the target eNB (14) to the UE (10), is sufficient, the handover complete message may be transmitted with additional traffic data when there is additional uplink traffic data.

[54] It can be said that the present invention provides a method of transmitting access information in a mobile communications system, the method comprising: deciding to perform a handover for a terminal to a cell of a target base station; transmitting, to the target base station, a handover request for performing a handover from a source base station to the target base station; receiving access information from the target base station that received the handover request, wherein the access information is then transmitted to the terminal to access the target base station; receiving a measurement report from the terminal; determining whether to perform a handover based upon the received measurement report; and transmitting a handover command that contains the access information to the terminal upon receiving the response by the source base station, wherein the measurement report includes a downlink physical channel condition for multiple cells including the cell of the target base station, the handover request includes at least one of terminal identification (ID) information and/or buffer state information of the terminal, the access information is random access information, the access information is for a random access channel (RACH), the access information includes at least one of signature information and/or preamble information, the signature information is determined by the target base station based upon terminal identification information, the preamble information includes frequency information

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and time information, and the handover command includes access information which contains at least one of signature information and/or preamble information to allow the terminal to access the target base station.

[55] Also, the present invention may provide a method of transmitting access information in a mobile communications system, the method comprising: receiving, from a source base station, a handover request for performing a handover from the source base station to a target base station; transmitting access information to the source base station upon receiving the handover request, wherein the access information is used to allow a terminal to access the target base station; allocating a radio resource for an uplink and transmitting radio resource allocation information to the terminal; receiving, from the terminal, preamble information of the terminal; and receiving a handover complete message from the terminal, wherein the radio resource allocation information is transmitted to the terminal through at least one of a downlink shared channel (SCH) and a downlink shared control channel (SCCH), an ACK/NACK signal includes the allocated resource information, the preamble information is used to identify the terminal, the handover complete message includes at least one of buffer state information of the terminal and uplink traffic data, and the handover complete message includes uplink traffic data if the radio resource allocation for the uplink is sufficient to transmit the uplink traffic data.

[56] It can be said that the present invention provides a method of receiving access information in mobile communications system, the method comprising: receiving access information from a source base station after a handover is accepted by a target base station; performing a random access procedure with the target base station using the received access information; transmitting a measurement report to the source base station by measuring a condition of a downlink physical channel for other cells, the measuring performed periodically or upon an occurrence of an event; transmitting the preamble information to the target base station for performing a radio access procedure with the target cell; receiving, from a network, radio resource information through a downlink shared channel (SCCH); receiving, from a network, radio resource information within an ACK/NACK signaling; and transmitting a handover complete message to the target base station, wherein the measurement report is used to determine whether to perform a handover from a current cell to an other cell, the access information is random access information for a random access channel (RACH) which includes preamble information within signature information, the access information includes a transmission characteristic of the preamble information, the transmission characteristic relates to frequency and time used in transmitting the preamble information, the access information includes system information transmitted from the target base station, and the handover complete message includes at least one

of buffer state information of the terminal and uplink traffic data.

[57] The present invention also may provide a mobile terminal for establishing a radio connection to a target base station in a mobile communications system, the mobile terminal comprising: a radio protocol adapted to receive access information from a source base station after a handover is accepted by the target base station and to perform a random access procedure with the target base station using the received access information, wherein the source base station is a source enhanced Node B (source eNB) and the target base station is a target enhanced Node B (target eNB) respectively in an Evolved Universal Mobile Telecommunication System (E-UMTS).

[58] Although the present invention is described in the context of mobile communications, the present invention may also be used in any wireless communication systems using mobile devices, such as PDAs and laptop computers equipped with wireless communication capabilities (i.e. interface). Moreover, the use of certain terms to describe the present invention should not limit the scope of the present invention to a certain type of wireless communication system. the present invention is also applicable to other wireless communication systems using different air interfaces and/or physical layers, for example, TDMA, CDMA, FDMA, WCDMA, OFDM, EV-DO, Mobile Wi-Max, Wi-Bro, etc.

[59] The preferred embodiments may be implemented as a method, apparatus or article of manufacture using standard programming and/or engineering techniques to produce software, firmware, hardware, or any combination thereof. The term "article of manufacture" as used herein refers to code or logic implemented in hardware logic (e.g., an integrated circuit chip, Field Programmable Gate Array (FPGA), Application Specific Integrated Circuit (ASIC), etc.) or a computer readable medium (e.g., magnetic storage medium (e.g., hard disk drives, floppy disks, tape, etc.), optical storage (CD-ROMs, optical disks, etc.), volatile and non-volatile memory devices (e.g., EEPROMs, ROMs, PROMs, RAMs, DRAMs, SRAMs, firmware, programmable logic, etc).

[60] Code in the computer readable medium is accessed and executed by a processor. The code in which preferred embodiments are implemented may further be accessible through a transmission media or from a file server over a network. In such cases, the article of manufacture in which the code is implemented may comprise a transmission media, such as a network transmission line, wireless transmission media, signals propagating through space, radio waves, infrared signals, etc. Of course, those skilled in the art will recognize that many modifications may be made to this configuration without departing from the scope of the present invention, and that the article of manufacture may comprise any information bearing medium known in the art.

[61] This specification describes various illustrative embodiments of the present

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invention. The scope of the claims is intended to cover various modifications and equivalent arrangements of the illustrative embodiments disclosed in the specification. Therefore, the following claims should be accorded the reasonably broadest interpretation to cover modifications, equivalent structures, and features that are consistent with the spirit and scope of the invention disclosed herein.

Claims

[1] A method of transmitting access information in a mobile communications system, the method comprising:
deciding to perform a handover for a terminal to a cell of a target base station;
transmitting, to the target base station, a handover request for performing a handover from a source base station to the target base station; and
receiving access information from the target base station that received the handover request, wherein the access information is then transmitted to the terminal to access the target base station.

[2] The method of claim 1, further comprising: receiving a measurement report from the terminal.

[3] The method of claim 2, wherein the measurement report includes a downlink physical channel condition for multiple cells including the cell of the target base station.

[4] The method of claim 3, further comprising: determining whether to perform a handover based upon the received measurement report.

[5] The method of claim 1, wherein the handover request includes at least one of terminal identification (ID) information and/or buffer state information of the terminal.

[6] The method of claim 1, wherein the access information is random access information.

[7] The method of claim 1, wherein the access information is for a random access channel (RACH).

[8] The method of claim 1, wherein the access information includes at least one of signature information and/or preamble information.

[9] The method of claim 8, wherein the signature information is determined by the target base station based upon terminal identification information.

[10] The method of claim 8, wherein the preamble information includes frequency information and time information.

[11] The method of claim 1, further comprising: transmitting a handover command that contains the access information to the terminal upon receiving the response by the source base station.

[12] The method of claim 11, wherein the handover command includes access information which contains at least one of signature information and/or preamble information to allow the terminal to access the target base station.

[13] A method of transmitting access information in a mobile communications system, the method comprising:

receiving, from a source base station, a handover request for performing a handover from the source base station to a target base station; and
transmitting access information to the source base station upon receiving the handover request, wherein the access information is used to allow a terminal to access the target base station.

[14] The method of claim 13, further comprising: allocating a radio resource for an uplink and transmitting radio resource allocation information to the terminal.

[15] The method of claim 14, wherein the radio resource allocation information is transmitted to the terminal through at least one of a downlink shared channel (SCH) and a downlink shared control channel (SCCH).

[16] The method of claim 15, wherein an ACK/NACK signal includes the allocated resource information.

[17] The method of claim 13, further comprising: receiving, from the terminal, preamble information of the terminal.

[18] The method of claim 17, wherein the preamble information is used to identify the terminal.

[19] The method of claim 13, further comprising:
receiving a handover complete message from the terminal.

[20] The method of claim 19, wherein the handover complete message includes at least one of buffer state information of the terminal and uplink traffic data.

[21] The method of claim 19, wherein the handover complete message includes uplink traffic data if the radio resource allocation for the uplink is sufficient to transmit the uplink traffic data.

[22] A method of receiving access information in mobile communications system, the method comprising:
receiving access information from a source base station after a handover is accepted by a target base station; and
performing a random access procedure with the target base station using the received access information.

[23] The method of claim 22, further comprising: transmitting a measurement report to the source base station by measuring a condition of a downlink physical channel for other cells, the measuring performed periodically or upon an occurrence of an event.

[24] The method of claim 23, wherein the measurement report is used to determine whether to perform a handover from a current cell to an other cell.

[25] The method of claim 22, wherein the access information is random access information for a random access channel (RACH) which includes preamble information within signature information.

[26] The method of claim 25, further comprising: transmitting the preamble information to the target base station for performing a radio access procedure with the target cell.

[27] The method of claim 25, wherein the access information includes a transmission characteristic of the preamble information, the transmission characteristic relates to frequency and time used in transmitting the preamble information.

[28] The method of claim 22, wherein the access information includes system information transmitted from the target base station.

[29] The method of claim 22, further comprising: receiving, from a network, radio resource information through a downlink shared channel (SCCH).

[30] The method of claim 22, further comprising: receiving, from a network, radio resource information within an ACK/NACK signaling.

[31] The method of claim 22, further comprising: transmitting a handover complete message to the target base station.

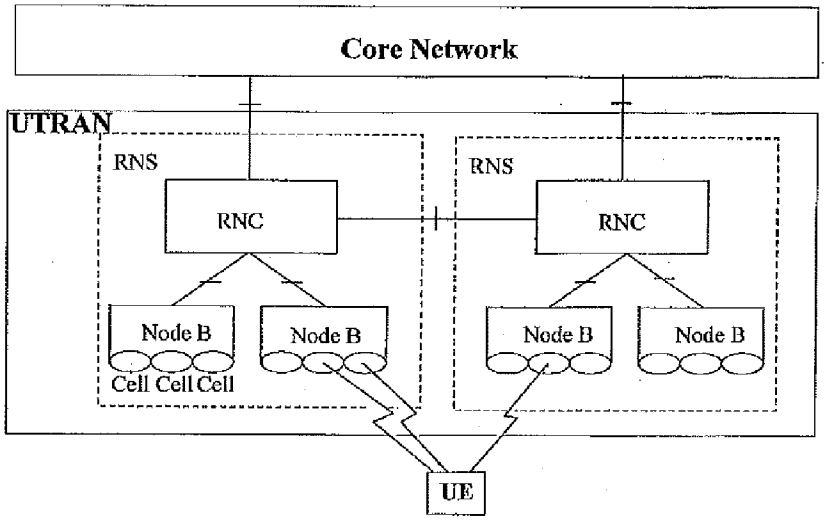
[32] The method of claim 31, wherein the handover complete message includes at least one of buffer state information of the terminal and uplink traffic data.

[33] A mobile terminal for establishing a radio connection to a target base station in a mobile communications system, the mobile terminal comprising:
a radio protocol adapted to receive access information from a source base station after a handover is accepted by the target base station and to perform a random access procedure with the target base station using the received access information.

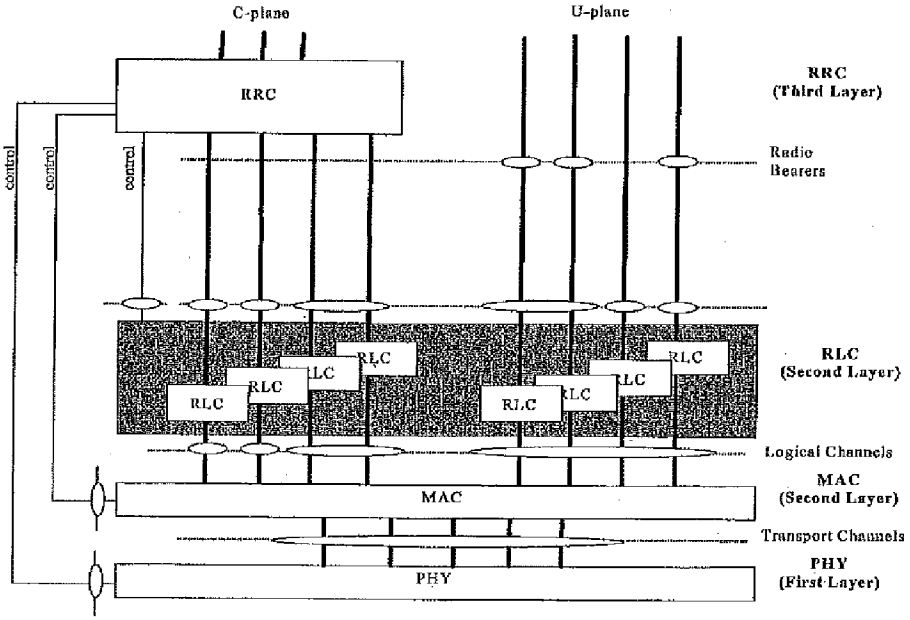
[34] The terminal of claim 33, wherein the source base station is a source enhanced Node B (source eNB) and the target base station is a target enhanced Node B (target eNB) respectively in an Evolved Universal Mobile Telecommunication System (E-UMTS).

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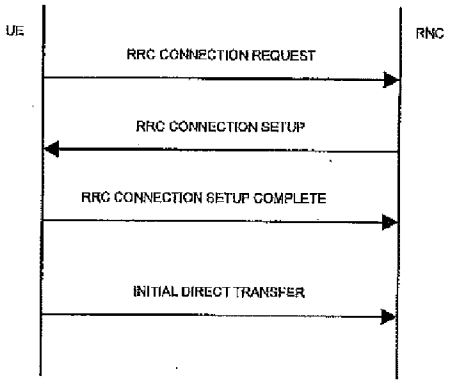
[Fig. 1]



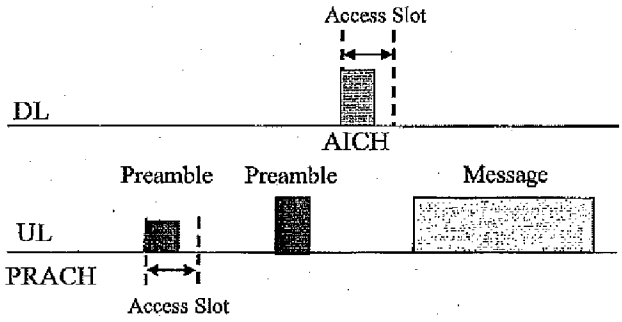
[Fig. 2]



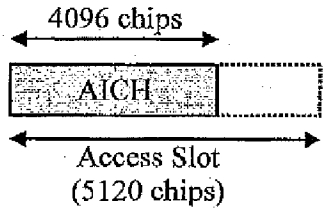
[Fig. 3]



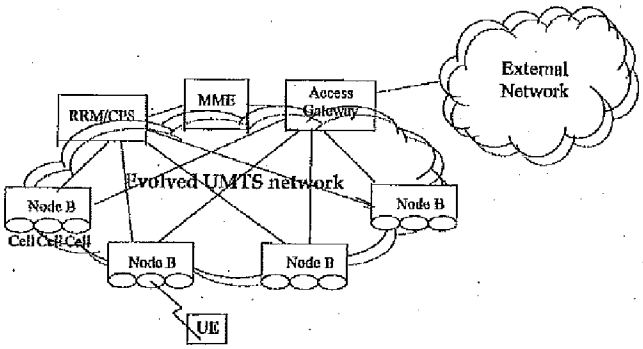
[Fig. 4]



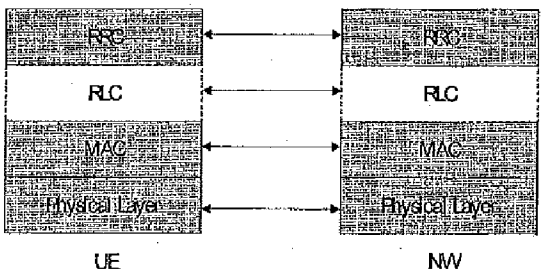
[Fig. 5]



[Fig. 6]

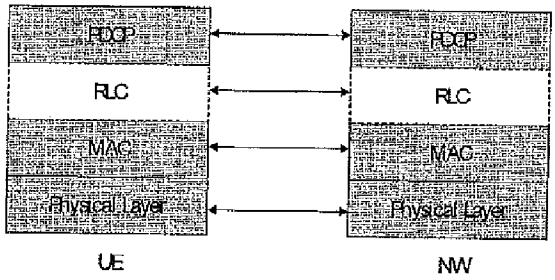


[Fig. 7]

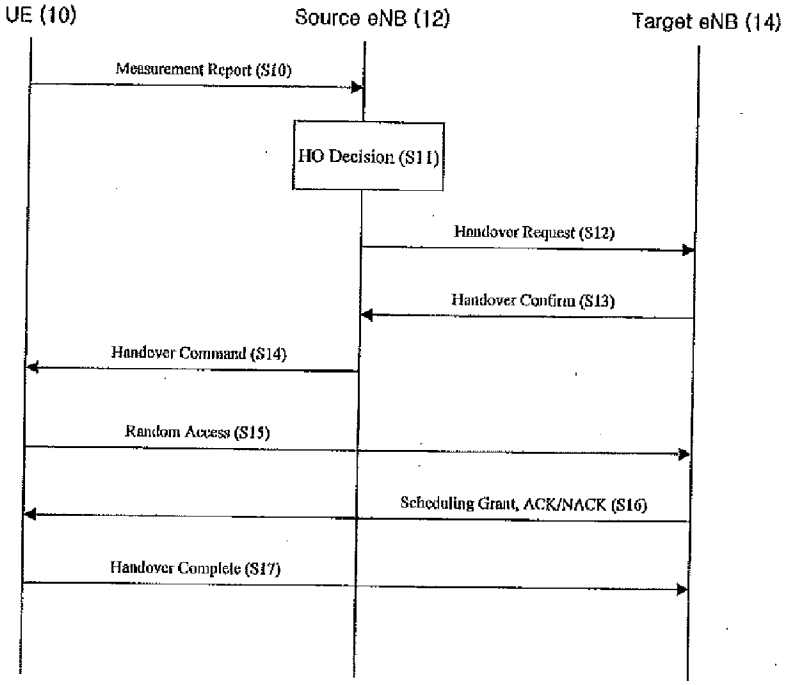


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[Fig. 8]


PDCP
RLC
MAC
Physical Layer
UE
PDCP
RLC
MAC
Physical Layer
NW

[Fig. 9]


UE (10)
Source eNB (12)
Target eNB (14)
Measurement Report (S10)
HO Decision (S11)
Handover Request (S12)
Handover Confirm (S13)
Handover Command (S14)
Random Access (S15)
Scheduling Grant, ACK/NACK (S16)
Handover Complete (S17)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2006/003697

A. CLASSIFICATION OF SUBJECT MATTER

H04B 7/26(2006.01)i

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)

IPC8 H04B 7/26

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

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

Korean Intellectual Property Office Patent Search System (eKIPASS; KIPO internal)"source & target & handover"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2004/0162072 A1(ALCATEL) 19.Aug.,2004(19.08.2004) * THE ABSTRACT	1-34
A	WO 03017544 A1(INTERDIGITAL TECH CORP) 27.Feb.,2003 (27.02.2003) * THE ABSTRACT	1-34

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

☒ 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 application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of 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
20 DECEMBER 2006 (20.12.2006)	**20 DECEMBER 2006 (20.12.2006)**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	UHM, In Kwon Telephone No. 82-42-481-5712

Form PCT/ISA/210 (second sheet) (April 2005)

BNSDOCID: <WO_____2007066882A1_I_>

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/KR2006/003697

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO03017544A1	27.02.2003	NONE	
US20040162072A1	19.08.2004	AT300848E	15.08.2005
		CN1522093A	18.08.2004
		DE60301122C0	01.09.2005
		EP01448010A1	18.08.2004

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 June 2007 (14.06.2007)

PCT

(10) International Publication Number
WO 2007/066882 A1

(51) International Patent Classification:
H04B 7/26 (2006.01)

(21) International Application Number:
PCT/KR2006/003697

(22) International Filing Date:
15 September 2006 (15.09.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/732,080 31 October 2005 (31.10.2005) US
10-2006-0063135 5 July 2006 (05.07.2006) KR

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(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **PARK, Sung-Jun** [KR/KR]; Goldenville Officetel 921, 724, Gojan-dong, Danwon-gu, Ansan, Gyeonggi-do, 425-906 (KR). **LEE, Young-Dae** [KR/KR]; Sinan Apt. 419-1501, Changu-Dong, Hanam, Gyeonggi-Do 465-711 (KR). **CHUN, Sung-Duck** [KR/KR]; Saetbyeol Hanyang Apt. 601-1007, Daran-dong, Dongan-gu, Anyang, Gyeonggi-do, 431-773 (KR). **JUNG, Myung-Cheul** [KR/KR]; 2/2, 358-36, Sangdo 2-dong, Dongjak-gu, Seoul, 156-832 (KR).

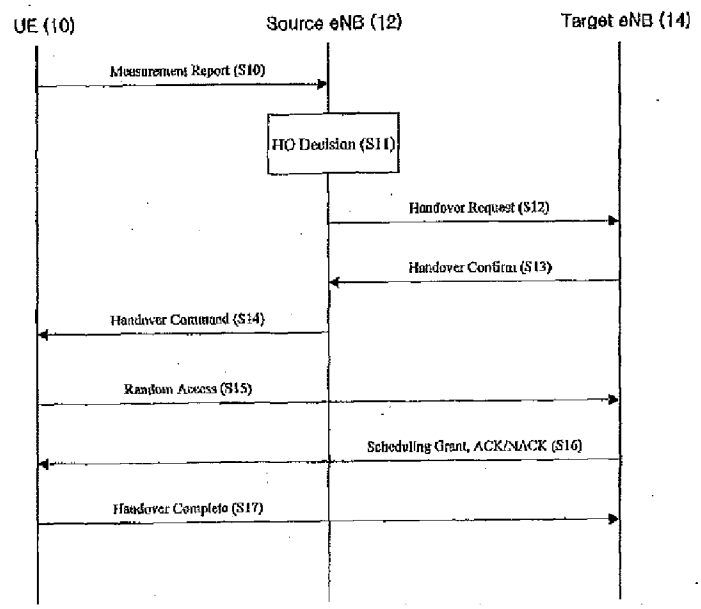
(74) Agent: **PARK, Jang-Won**; Jewoo Bldg, 5th Floor, 200, Nonhyun-Dong, Gangnam-Gu, Seoul 135-010 (KR).

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

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH,

[Continued on next page]

(54) Title: METHOD OF TRANSMITTING AND RECEIVING RADIO ACCESS INFORMATION IN A WIRELESS MOBILE COMMUNICATIONS SYSTEM



(57) Abstract: In a wireless mobile communications system, a method of transmitting and receiving radio access information that allows a faster and an efficient way of establishing a radio connection between a terminal and a target base station while performing a handover for the terminal to a cell of the target base station. The network transmits in advance, the radio access information and the like, to the terminal so that the terminal can be connected with the target cell in a faster manner which minimizes the total time for the handover process.

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

Published:

— *with international search report*

(48) Date of publication of this corrected version:
5 June 2008

(15) Information about Correction:
see Notice of 5 June 2008

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 October 2010 (28.10.2010)

PCT

(10) International Publication Number
WO 2010/123417 A1

(51) International Patent Classification:
H04W 48/20 (2009.01)

(21) International Application Number:
PCT/SE2009/050400

(22) International Filing Date:
20 April 2009 (20.04.2009)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)** [SE/SE]; S-164 83 Stockholm (SE).

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(74) Agent: **AROS PATENT AB**; P.O. Box 1544, S-751 45 Uppsala (SE).

(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.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

[Continued on next page]

(54) Title: CONTROLLING CELL ACTIVATION IN A RADIO COMMUNICATION NETWORK

(57) Abstract: In a radio communication network there are a number of radio base stations, at least one of which belongs to a first radio access network and manages at least one active cell serving user equipment. It is determined whether a passive other cell of a radio base station belonging to a second overlapping radio access network should be activated based on information representative of radio access preferences of the user equipment (S1). When it is determined that the passive other cell should be activated, the passive cell is requested to be activated by causing the corresponding radio base station belonging to the second overlapping radio access network to start transmission of cell-defining information (S2).

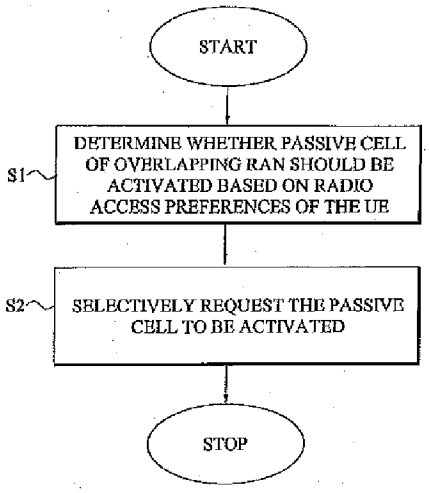


Fig. 1

WO 2010/123417 A1

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

CONTROLLING CELL ACTIVATION IN A RADIO COMMUNICATION NETWORK

TECHNICAL FIELD

The present invention generally relates to radio communications technology and operations in a radio communication network, and in particular to the issue of controlling cell activation in such a radio communication network.

BACKGROUND

Today, radio communication networks typically comprise radio base stations with associated cells that are continuously active. This means that the radio base stations more or less continuously transmit certain forms of signals in the cells to assist user equipment present in the radio communication network or user equipment attempting to connect thereto. Examples of such signals are reference signals, often denoted pilot signals, synchronization signals and the broadcast channel. These signals are used for many purposes including downlink (DL) channel estimation, cell synchronization in connection with power-up of user equipment and mobility cell search. However, the transmission of these signals means that the power consumption will be quite significant, and it may be advisable to try to reduce the power consumption in the network.

In Wideband Code Division Multiple Access (WCDMA) a NodeB for a cell can be put to sleep at night by switching off the power supply to the NodeB in order to reduce power consumption. In the morning, the NodeB is turned on again by once more providing power supply to the NodeB. Unfortunately, this means that no communication services can be offered during the night since the NodeB is out-of-service in that period of time.

SUMMARY

There is a demand for more efficient ways of reducing the power consumption, while still ensuring efficient communication services.

It is a specific object to provide an efficient method of controlling activation of at least one cell in a radio communication network.

It is another specific object to provide an apparatus for controlling activation of at least one cell in a radio communication network.

Yet another object is to provide a network unit comprising such an apparatus for controlling activation of at least one cell in a radio communication network

These and other objects are met by embodiments as defined by the accompanying patent claims.

The possibility of temporarily inactivating cells into passive cells, where their associated radio base stations do not transmit any of the above-mentioned signals is sometimes advantageous. Such a cell inactivation could then be used for example during periods in which there is no need, or at least very low need, for radio communication services in the cells. Inactivating cells and turning off the transmitters of the passive cells not only saves power for the radio base stations but also contributes to lowering the total interference level in the radio communication network.

The inventors have recognized that the inactivation of cells during periods of no or low need for radio communication services not only achieves several advantages for the operators of the radio communication networks but also brings about new challenges. For instance, today there is no efficient solution of how to activate a passive cell when a potential need for radio communication services arises in the area of the passive cell. Furthermore, there is no efficient solution to inform user equipment of the existence of passive cells in the radio communication network.

In a first aspect, there is provided a method of controlling activation of at least one cell in a radio communication network having a number of radio base stations. At least one of the radio base stations belongs to a first radio access network and manages at least one active cell serving one or more user equipment. In this context, the method is based on determining whether a

passive other cell of a radio base station belonging to a second overlapping radio access network should be activated based on information representative of radio access preferences of the user equipment. The radio base station belonging to the second overlapping radio access network is currently not transmitting any cell-defining information for the passive other cell. Further, the method continues by requesting, when it is determined that the passive other cell should be activated, the passive cell to be activated by causing the corresponding radio base station belonging to the second overlapping radio access network to start transmission of cell-defining information.

In this way the invention allows cells to stay passive for as long as possible to reduce power consumption, and allows passive cells to be activated when needed to ensure satisfactory communication services for the users.

In a second aspect, there is provided an apparatus for controlling activation of at least one cell in a radio communication network comprising a number of radio base stations. At least one of the radio base stations belongs to a first radio access network and manages at least one active cell serving one or more user equipment. The apparatus comprises a selector for selecting, based on information representative of radio access preferences of the user equipment, at least one passive other cell of a radio base station belonging to a second overlapping radio access network for activation. The radio base station belonging to a second overlapping radio access network is currently not transmitting any cell-defining information for the passive other cell. The apparatus also comprises an activation controller for requesting the selected passive other cell(s) to be activated by causing the corresponding radio base station(s) belonging to the second overlapping radio access network to start transmission of cell-defining information.

In yet another related aspect, there is provided a network unit that comprises the above apparatus for controlling activation of at least one cell in a radio communication network. The network unit may for example belong to a radio access network and/or a core network associated with the radio communication network.

Other advantages offered by the invention will be appreciated when reading the below description of embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention, together with further objects and advantages thereof, may best be understood by making reference to the following description taken together with the accompanying drawings, in which:

FIG. 1 is a flow diagram illustrating a method of controlling cell activation according to an exemplary embodiment.

FIG. 2 is a schematic diagram illustrating a stratified view of an exemplary radio communication network including the core network level, the radio access network level and the user equipment level.

Fig. 3 is a schematic overview of an exemplary radio communication network including the radio access network side and the core network side.

Fig. 4 is a schematic diagram illustrating relevant nodes on the radio access network side and the core network side, respectively, for a few examples of different types of radio communication networks.

Fig. 5 is a schematic signal diagram according to an exemplary embodiment of the invention.

Fig. 6 is a schematic diagram illustrating co-siting of radio base stations of different radio access networks (RANs) and/or different radio access technologies (RATs) according to an exemplary embodiment.

Fig. 7 is a schematic diagram illustrating an example of a common cell plan between different radio access networks (RANs) and/or different radio access technologies (RATs).

Fig. 8A is a schematic diagram illustrating an example of a cell plan in which radio base stations of different radio access networks (RANs) and/or different radio access technologies (RATs) are not co-sited.

Fig. 8B is a schematic diagram illustrating an example of a partially common cell plan according to an exemplary embodiment.

Fig. 9 is a schematic block diagram illustrating an apparatus for controlling activation of at least one cell according to an exemplary embodiment.

Fig. 10 is a schematic block diagram illustrating an apparatus for controlling activation of at least one cell according to another exemplary embodiment.

Fig. 11 is a schematic block diagram illustrating an example of a radio base station having transmission and/or reception control capabilities.

Fig. 12 is a schematic flow diagram illustrating a particular example of how information is selected for transfer using the exemplary Subscriber Profile ID for RAT/Frequency priority (SPID) 3GPP signal.

Fig. 13 is a schematic flow diagram illustrating a particular example of how the radio access network side may determine to initiate activation of selected cells according to an exemplary embodiment.

DETAILED DESCRIPTION

Throughout the drawings, the same reference numbers are used for similar or corresponding elements.

Embodiments as disclosed herein relate to controlling cell activation in a radio communication network having at least one passive cell.

In current cellular radio communication networks, the radio base stations continuously transmit certain forms of signals in their respective cells. Examples of such signals are pilot signals, such as reference and/or synchronization signals, and the broadcast channel. These signals are used for many purposes, including:

Mobility cell search: User equipment regularly scans for neighboring cells. The synchronization signals transmitted in a neighboring cell are used to find and synchronize to a potential neighbor. Active user equipment typically reports the signal strength of the neighboring cell to the network, which takes a decision if the user equipment should be handed over to the candidate cell.

Initial cell search: At power-up user equipment tries to find potential cells to connect to by scanning for synchronization signals. Once a cell is found and synchronization is obtained, the user equipment reads the broadcast channel and pilot signal(s) transmitted in the cell to obtain the necessary system information and normally performs a random access to connect to the network.

Data reception: Active user equipment needs to perform channel estimation, typically based on the pilot reference signals, to receive the transmitted data. The pilot reference signals may also be used for estimation and reporting of the downlink channel quality to support radio base station functions such as channel-dependent scheduling.

User equipment synchronization: Idle user equipment needs synchronization signals and/or reference signals to be able to keep in sync with the network, i.e. once waking up from paging DRX (Discontinuous Reception) cycles, these signals are used to fine-tune timing and frequency errors etc.

When there are active users in a cell, the cost of transmitting the signals discussed above is justified. However, when there are no active users in the cell, there is in principle no need for these signals. This is especially true in scenarios with dense deployment of cells, i.e. in case where micro cells are placed under macro cells. In such scenarios, the micro cells may for example be used to cope with high load scenarios, and the energy spent on transmitting these signals from the micro cells in low load scenarios is in essence wasted.

In absence of active user equipment in a cell, or at least a very low number of active user equipment, there is in principle no need to transmit anything. This allows the radio base station to turn off the power amplifier, the baseband processing as well as the transmission equipment.

The cell managed by the radio base station in essence becomes "idle" in the downlink. Such a cell is denoted a passive cell herein, although alternative terminology could also be used, such as sleeping cell or inactivated cell. The expression "passive cell" therefore also encompasses expressions such as idle, sleeping or inactivated cell.

As defined herein, a passive cell is a cell of the radio communication network for which the corresponding radio base station is currently not transmitting any cell-defining information for the cell. The cell-defining information includes, in particular, information to assist user equipment in finding the cell. It may also include information required by user equipment for identifying and actually locking to a cell. Cell-defining information typically comprises the information traditionally carried by the above-mentioned pilot signals, such as reference signals and/or synchronization signals, and optionally also information carried by the broadcast channel. In a particular exemplary embodiment, the cell-defining information includes at least synchronization signal information.

Note, however, that even though the radio base station does not transmit any cell-defining information for a passive, the radio base station may optionally still have its receivers switched on and can therefore receive data transmitted, for instance, by user equipment even though the transmitter or transmitters for the passive cell are switched off.

For the purposes of the present disclosure, a radio base station is assumed to serve one or more cells in the radio communication network. Thus, "radio base station" also refers to more recent entities, such as NodeB and eNodeB (evolved NodeB), which are capable of handling more than one cell, as well as other corresponding network nodes, such as a base transceiver station (BTS) and a base station (BS). Furthermore, the expression radio base station may also encompass wireless network nodes such as relays and repeaters and home base stations having a respective geographical serving area, i.e. a cell.

Similarly, "user equipment" will be used to indicate different types of radio terminals, such as mobile stations, mobile user equipments, laptops, etc. having functionality for wirelessly communicating with radio base stations in the radio communication network.

FIG. 1 is a flow diagram illustrating a method of controlling activation of at least one cell in a radio communication network according to an exemplary embodiment. The radio communication network comprises a number of radio base stations, at least one of which belongs to a first radio access network (RAN) and manages at least one active cell serving one or more user equipment. The method starts in step S1 by determining whether a passive other cell of a radio base station belonging to a second overlapping radio access network (RAN) should be activated based on information representative of radio access preferences of the user equipment (UE). The radio base station belonging to the second overlapping radio access network is currently not transmitting any cell-defining information for the passive other cell. Further, the method continues in step S2 by requesting, when it is determined that the passive other cell should be activated, the passive cell to be activated by causing the corresponding radio base station belonging to the second overlapping radio access network to start transmission of cell-defining information.

In this way the invention allows cells to stay passive for as long as possible to reduce power consumption, and allows passive cells to be activated when needed to ensure satisfactory communication services for the users.

For example, the information representative of radio access preferences of user equipment may include information representative of at least one of radio access capabilities, subscription and current service used by the user equipment. With regard to information representative of radio access capabilities, such information preferably includes information representative of expected or known radio access capabilities.

It may be beneficial to use information representative of an order of preference of radio access networks, as will be explained later on. For example, such information may include an indication that user equipment has a preference for the second overlapping radio access network over the first radio access network.

The first radio access network may be associated with a first radio access technology (RAT), whereas the second overlapping radio access network is associated with a second different radio access technology (RAT). Non-limiting examples of different radio access technologies

(RATs) that can be combined include Global System for Mobile Communications (GSM), Wideband Code Division Multiple Access (WCDMA), Code Division Multiple Access 2000 (CDMA2000) or Time Division – Synchronous CDMA (TDSCDMA) and Long Term Evolution (LTE). For example, the first radio access technology may be GSM, CDMA2000, TDSCDMA or WCDMA whereas the second radio access technology may be LTE. Other combinations are of course also possible including GSM as the first RAT and WCDMA as the second RAT.

It is also possible that the overlapping radio access network is of the same underlying radio access technology. By way of example, the first radio access network may be based on a given radio access technology operating at a first frequency and the second overlapping radio access network may based on the same radio access technology but operating at a second different frequency. Examples of different networks of the same underlying technology operating at different frequency ranges include LTE 700 MHz and LTE 2600 Hz.

For a better understanding of the invention, it may be useful to continue with a brief network overview referring to Fig. 2.

FIG. 2 is a schematic diagram illustrating a stratified view of an exemplary radio communication network including the core network level, the radio access network level and the user equipment level. Basically, the radio communication network includes a core network 10, and one or more radio access networks 20 serving user equipment 30. The radio access network(s) 20 includes radio base stations 25, which may be of different types. Each of the radio access networks is associated with a conventional Operations Support System (OSS) 15.

Fig. 3 is a schematic overview of an exemplary radio communication network including the radio access network side and the core network side. In this example a radio base station (RBS) site 25-1 supports different radio access networks (RANs) and/or radio access technologies (RATs), and is therefore sometimes referred to as a co-sited RBS implementation, as will be explained in detail later on. In the present example, the RBS site 25-1 is operated for managing an active cell 26-1 of a first radio access network (RAN) that is capable of serving one or more user equipment 30 currently residing in the active cell 26-1. This means that the RBS site 25-1 transmits cell-defining information for the active cell 26-1 of the first RAN. The RBS site 25-1

also has the possibility of transmitting cell-defining information for one or more, two in the example of Fig. 3, other cells 27-1, 27-2 of a second different overlapping RAN. In an embodiment, these cells 27-1 and 27-2 are currently passive, implying that the RBS site 25-1 currently does not transmit any cell-defining information for the cells 27-1, 27-2. The passive cells 27-1, 27-2 are therefore invisible for user equipment 30 present in the area of or near a passive cell 27-1, 27-2.

A similar scenario can be seen with the radio base station (RBS) 25-2, which manages an active cell 26-2 of a first radio access network (RAN) serving user equipment 30, and the separate radio base station 25-3 with a currently passive cell 27-3 of a second radio access network (RAN).

In a possible scenario, one or more of the passive cells 27-1, 27-2 and 27-3 may be planned for particular services that cannot be handled or not handled sufficiently well by the active cells 26-1 and 26-2. A typical example could be when the passive cells 27-1, 27-2 and 27-3 are planned for a broadband access technology, which only needs to be active when a service requiring high bandwidth is required. If no such high bandwidth services are needed, the traffic is instead served by the active cells 26-1, 26-2 of the overlapping access network/technology.

For example, the active cell 26-1 and the relevant parts of the RBS site 25-1 may be of a given radio access technology, such as the Global System for Mobile Communications (GSM), Wideband Code Division Multiple Access (WCDMA), Code Division Multiple Access 2000 (CDMA2000) or Time Division Synchronous CDMA (TDSCDMA), whereas the passive cells 27-1, 27-2 and the relevant parts of the RBS site 25-1 may be of another radio access technology, such as Long Term Evolution (LTE), capable of handling high bandwidth services. Similarly, the same may apply for the active cell 26-2 and the corresponding RBS 25-2, and the passive cell 27-3 and the corresponding RBS 25-3.

A further possible scenario could be that one or more of the passive cells 27-1, 27-2 and 27-3 are only activated if the need for radio communication services in one or more of the active cells 26-1, 26-2 increases so much that the traffic load becomes too large for the corresponding radio

base stations to handle effectively. In such a case, some of the traffic could instead be handled by at least one of the passive cells 27-1, 27-2 and 27-3, which then need(s) to be activated.

It should be appreciated that in order to be useful for any of the above purposes, an area of a passive cell should cover, when activated, an area in which the considered user equipment is currently located or expected to be located within the near future.

It should also be understood that radio base stations may be capable of serving multiple, i.e. at least two, cells, of which a subset of one or more cells may be passive while another subset may be active.

As well-known to the skilled person, the architecture of the radio access network and core network will differ in dependence on the considered radio access technology. This means that the radio base stations in the schematic example of Fig. 3 may be connected to one or more Base Station Controllers (BSC) 45-1, 45-2 for GSM, one or more Radio Network Controllers (RNC) 50-1, 50-2 for CDMA-based networks, or directly to the corresponding core network 40 for LTE.

Fig. 4 is a schematic diagram illustrating relevant nodes on the radio access network side and the core network side, respectively, for a few examples of different types of radio communication networks.

In GSM, for example, the radio access network (RAN) generally has two fundamental logical node types: the Radio Base Station (RBS) 25, and the Base Station Controllers (BSC) 45. The radio access network also has an associated Operations Support System (OSS) 15. The GSM core network 40 is based on the Mobile Switching Center (MSC) node 55, together with additional nodes such as the Home Location register (HLR) (not shown) and other conventional support units and/or nodes.

In CDMA-based networks, for example, the radio access network (RAN) generally has two fundamental logical node types: the Radio Base Station (RBS) 25, and Radio Network

Controllers) (RNC) 50. The radio access network also has an associated Operations Support System (OSS) 15. The RBS 25 is often denoted NodeB.

The RBS/NodeB 25 is the logical node handling the transmission and reception for a set of one or more cells. Logically, the antennas of the cells belong to the NodeB 25 but they are not necessarily located at the same antenna site. The NodeB 25 typically owns its hardware but not the radio resources of its cells, which are owned by the RNC 50 to which the NodeB 25 is connected. This RNC-NodeB connection is effected using the known Iub interface.

Each RNC 50 in the radio communication network can normally connect to every other RNC 50 via the known Iur interface. Thus, the Iur interface is a network wide interface making it possible to keep one RNC 50 as an anchor point for user equipment and hide mobility from the core network.

The RNC 50 is the node connecting the radio access network to the core network via the known Iu interface. For WCDMA/HSPA, the core network is normally based on the GSM core network and therefore comprises two distinct domains; the circuit-switched (CS) domain with the Mobile Switching Centre (MSC), and the packet-switched (PS) domain with the Serving GPRS Support Node (SGSN)/Gateway GPRS Support Node (GGSN) 60. Common for the two domains is the Home Location Register (HLR) (not shown).

In LTE, for example, the radio access network (RAN) generally has a single fundamental type of node, namely the Radio Base Station 25, called eNodeB. The radio access network also has an associated Operations Support System (OSS) 15. Each eNodeB 25 is in charge of a set of one or more cells. The cells of an eNodeB 25 do not have to be using the same antenna site but can have separate dedicated antenna sites.

The eNodeB 25 is normally in charge of a number of functionalities, including single cell radio resource management (RRM) decisions, handover decisions, scheduling of user equipment in both uplink and downlink in its cells.

The known X2 interface connects any eNodeB in the radio communication network with any other eNodeB. This X2 interface is mainly used to support active-mode mobility but may also be used for multi-cell RRM functions. Another interface, the known S1 interface, connects the eNodeB 25 to the core network.

The core network for LTE is often denoted Evolved Packet Core (EPC) to indicate that it is a radical evolution from the GSM/General Packet Radio Service (GPRS) core network. The EPC is developed as a single-node architecture with all its functions in one node, the Mobility Management Entity (MME), except the Home Subscriber Server (HSS) (not shown) that is a node or database containing details of each user equipment subscriber that is authorized to use the LTE core network and the user plane gateways (not shown). The EPC connects to the LTE RAN via the-above mentioned S1 interface, to the Internet (not shown) via the known SGi interface and to the HSS (not shown) using the known S6 interface.

The exemplary procedures for cell activation according to embodiments of the invention may be implemented for execution in one or more network units associated with the radio communication network. If the cell activation procedure is implemented in more than one network unit, the result will be a distributed implementation.

For example, the determination of whether a passive other cell of a radio base station belonging to another overlapping radio access network should be activated, and the request for activation of the passive cell by causing the corresponding radio base station belonging to the overlapping radio access network to start transmission of cell-defining information may be performed by one or more network units of the so-called first radio access network currently serving the user equipment. This may be a radio base station (RBS), a base station controller (BSC) or a radio network controller (RNC) of the first radio access network. Typically, the serving radio base station may be suitable for executing the "remote" cell activation of a passive cell belonging to another overlapping radio access network.

In an exemplary embodiment, the network unit of the first radio access network receives information representative of radio access preferences of user equipment from a core network associated with the radio communication network. This information may for example be carried

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by Subscriber Profile ID for RAT/Frequency priority (SPID) 3GPP signaling from the core network, as will be explained in detail later on.

In addition to UE radio access preference information (such as information representative of at least one of radio access capabilities, subscription and current service of the UE) from the core network side, it is also possible and often advantageous to exploit information originating from the radio access network side, such as current UE position, signal strength indications, cell and/or cell plan information. In this regard, it may by way of example be important to exploit information representative of the number of user equipment, with radio access capabilities for the second overlapping radio access network, that are expected to be located in a passive cell when the cell is activated, and compare this number of user equipment to a given threshold to determine whether the passive cell should be activated. In this way, a passive cell will only be activated when a certain number of user equipment terminals having the right radio access capabilities are present in the cell or at least expected to be located in the cell when it is activated.

Alternatively, it is indeed possible to have the determination of whether a passive other cell of a radio base station belonging to another overlapping radio access network should be activated, and the request for activation performed by one or more network units of a core network associated with the radio communication network. This could for instance be the MME node, SGSN node, GGSN node, MSC node and/or a new dedicated node for cell activation purposes.

In yet another alternative implementation, the determination and the request are distributed between the core network side and the radio network side.

There are several different ways of causing a radio base station to start transmission of cell-defining information. A cell activation command is preferably signaled through proper control signal paths from the requesting network unit to the radio base station having a passive cell that needs to be activated. This may be inter-RBS signaling for co-sited base stations, inter-RAN signaling between the different radio access networks, CN-to-RAN signaling when the core network requests the cell activation, signaling via OSS, or even via random access signaling from user equipment.

The RAN serving the UE may have a list of radio base stations of the overlapping RAN serving the same area as the cell to which the UE is connected. This would be similar to the neighbor list, but with the difference that it includes radio base stations of one or more overlapping RANs.

If the RBS serving the user equipment is co-sited with the relevant RBS of the overlapping radio access network, the serving RBS can signal directly to the co-sited RBS to turn on its corresponding cell.

Activation of the passive cell can also be triggered by signaling to the corresponding radio base station belonging to the second overlapping radio access network via an Operations Support System (OSS) associated with the overlapping radio access network.

Yet another illustrative example includes signaling random access (RA) enabling information from the serving radio base station to the user equipment, which is located in the area of selected cell to be activated, and requesting the user equipment to transmit a random access (RA) to the radio base station of the second overlapping radio access network to trigger activation of the cell.

Fig. 5 is a schematic signal diagram according to an exemplary embodiment of the invention. It should be understood that the particular example of Fig. 5 merely serves to represent one of many possible ways of realizing the invention.

For example, when the UE is registering with the network, information (1) associated with the UE regarding radio access preferences is normally collected at the corresponding core network (CN). The core network can build a list of UE radio access preferences in different ways:

- Have a default list for all UEs.
- Have a list based on UE radio access capabilities.
- Have a list based on UE radio access capabilities and the subscription of the UE.
- Have a list based on UE radio access capabilities, subscription and the current service used by the UE.

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The more specific the CN defines the list, the more power can be saved when executing the cell activation procedure of the invention.

In this example, a network unit, such as the serving RBS, of the first radio access network (RAN1) receives information (2) representative of radio access preferences of user equipment from the core network (CN), and this network unit then determines whether a passive cell of a second overlapping radio access network (RAN2) should be activated based on the received information. If it has been determined that a passive cell of the second RAN (RAN2) should be activated, the network unit of the first RAN (RAN1) signals (3) to the relevant RBS of the second RAN to trigger activation of the corresponding cell.

This information (2) representative of radio access preferences of user equipment may for example be carried by Subscriber Profile ID for RAT/Frequency priority (SPID) 3GPP signaling from the core network to the radio access network side and by Idle Mode Mobility Control Information from the radio access network to the UE/mobiles to set mobility preferences during idle mode individually per mobile. In an exemplary embodiment, the first RAN extracts the relevant information of UE radio access preferences based on the SPID signaling from the core network (CN) and then uses this information to determine whether the passive cell of the second overlapping RAN should be activated. For more information on the 3GPP signaling relevant to the above exemplary embodiment, reference can be made to [1, 2].

For example, if LTE is preferred over the current radio access technology (e.g. GSM, WCDMA or CDMA2000), the currently serving first RAN signals to the LTE base station(s) with passive cells having a potential of covering the area where the UE(s) is/are located. The signal(s) causes the LTE RBS(s) to turn on the corresponding cell(s), including transmission of cell-defining information to assist the UE(s) to find and attach to the activated cell(s).

Cells of the second overlapping RAN that have not been carrying user traffic within, or during, a predefined period of time are normally turned off again, meaning that the corresponding radio base station(s) will not be transmitting any cell-defining information for these cells.

In particular, it is thus possible to set such a cell in a passive state in which the corresponding radio base station does not transmit any cell-defining information for the cell if no user data is transmitted by the RBS for the cell within a predetermined period, and preferably also if with the optional condition that no data is received by the RBS for the considered cell during the time period.

For a better understanding, examples of various network contexts in which embodiments can be applied will now be schematically described.

In the following, various exemplary embodiments will be described in more detail, mainly with reference to GSM, CDMA2000, TDSCDMA, or WCDMA communication systems as the RAT for the first RAN, and LTE as the RAT for the second RAN. Most areas where LTE is rolled out already have coverage by at least one other radio access technology, such as GSM, CDMA2000, TDSCDMA or WCDMA. The invention is not limited thereto. Other scenarios are also possible, as previously mentioned.

In an LTE communication system for example, it may be desirable to minimize the number of LTE cells that are turned on. Preferably, only those cells that are need in order to provide the required services should be active. All other cells should be turned off.

In other words, an idea is to have triggered start of operation of the LTE cells, where the trigger is based on an indication that a UE would prefer LTE operation. This allows for prolonging of the idle or passive period of the LTE cell(s)while still maintaining or improving the response time of an LTE attachment.

Typically the UE makes the initial access to another overlay access network, and the LTE system is optionally and selectively turned for example upon reception of access from a LTE capable UE.

Normally LTE will be deployed where there already exist other radio access networks such as GSM, WCDMA, CDMA2000, TDSCDMA, or even LTE of another frequency band. The idea is to have the UEs camp on these standards, and for example when services requiring LTE is

started, at least one of the LTE RBSs within the area will be asked to turn the proper LTE cell(s) on.

Exemplary optional advantages include:

- Minimal power consumption, as a complete LTE network can be turned off, and activated only when a service requiring LTE is started by an LTE capable UE.

- LTE RBSs can be used as spot-wise capacity enhancements. UEs are normally handled via another RAN/RAT, but when LTE is present in the area, a high-traffic user can "start it up".

- Lower power consumption since all transmission can be turned off when no (or very low) traffic is present in the cell.

Co-sited scenario

A possible deployment for LTE is to reuse the sites of GSM (or a CDMA-based system), e.g. put LTE RBS next to a GSM RBS on the GSM site. Furthermore, the feeders and antenna units may be reused, for appearance reasons and for wind load reasons. Such an example is shown in Fig. 6.

Fig. 6 is a schematic diagram illustrating co-siting of radio base stations of different radio access networks (RANs) and/or different radio access technologies (RATs) according to an exemplary embodiment. Fig. 6 illustrates a co-sited cell representation, a typical physical site 200 with shared feeder cables and antennas, and a more detailed view of the radio base stations (RBSs) 210, 220 and duplex filter 230 in the site 200, as well as a sector antenna 240. The radio base stations 210, 220 may be of different radio access technologies (RATs), typically operating on different frequency bands and having a duplex filter for sharing the feeder. The associated antenna unit 240 typically houses two diversity antennas – one diversity antenna per band. Alternatively, the radio base stations are of the same RAT, but anyway belonging to different radio access networks, e.g. operating on different frequency bands. Of

course, also other co-siting solutions exist, with or without shared equipment. The cells are normally virtually overlapping.

Fig. 7 is a schematic diagram illustrating an example of a common cell plan between different radio access networks (RANs) and/or different radio access technologies (RATs). For example, a cell plan of a first RAT such as GSM is indicated by solid arrows and a cell plan a second RAT such as LTE is indicated by dashed arrows. This could for instance be the result of the co-siting as illustrated in Fig. 6.

With reference to Fig. 6, assume that GSM RBS A is the serving RBS for the UE 30, and that all the cells of LTE RBSs in A, B and C are passive.

When it is detected that the UE 30 has a preference for LTE over GSM, the serving GSM RBS A, or another suitable network unit, will decide that it is appropriate to activate an LTE cell and therefore sends a cell-activation command signal to the co-sited LTE RBS via a site-local control interface.

Generic scenario

When the LTE deployment is extended, not all LTE RBSs will be co-sited with GSM RBSs.

Examples of more generic scenarios will now be outlined with reference to Figs. 8A-B.

Fig. 8A is a schematic diagram illustrating an example of a cell plan in which radio base stations of different radio access networks (RANs) and/or different radio access technologies (RATs) are not co-sited. This could by way of example represent a scenario in which LTE RBSs are not co-sited with GSM RBSs; perhaps because the other RAT belongs to another operator.

Fig. 8B is a schematic diagram illustrating an example of a partially common cell plan according to an exemplary embodiment. This could by way of example represent a scenario in which an LTE-only RBS G is placed in-between the sites with co-sited RBSs. This can be due to a need for higher capacity in that area for LTE, but not for GSM.

For a more generic case, the GSM RBS(s) typically needs to know which LTE cells are serving the same area as the GSM cells. By way of example, it may be determined that more than one LTE cell should be selected for activation. For example, in the case of Fig. 10B, the serving GSM RBS A may request both LTE RBS C and RBS G to turn on at least some of their respective cells.

The above procedures may be implemented in an apparatus or corresponding controller module by hardware or a suitable combination of software and processing hardware for executing the software.

Fig. 9 is a schematic block diagram illustrating an apparatus for controlling activation of at least one cell according to an exemplary embodiment. Basically, the apparatus 300 for controlling activation of at least one cell in a radio communication network comprises a selector 310 for selecting, based on information representative of radio access preferences of the user equipment, at least one passive other cell of a radio base station belonging to a second overlapping radio access network for activation. The radio base station belonging to a second overlapping radio access network is currently not transmitting any cell-defining information for the passive other cell. The apparatus 300 also comprises an activation controller 320 for requesting the selected passive other cell or cells to be activated by causing the corresponding radio base station or stations belonging to the second overlapping radio access network to start transmission of cell-defining information to assist the UE in finding the cell for radio communication services.

As previously indicated, the apparatus 300 for controlling cell activation may be implemented in a network unit 25/45/50/55/60/65 associated with the radio communication network. The network unit may for example belong to a radio access network and/or a core network associated with the radio communication network. For example, the network unit may be a Radio Base Station (RBS) 25, a Base Station Controller (BSC) 45, a Radio Network Controller (RNC) 50, a Mobile Switching Center (MSC) 55, a Serving GPRS Support Node (SGSN) and/or Gateway GPRS Support Node (GGSN) 60, or a Mobility Management Entity (MME) node 65.

In an exemplary embodiment, when the network unit in which the apparatus 300 for controlling cell activation is implemented belongs to the radio access network side, the information representative of radio access preferences of the user equipment is preferably received from a core network associated with the radio communication network.

Other examples and/or optional features of the apparatus for controlling cell activation will be described below:

Fig. 10 is a schematic block diagram illustrating an apparatus for controlling activation of at least one cell according to another exemplary embodiment. In similarity to the apparatus of Fig. 9, the apparatus of Fig. 10 includes a selector for selecting one or more passive cells of another overlapping radio access network for activation, and activation controller 320 for requesting the selected cell(s) to be activated. In the exemplary embodiment of Fig. 10, the selector 310 includes an extractor 312 and a unit 314 for cell selection.

The extractor 312 is configured for receiving information representative of radio access preferences and uses translation information to interpret the received information of radio access preferences.

For example, information representative of radio access preferences may be carried by Subscriber Profile ID for RAT/Frequency priority (SPID) 3GPP signaling from the core network. The relevant OSS normally has information for translating the SPID signaling into information of UE radio access preferences, and this information is advantageously distributed to the apparatus 300 for controlling cell activation so that the SPID signaling received from the core network may be properly interpreted.

The extracted information on the UE radio access preferences is then forwarded from the extractor 312 to the cell selection unit 314, which is configured to select one or more passive cells of the overlapping RAN based on the UE radio access preferences.

Preferably, the information representative of UE radio access preferences includes information representative of an order of preference of radio access networks.

In an exemplary embodiment, the information representative of radio access preferences includes information representative of radio access capabilities, subscription and/or current service of the considered user equipment.

As previously indicated, it is possible to use complementary information originating from one or both of the first radio access network and the second overlapping radio access network in the cell selection procedure.

The activation controller 320 receives information on one or more passive cells of the second overlapping radio access network to be activated. The activation controller 320 is preferably configured to trigger activation of the passive cell(s) by signaling an activation request to the corresponding radio base station(s) of the second overlapping radio access network requesting this or these base stations to start transmission of cell-defining information.

In the above presented block diagrams of Figs. 9 and 10, only the units directly involved in the controlled cell activation as disclosed herein are explicitly illustrated. It is therefore anticipated that a network unit, such as a radio base station, a base station controller or radio network controller, including a corresponding apparatus for cell activation also comprises other units and functionalities used in their traditional operations.

Fig. 11 is a schematic block diagram illustrating an example of a radio base station having transmission and/or reception control capabilities. Basically, the radio base station (RBS) 400 includes a transmitter (TX) 410 and associated antenna(s), a transmitter control unit 420, a receiver (RX) 430 and associated antenna(s), a receiver control unit 440, and an input/output (I/O) unit 450.

In a radio base station responsible for a passive cell to be activated, there is typically a transmitter control unit 420 that is capable of activating the passive cell by controlling the transmitter 410 to start transmission of cell-defining information for the cell. The radio base station may also have access to a timer (not shown), and when this timer has expired and/or no or only very low amount of active traffic is or has been present in the active cell as detected by conventional means, the transmitter control unit 420 may for example inactivate the cell by

controlling the transmitter 410 to stop the transmission of the cell-defining information for the cell.

The transmitter control unit 420, also referred to as a transmitter controller, may be associated with the power amplifier, the baseband processing as well as the actual transmission equipment in the radio base station.

As mentioned above, there are many ways of requesting the radio base station and the transmitter control unit 420 to activate a cell. For example, this information may be signaled as a cell activation command via the I/O unit 450, but it may also be provided, e.g. through a random access (RA) received from user equipment via the receiver 430 as indicated by the dashed line.

The base station 400 may also have an optional receiver control unit 440, also referred to as a receiver controller, which controls the receiver 430 so that it is activated or inactivated for a specific cell.

As a final example, reference will now be made to the flow diagrams of Figs. 12 and 13, which schematically illustrate an exemplary procedure based on Subscriber Profile ID for RAT/Frequency priority (SPID) 3GPP signaling from the core network and so-called RAN filtering to determine which cell(s) to activate.

Fig. 12 is a schematic flow diagram illustrating a particular example of how information is selected for transfer using the exemplary Subscriber Profile ID for RAT/Frequency priority (SPID) 3GPP signal. As previously mentioned, the core network (CN) may send information about the preferences to the radio access network (RAN) node. In this particular example, the information is the SPID, a number representing an entry in a configured table. The table may have many entries stating that the second RAN shall be preferred. This can be used to transfer also a "weight" for the information: If a UE would benefit from having LTE but it is not crucial, it will have a low weight. The SPID 1-10 could then indicate "LTE 700 preferred, with weight <SPID>", and SPID 11-20 could indicate "LTE 2600 preferred, with weight <SPID-10>", and so forth. This would allow for a "filtering" in the RAN before turning on one or more cells in the

second RAN. Alternatively, the CN implements the filtering of weight of preferred RAN. When the sum of weights for UEs within a selected area (e.g. routing area or paging) are high enough a signal to turn on the second RAN for that area, the SPID for "LTE 2600 preferred" is signaled.

To determine the preferred access and weight, the core network (CN) may use one or more of step S11-S14:

In step S11, the CN looks at the UE capabilities.

In step S12, the CN checks the static UE subscription. Is it allowed to use the second RAN? Does the subscription motivate a high weight (a gold user)?

In step S13, the CN checks the dynamic UE subscription. Has the user already used its monthly quota (if any)? If so, the weight may be decreased, or another RAN may be selected.

In step S14, the CN checks the setup services, and checks if they would benefit from the second RAN. If so, the weight is then increased.

Steps S11 and S12 are typically evaluated at UE connection setup. Steps S13 and S14 can be updated during the time the UE is connected.

In step S15, the total weight is calculated and the best matching SPID is selected. The CN may optionally include information about the weight of other UEs, e.g. within the routing area when selecting SPID. This would be beneficial if no filtering of weights is done in the RAN. It is though normally preferred to have the filtering in RAN.

In step S16, the SPID is sent to the RAN node.

Fig. 13 is a schematic flow diagram illustrating a particular example of how the radio access network side may determine to initiate activation of selected cells according to an exemplary embodiment. The RAN node determines if the second RAN shall be turned on by evaluating the total weight received from the SPID signal(s). The weight may be evaluated based on different criteria:

- Is the combined weight higher than a preconfigured threshold?
- Is the combined weight high, and the load of the served cells high?

Based on this, one or more passive cells may be turned on. A special case is of course that the load of the served cells is very high, and the SPID indicates that a UE can be moved to the second RAN. That may be a trigger to turn on a second cell.

In step S21, the RAN node receives the SPID for a certain UE. In step S22, the SPID is used to read out the weight from the preconfigured table. In step S23, the RAN determines which cell of the second RAN would be the target cell in case of an inter-RAT handover. The RAN node may find multiple cells to be plausible. In step S24, the RAN node calculates the weight per cell in the second RAN. The calculation may take into account the probability that any of the UEs moves in or out of the cell, i.e. is close to the cell border and/or is moving fast. The calculation may also take into account that a user has bad coverage in the first RAN and would be better served by the second RAN, and would then correspondingly increase the weight. The calculation may also take into account if the UE requires a lot of air interface resources, e.g. has a combination of bad channel and high bit-rate. The RAN would then benefit from having the UE move to the second RAN, assuming the second RAN is better for serving high speed users. In step S25, the RAN node calculates the weight per area in the second RAN. Many different areas may exist in the second RAN, and can be defined by configuration. Examples may be: a routing area, a hierarchical layer, and/or a set of cells covering an office area.

In step S26, the RAN node determines the cell threshold. The threshold can for example be a combination of a preconfigured fixed value and a function of the load in the serving cell in the first network. If the load is high in the serving network, the threshold is preferably decreased to even out the load between the RANs. In step S27, the RAN node determines the area threshold. As for the cell threshold, the area threshold value can be a combination of a preconfigured value and the load of the first RAN. The purpose of the area threshold is to be able to have a high per-cell threshold: One user in one cell shall seldom result in the second RAN being turned on, but one user in many cells in a larger area may.

In step S28, the calculated cell weight and cell threshold are compared to determine if any of the passive cells of the second RAN shall be turned on. In step S29, the calculated area weight and area threshold are compared to determine if any of the passive cells in the corresponding area of the second RAN shall be turned on.

In step S30, the determined cells, if any, are turned on by means of signaling.

Steps S23 to S29 are preferably evaluated repeatedly as the load changes or the UE moves.

The RAN part works also if the CN only has 1 SPID for the exemplary case of "UE prefers LTE". That would correspond to each UE preferring LTE having equal weight.

The CN part works fine also when having no special filtering in the RAN. The CN would then do the corresponding filtering and send the SPID corresponding to the exemplary case of "UE prefers LTE" only when the CN wants LTE to be turned on. Optionally, the CN does not use the SPID in this case but sends the signal directly to the OSS of the second RAN.

The embodiments described above are to be understood as a few illustrative examples of the present invention. It will be understood by those skilled in the art that various modifications, combinations and changes may be made to the embodiments without departing from the scope of the present invention. In particular, different part solutions in the different embodiments can be combined in other configurations, where technically possible. The scope of the present invention is, however, defined by the appended claims.

REFERENCES

[1] TS 36.300 version 8.7.0, 3GPP

[2] TS 36.413 version 8.4.0, 3GPP

CLAIMS

1. A method of controlling activation of at least one cell in a radio communication network comprising a number of radio base stations (25), at least one of said radio base stations belonging to a first radio access network and managing at least one active cell (26) serving one or more user equipment (30), said method comprising the steps of:

- determining (S1) whether a passive other cell (27) of a radio base station belonging to a second overlapping radio access network should be activated based on information representative of radio access preferences of said user equipment (30), wherein said radio base station belonging to a second overlapping radio access network is currently not transmitting any cell-defining information for said passive other cell;

- requesting (S2), when it is determined that said passive other cell (27) should be activated, said passive other cell to be activated by causing the corresponding radio base station belonging to said second overlapping radio access network to start transmission of cell-defining information.

2. The method of claim 1, wherein said information representative of radio access preferences of said user equipment (30) includes information representative of at least one of radio access capabilities, subscription and current service of said user equipment.

3. The method of claim 1, wherein said information representative of radio access preferences of said user equipment (30) includes information representative of expected or known radio access capabilities.

4. The method of any of the claims 1 to 3, wherein said information representative of radio access preferences of said user equipment (30) corresponds to information representative of an order of preference of radio access networks.

5. The method of claim 4, wherein said information representative of an order of preference of radio access networks includes an indication that said user equipment (30) has a preference for said second overlapping radio access network over said first radio access network.

6. The method of claim 1, wherein said first radio access network is associated with a first radio access technology, and said second overlapping radio access network is associated with a second different radio access technology.

7. The method of claim 1, wherein said step (S1) of determining and said step (S2) of requesting are performed by at least one network unit of said first radio access network.

8. The method of claim 7, wherein said at least one network unit of said first radio access network receives said information representative of radio access preferences of said user equipment from a core network (40) associated with said radio communication network.

9. The method of claim 8, wherein said information representative of radio access preferences of said user equipment is carried by Subscriber Profile ID for RAT/Frequency priority (SPID) signaling from said core network (40).

10. The method of claim 8 or 9, wherein said step (S1) of determining is also based on information originating from at least one of said first radio access network and said second overlapping radio access network.

11. The method of claim 10, wherein said step (S1) of determining is also based on information representative of the number of user equipment (30), with radio access capabilities for said second overlapping radio access network, that are expected to be located in said passive other cell when activated, and said determining step (S1) includes the step of comparing the number of user equipment to a given threshold.

12. The method of claim 7 or 8, wherein said at least one network unit comprises at least one of a radio base station (RBS) (25), a base station controller (BSC) (45) and a radio network controller (RNC) (50) of said first radio access network.

13. The method of claim 1, wherein said step (S1) of determining and said step (S2) of requesting are performed by at least one network unit of a core network (40) associated with said radio communication network.

14. The method of claim 1, wherein said step (S2) of requesting said passive other cell (27) to be activated comprises the step of triggering activation of said passive cell (27) by signaling to the corresponding radio base station (25) belonging to said second overlapping radio access network to start transmission of cell-defining information.

15. The method of claim 14, wherein said step of triggering activation of said passive cell (27) by signaling to the corresponding radio base station (25) includes the step of signaling a cell activation command to said radio base station (25) via an Operations Support System (OSS) (15) associated with said second overlapping radio access network.

16. An apparatus (300) for controlling activation of at least one cell in a radio communication network comprising a number of radio base stations (25), at least one of said radio base stations belonging to a first radio access network and managing at least one active cell (26) serving one or more user equipment, said apparatus (300) comprising:

- a selector (310) for selecting, based on information representative of radio access preferences of said user equipment, at least one passive other cell (27) of a radio base station belonging to a second overlapping radio access network for activation, wherein said radio base station belonging to a second overlapping radio access network is currently not transmitting any cell-defining information for said passive other cell;
- an activation controller (320) for requesting said selected passive other cell(s) (27) to be activated by causing the corresponding radio base station(s) belonging to said second overlapping radio access network to start transmission of cell-defining information.

17. The apparatus of claim 16, wherein said selector (310) is configured to select at least one passive other cell (27) based on information representative of radio access preferences of said user equipment (30) including information representative of at least one of radio access capabilities, subscription and current service of said user equipment.

18. The apparatus of claim 16, wherein said selector (310) is configured to select at least one passive other cell (27) based on information representative of radio access preferences of

said user equipment (30) including information representative of an order of preference of radio access networks.

19. The apparatus of claim 16, wherein said first radio access network is associated with a first radio access technology, and said second overlapping radio access network is associated with a second different radio access technology.

20. The apparatus of claim 16, comprising an extractor (312) for extracting said information representative of radio access preferences of said user equipment (30) based on control signaling from a core network (40) associated with said radio communication network.

21. The apparatus of claim 20, wherein said extractor (312) is configured for extracting said information representative of radio access preferences of said user equipment based on Subscriber Profile ID for RAT/Frequency priority (SPID) signaling from said core network (40).

22. The apparatus of claim 20 or 21, wherein said selector (310) is configured to select said at least one passive other cell (27) also based on information originating from at least one of said first radio access network and said second overlapping radio access network.

23. The apparatus of claim 16, wherein said activation controller (320) is configured to trigger activation of said passive cell(s) (27) by signaling to the corresponding radio base station(s) (25) belonging to said second overlapping radio access network to start transmission of cell-defining information.

24. A network unit for use in a radio communication network, said network unit comprising an apparatus (300) of any of the claims 16-23.

25. The network unit of claim 24, wherein said network unit belongs to at least one of a radio access network and a core network of said radio communication network.

26. The network unit of claim 25, wherein said network unit is at least one of a radio base station (RBS) (25), a base station controller (BSC) (45) and a radio network controller (RNC) (50).

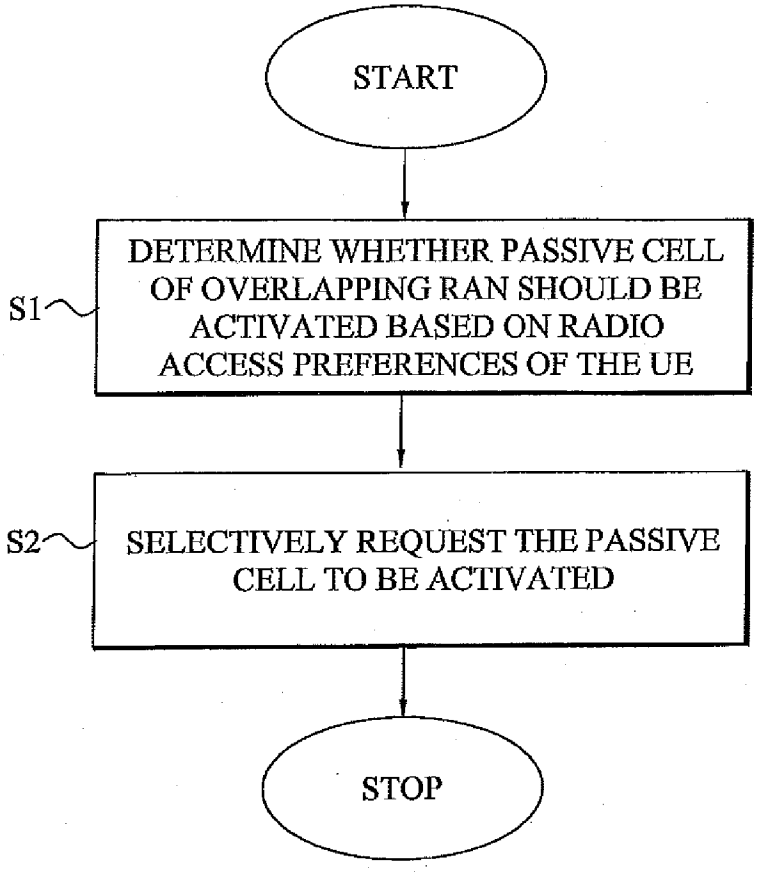

START
S1
DETERMINE WHETHER PASSIVE CELL OF OVERLAPPING RAN SHOULD BE ACTIVATED BASED ON RADIO ACCESS PREFERENCES OF THE UE
S2
SELECTIVELY REQUEST THE PASSIVE CELL TO BE ACTIVATED
STOP

Fig. 1

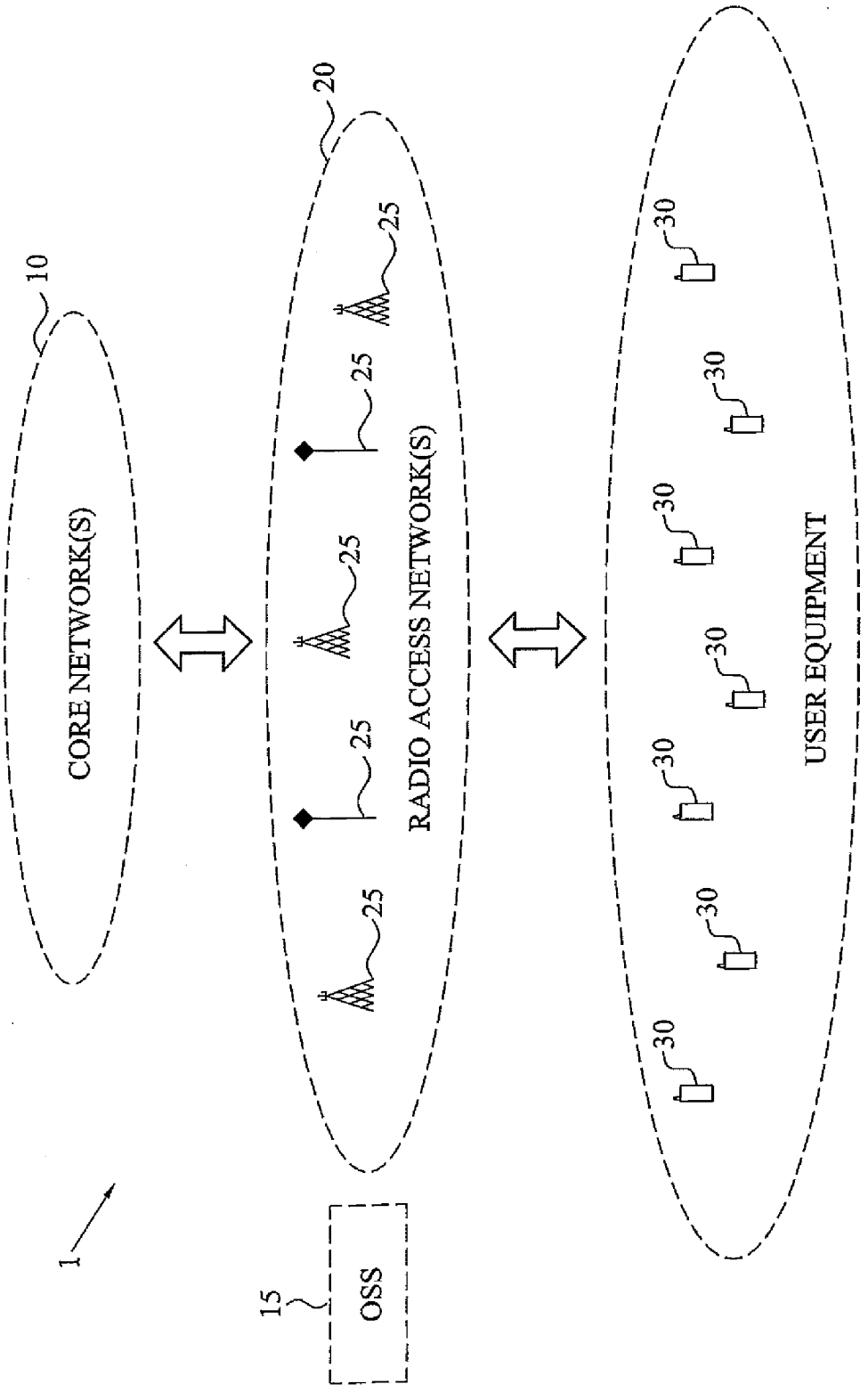

1
10
CORE NETWORK(S)
20
RADIO ACCESS NETWORK(S)
25
25
25
25
30
30
30
30
30
30
USER EQUIPMENT
15
OSS

Fig. 2

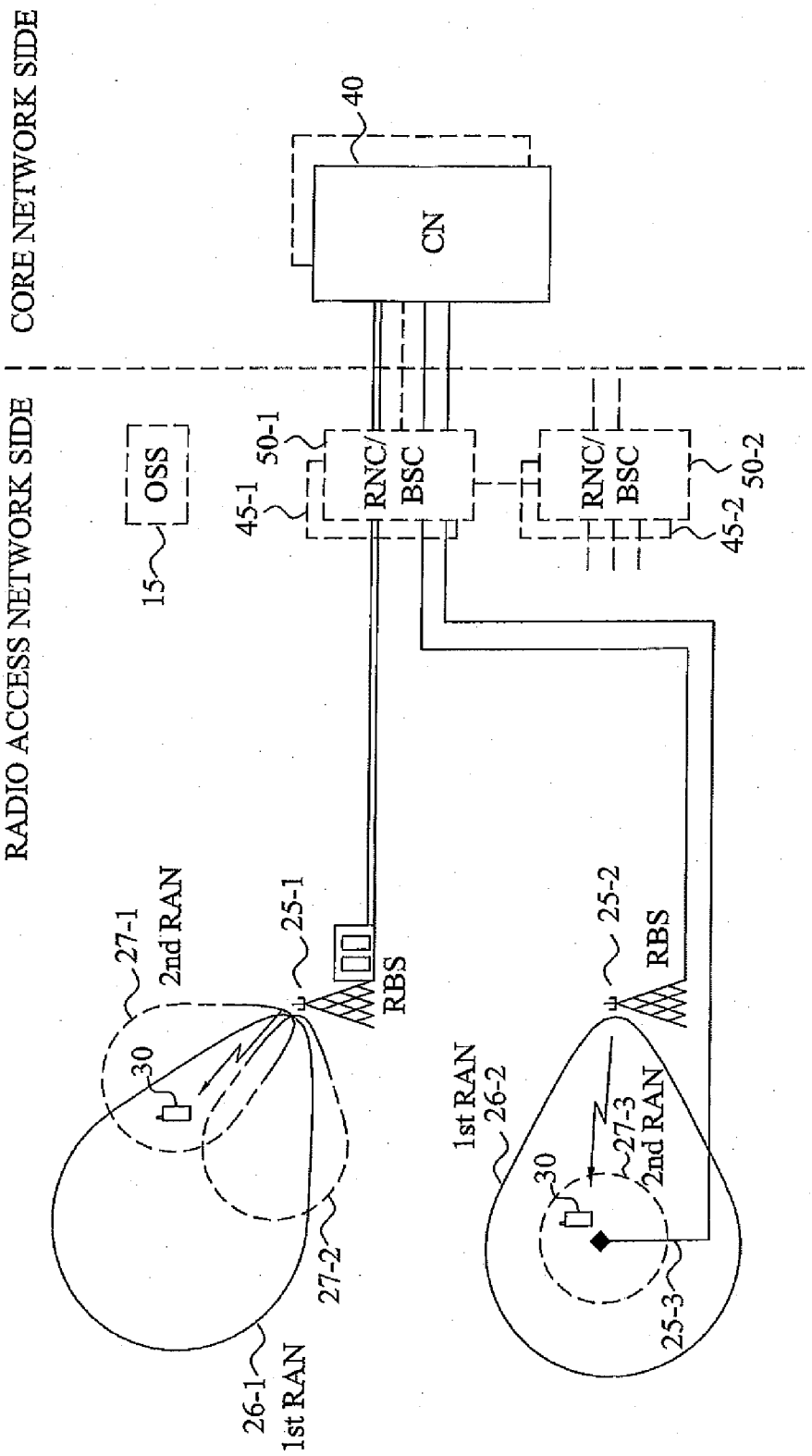


Fig. 3

BNSDOCID: <WO_____2010123417A1_I_>

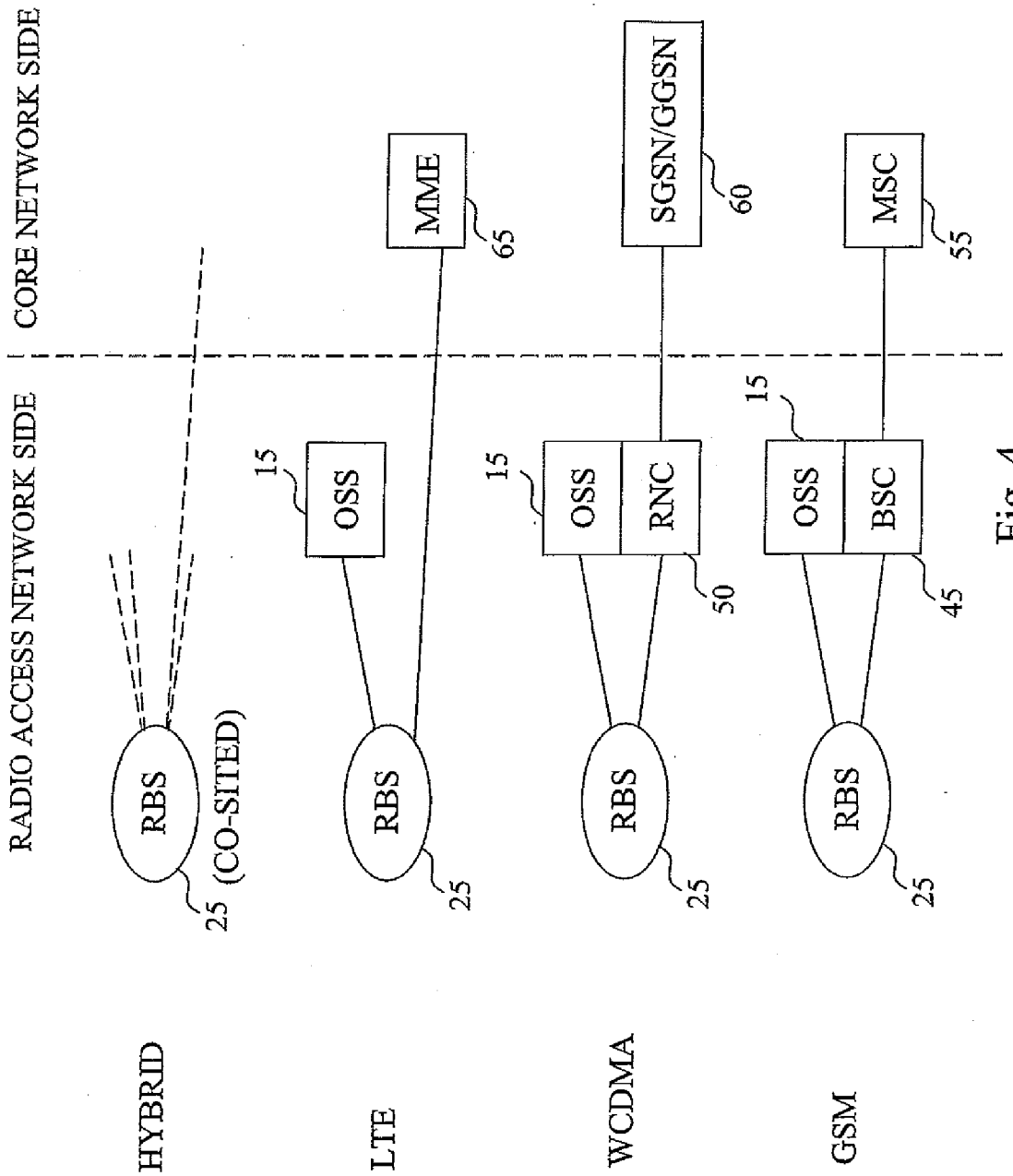

CORE NETWORK SIDE
RADIO ACCESS NETWORK SIDE
MME
65
SGSN/GGSN
60
MSC
55
15
OSS
15
OSS
RNC
50
15
OSS
BSC
45
RBS
25 (CO-SITED)
RBS
25
RBS
25
RBS
25
HYBRID
LTE
WCDMA
GSM

Fig. 4

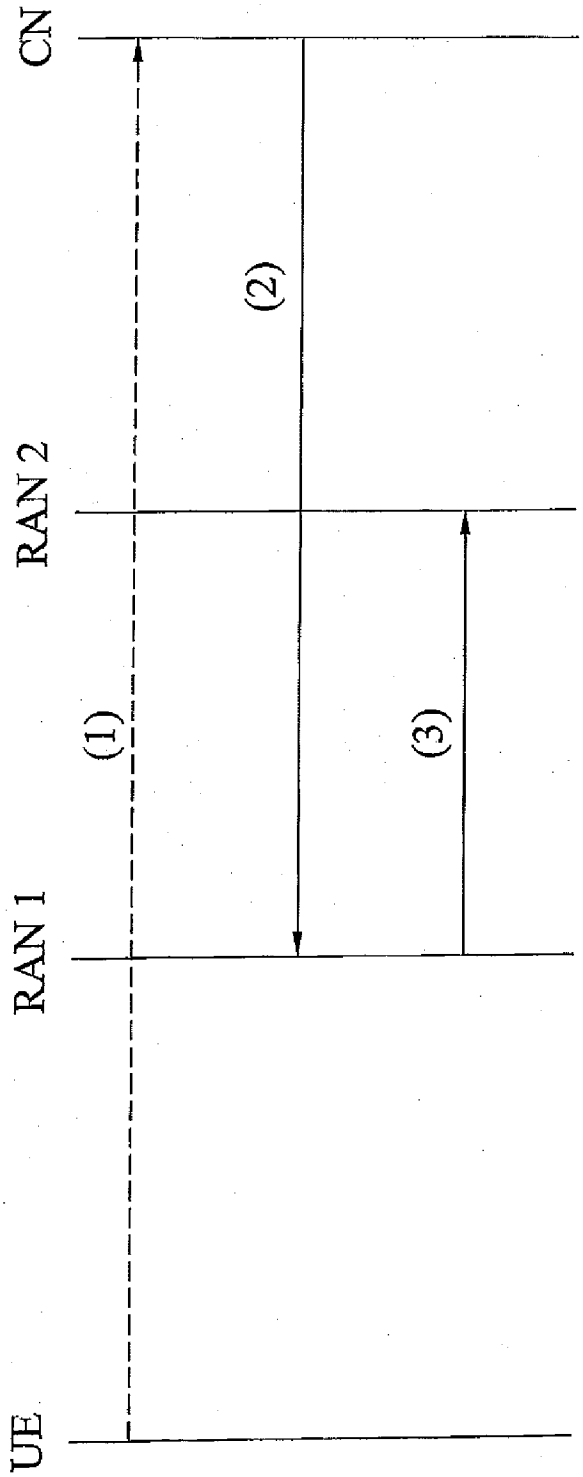


Fig. 5

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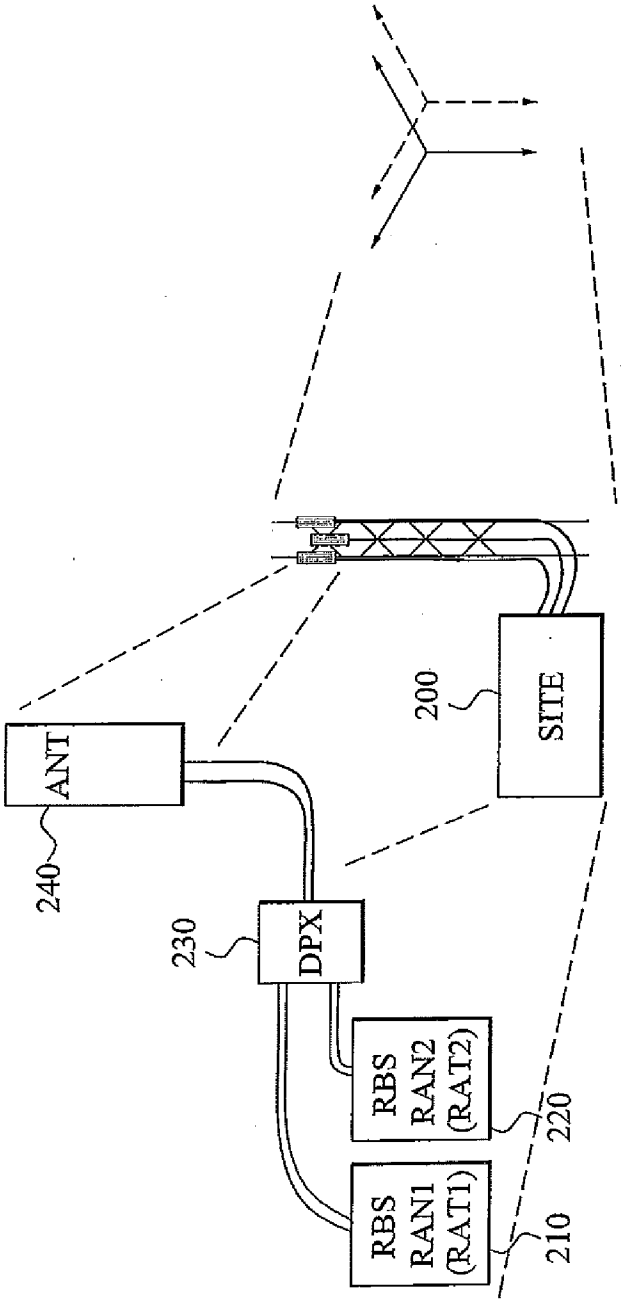


Fig. 6

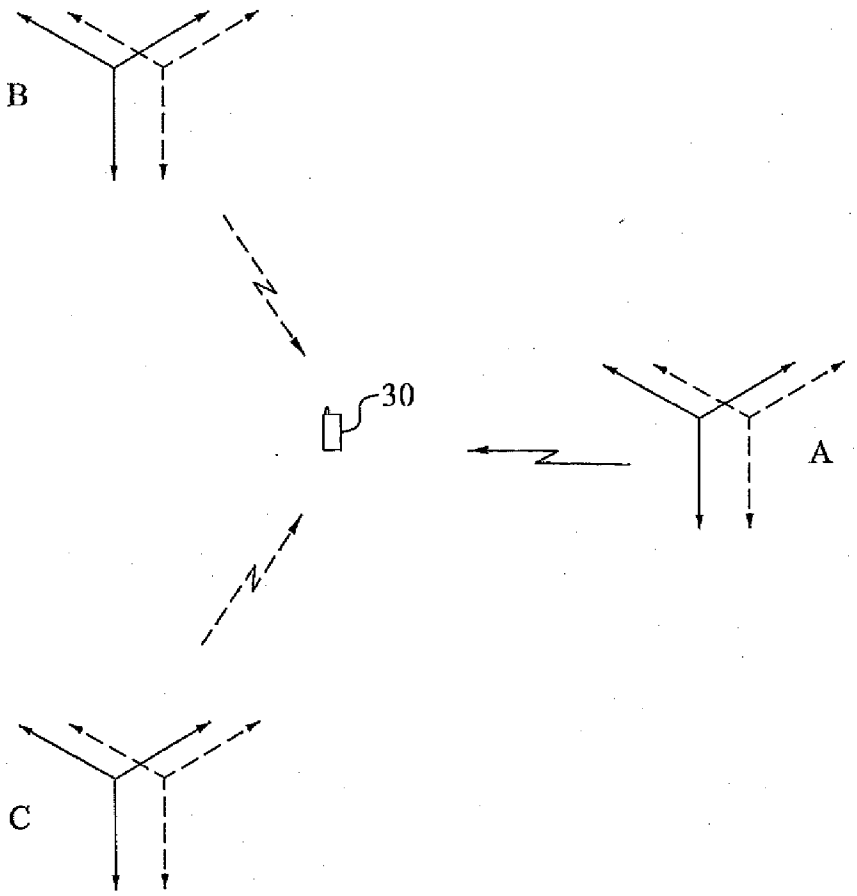


Fig. 7

BNSDOCID: <WO 2010123417A1 1 >

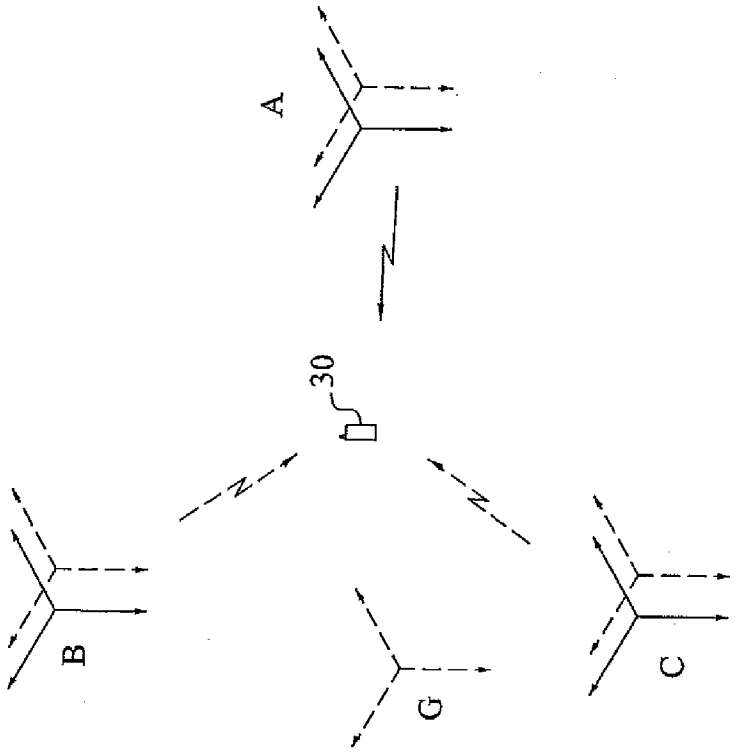


Fig. 8B

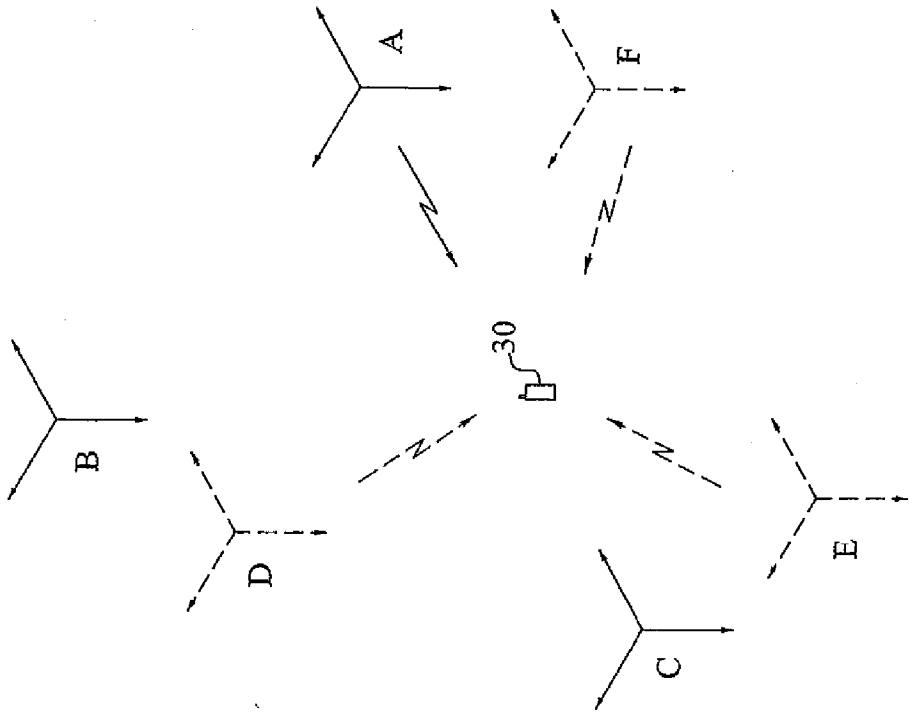


Fig. 8A

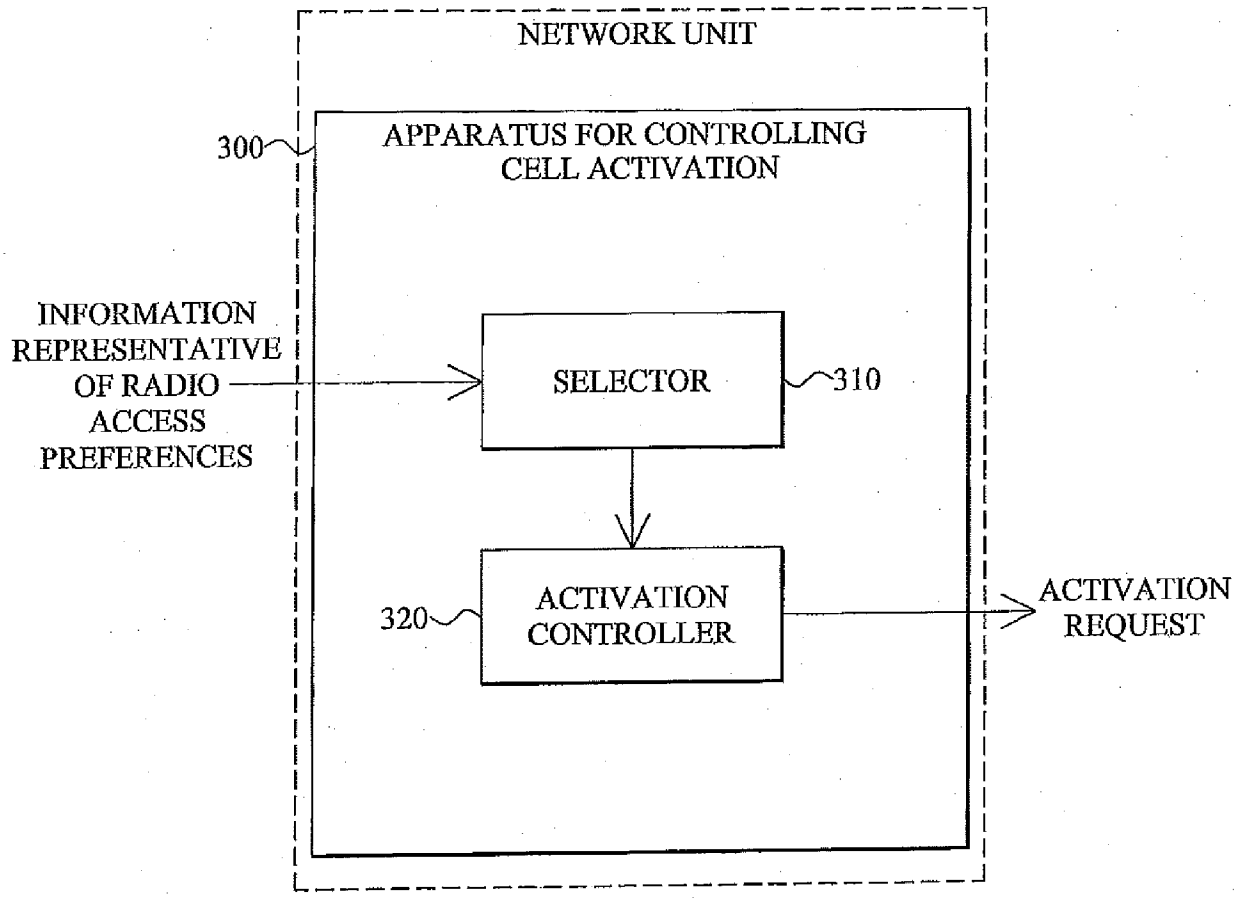


Fig. 9

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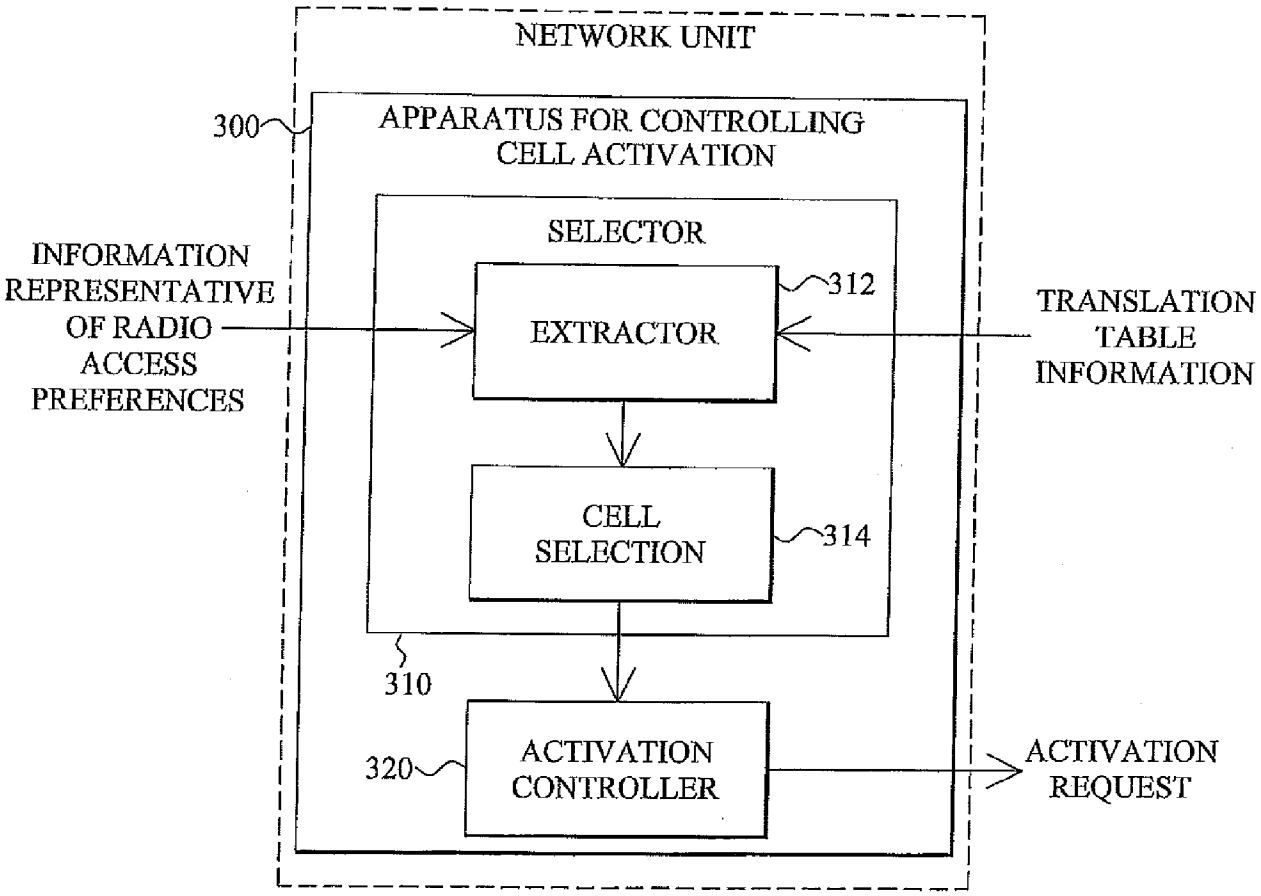

NETWORK UNIT
300
APPARATUS FOR CONTROLLING CELL ACTIVATION
SELECTOR
INFORMATION REPRESENTATIVE OF RADIO ACCESS PREFERENCES
EXTRACTOR
312
TRANSLATION TABLE INFORMATION
CELL SELECTION
314
310
320
ACTIVATION CONTROLLER
ACTIVATION REQUEST

Fig. 10

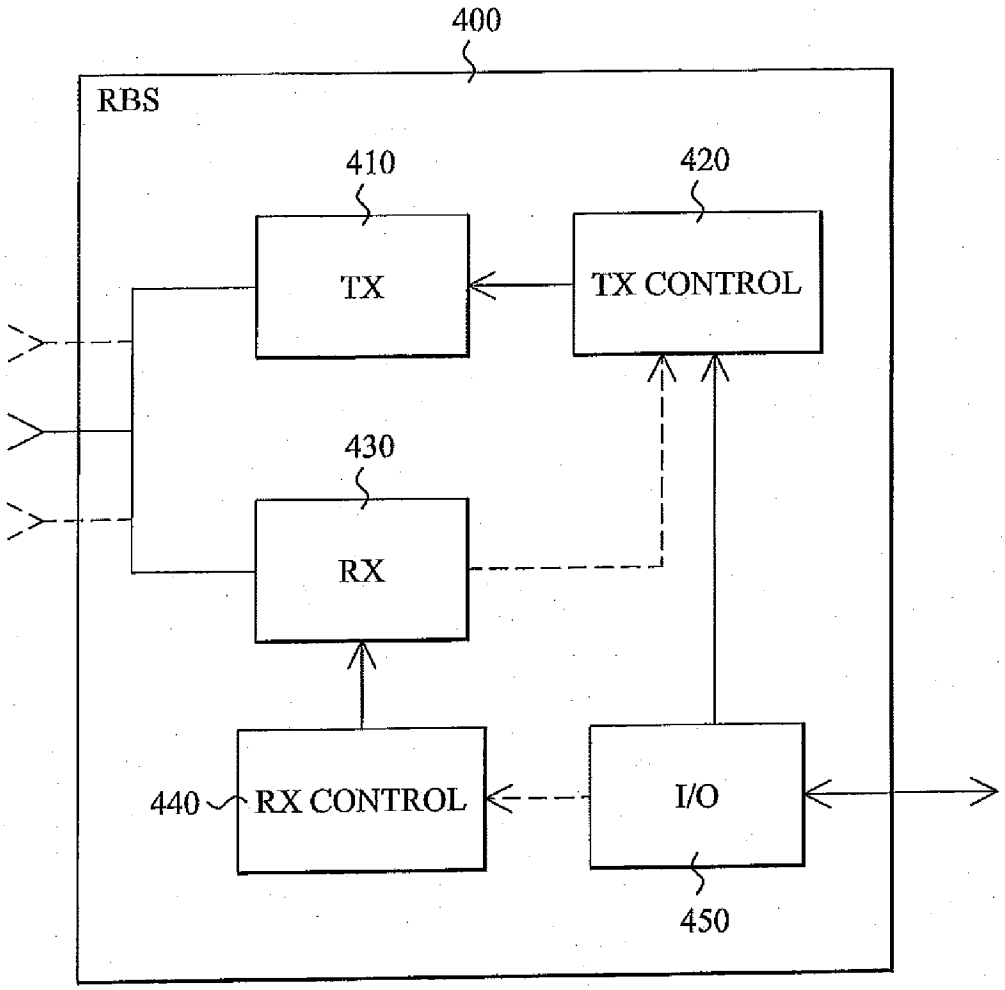


Fig. 11

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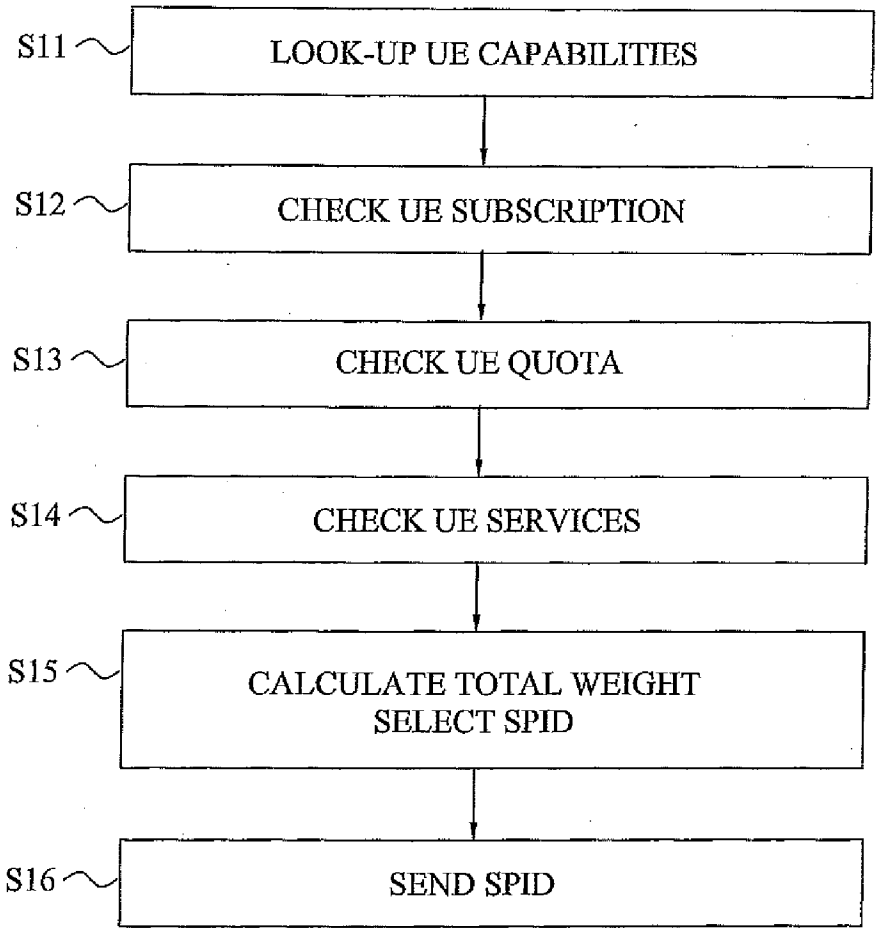

S11
LOOK-UP UE CAPABILITIES
S12
CHECK UE SUBSCRIPTION
S13
CHECK UE QUOTA
S14
CHECK UE SERVICES
S15
CALCULATE TOTAL WEIGHT
SELECT SPID
S16
SEND SPID

Fig. 12

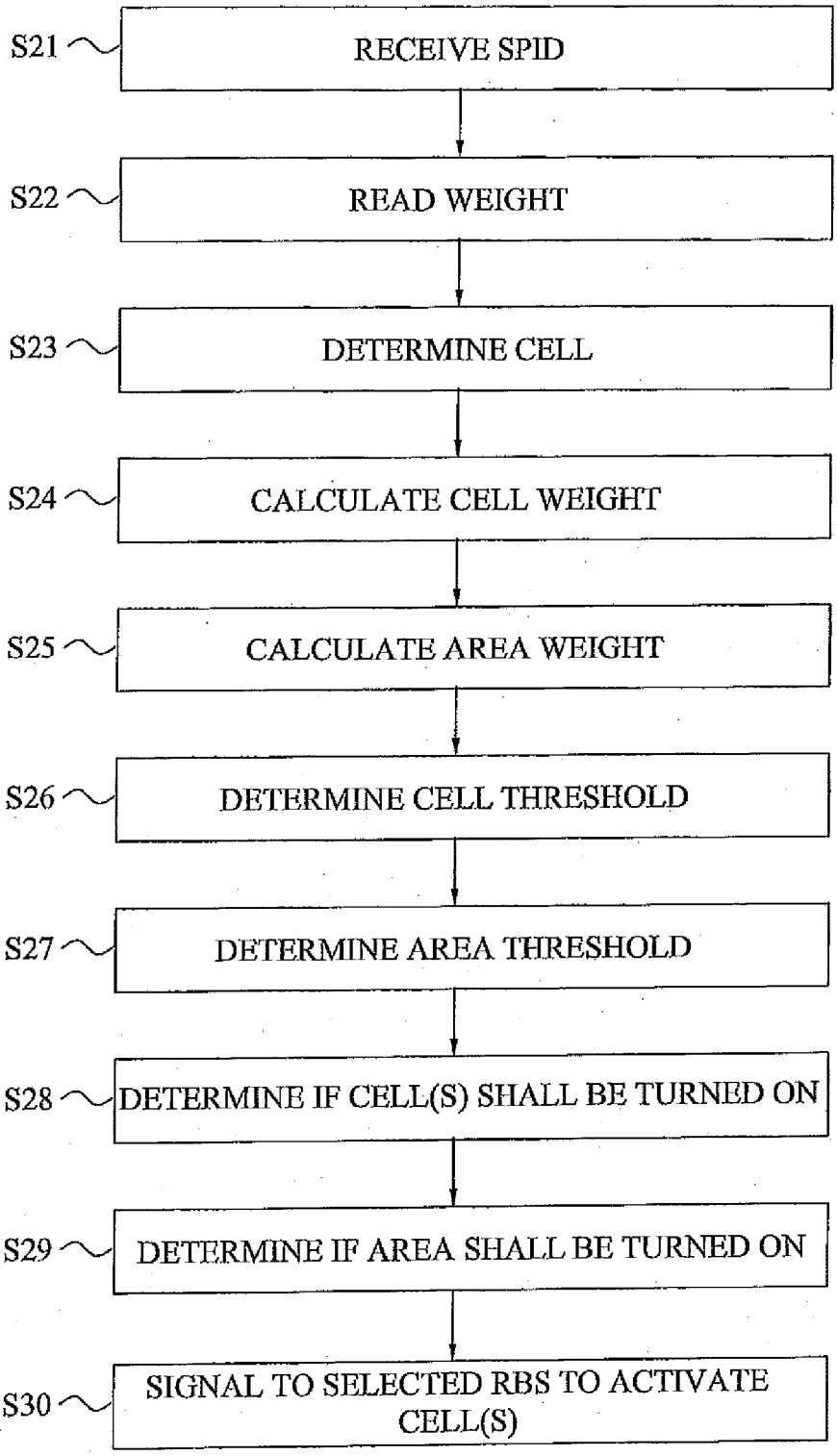


Fig. 13

BNSDOCID: <WO 2010123417A1_1_>

INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2009/050400

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W48/20

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	SUJUAN FENG ET AL: "Self-Organizing Networks (SON) in 3GPP Long Term Evolution" INTERNET CITATION, 20 May 2008 (2008-05-20), pages 1-15, XP002526917 [retrieved on 2009-05-05] page 1, left-hand column, lines 27-29	1-7,12, 14, 16-20, 22-26
A	page 9, left-hand column, lines 1-26 figure 9	8-11,13, 15,21

-/--

[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

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"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
19 January 2010	27/01/2010

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	Isopescu, Ciprian

Form PCT/ISA/210 (second sheet) (April 2005)

BNSDOCID: <WO____2010123417A1_I_>

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INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2009/050400

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	"A method for interference control and power saving for home access point" IP.COM JOURNAL, IP.COM INC., WEST HENRIETTA, NY, US, 13 December 2007 (2007-12-13), XP013122942 ISSN: 1533-0001	1-7,12, 14, 16-19, 22-26
A	page 1, line 30 - page 2, line 59	8-11,13, 15,20,21
X	MITSUBISHI ELECTRIC: "Dynamic Setup of HNBs for Energy Savings and Interference Reduction" 3GPP DRAFT; R3-081949 (DYNAMIC SETUP HNBS), 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG3, no. Jeju Island; 20080813, 13 August 2008 (2008-08-13), XP050165010 [retrieved on 2008-08-13]	1-5,7, 12-18, 20,22-26
A	page 1, paragraphs 1.,2. pages 3-5, paragraphs 2.2,A,C-F	6,8-11, 19,21
X	DE 10 2005 051291 A1 (SIEMENS AG [DE]) 3 May 2007 (2007-05-03) abstract pages 11,13,15, columns -19,21,2, lines 3,25	1-3,7, 12,14, 17,23-26
X	US 2007/066329 A1 (LAROIA RAJIV [US] ET AL) 22 March 2007 (2007-03-22) abstract paragraphs [0109], [0110], [0132], [0141]	1-3,7, 12-14, 17,20, 22-26

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

Samsung Ex. 1002, Page 548 of 615

BNSDOCID: <WO 2010123417A1 I >

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/SE2009/050400

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE 102005051291 A1	03-05-2007	CN	101347008 A	14-01-2009
		EP	1941754 A1	09-07-2008
		WO	2007048750 A1	03-05-2007
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		CA	2623060 A1	29-03-2007
		CN	101496309 A	29-07-2009
		EP	1949564 A2	30-07-2008
		JP	2009510835 T	12-03-2009
		KR	20080048084 A	30-05-2008
		WO	2007035447 A2	29-03-2007

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
1 November 2012 (01.11.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/148410 A1

(51) International Patent Classification:
H04W 36/14 (2009.01) *H04W 36/32* (2009.01)

(21) International Application Number:
PCT/US2011/034470

(22) International Filing Date:
29 April 2011 (29.04.2011)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **EMPIRE TECHNOLOGY DEVELOPMENT LLC** [US/US]; 2711 Centerville Road, Suite 400, Wilmington, DE 19808 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **KRUGLICK, Ezekiel** [US/US]; 13842 Deergrass Ct., Poway, CA 92064-2276 (US).

(74) Agent: **CRAWFORD, Ted, A.**; Omikron IP Law Group, 16325 Boones Ferry Road Suite 204, Lake Oswego, OR 97035 (US).

(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, CL, 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, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

— *with international search report (Art. 21(3))*

(54) Title: WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

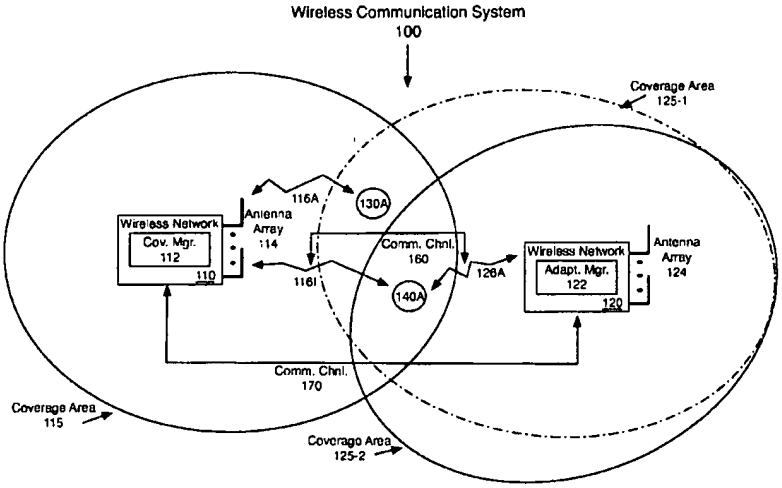


FIG. 1A

(57) Abstract: A method implemented at a first wireless network to handoff a wireless device to a second wireless network, the method comprising: i) receiving coverage information associated with the wireless; ii) determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information; and iii) transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network.

WO 2012/148410 A1

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
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13263835
Filing Date	2011-10-10
First Named Inventor	Ezekiel Kruglick
Art Unit	2646
Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

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/T.B./	1	20090017823	A1	2009-01-15	Sachs et al.	

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/T.B./	1	1643785	EP	A1	2006-04-05	ALCATEL 75008 Paris (FR)		☐
/T.B./	2	2007066882	WO	A1	2007-06-14	LG ELECTRONICS INC.		☐
/T.B./	3	2010123417	WO	A1	2010-10-28	TELEFONAKTIEBOLAGET LM ERICSSON		☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13263835
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	2646
	Examiner Name	BEAMER, TEMICA M
	Attorney Docket Number	2796.737BS

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EXAMINER SIGNATURE			
Examiner Signature	/Temica Beamer/	Date Considered	05/05/2015

*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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13263835
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	2646
	Examiner Name	BEAMER, TEMICA M
	Attorney Docket Number	2796.737BS

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.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

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	/David S. Lee/	Date (YYYY-MM-DD)	2015-03-30
Name/Print	David S. Lee	Registration Number	38,222

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.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

86636 7590 05/08/2015

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER
BEAMER, TEMICA M

ART UNIT	PAPER NUMBER
2646	

MAIL DATE	DELIVERY MODE
05/08/2015	PAPER

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/263,835	10 October, 2011	KRUGLICK, EZEKIEL	2796.737BS

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER	
TEMICA M. BEAMER	
ART UNIT	PAPER
2646	20150505

DATE MAILED:

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Commissioner for Patents

The IDS filed 3/30/2015 has been reviewed.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

PTO-90C (Rev.04-03)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No..... 13/263,835
Filing Date ..... October 10, 2011
Confirmation No. 1463
Inventorship ..... Ezekiel Kruglick
Group Art Unit..... 2646
Examiner ..... BEAMER, TEMICA M
Attorney Docket No. 2796.737BS
Title: .....WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

AMENDMENT UNDER 37 C.F.R. § 1.312

To: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

From: David S. Lee
Customer No. 86636
Brundidge & Stanger, PC
2318 Mill Road, Suite 1020
Alexandria, VA 22314

Madam:

Subsequent to the Notice of Allowance dated March 18, 2015, in connection with the above-identified application, the following amendments and remarks are respectfully submitted. An explanation regarding the propriety of the Amendment is included within the Remarks section. Favorable consideration is respectfully requested.

Fees will be paid by credit card through the EFS Web; however the Commissioner is hereby authorized to charge any deficiency of fees and credit any overpayments to Deposit Account Number 50-4888.

INTRODUCTORY COMMENTS

Amendment to the Specification section begins on page 3.

Amendment to the Drawings section begins on page 8.

The Listing of the Claims section begins on page 9.

Remarks section begins on page 18.

AMENDMENTS TO THE SPECIFICATION

The following will replace all prior versions of the listed paragraphs in the application. The amendment to the specification does not introduce any new matter.

1. Please correct §371(c) Date on the Face Page, in Field (86), Line 3 of the specification as published as follow:

Please delete "May 8, 2012" and insert - - October 10, 2011 - -, therefor.

2. Please add the cross-reference to related applications section of the specification as follows:

CROSS-REFERENCE TO RELATED APPLICATIONS

This Application is the National Stage filing under 35 U.S.C. § 371 of PCT Application Ser. No. PCT/US2011/034470 filed on April 29, 2011.

3. Please replace paragraphs [0023], [0032], [0047], [0062], [0067]-[0069], [0074], and [0078] of the specification as published with the following substitute paragraphs, respectively. The amendment to the specification does not introduce any new matter.

[**0023**] According to some examples, as shown in FIGS. 1A-C, wireless device **130**A may communicatively couple to wireless network **110** via communication link **116**A. Also, wireless device **140**A may communicatively couple to wireless network **120** via communication link **126**A. In some examples, wireless device **140**A may also be communicatively coupled to network **110** via ~~communication link **1161**~~ communication link **116**I. As described more below, since wireless device **140**A may be communicatively coupled to both wireless networks, a communication channel **160** may be established that includes communication links **116**I and **126**A. Either wireless network **110** or wireless network **120** may use

wireless device **140**A as a relay to communicate with the other wireless network via communication channel **160**. Additionally and/or alternatively, wireless network **110** may be communicatively coupled to wireless network **120** via communication channel **170** as shown in FIGS. 1A-C.

[**0032**] FIG. 1C depicts a view of wireless communication system **100** that shows numerous wireless devices communicatively coupled to wireless network **120**. As shown in FIG. 1C, ~~wireless devices **140**A-1~~ wireless devices **140**A-I and **130**A may couple to wireless network **120** via communication links **126**A-J. In some examples, as described more below, adaption manager **122** of wireless network **120** may include logic and/or features configured to receive a handoff request from wireless network **110** (e.g., via communication channel **160** or **170**). As described above, the handoff request may be based on a determination by wireless network **110** that wireless device **130**A may not be currently covered by wireless network **120** but may be capable of being covered by wireless network **120**. Adaption manager **122** may also include logic and/or features to adapt one or more beams of antenna array **124** to adjust wireless network **120**'s coverage area (e.g., back to coverage area **125-1**) based at least on the handoff request. For example, the one or more beams of antenna array **124** may be configured to provide directional signal transmissions for wireless network **120** via the use of beamforming techniques to include, but not limited to, the use of conventional beamformers or adaptive beamformers.

[**0047**] The example adaption manager **122** of FIG. 3 includes adapt logic **310**, control logic **320**, memory **330**, input/output (I/O) interfaces **340** and optionally one or more applications **350**. As illustrated in FIG. 3, adapt logic **310** is coupled to control logic **320**, memory **330** and I/O interfaces **340**. Also illustrated in FIG. 3, the optional applications **350** are arranged in cooperation with control logic **320**. Adapt logic **310** may further include one or more of a receive feature **312**, a cost feature **314**, a beam feature **316** or a ~~handoff feature **218**~~ handoff feature **318**, or any reasonable combination thereof.

[0062] Continuing from block 460 to decision block 470 (Conf. Received?), coverage manager 112 may include logic and/or features configured to determine whether a confirmation has been received from wireless network 120 (e.g., via receive feature 218). In some examples, the received confirmation indicates to coverage manager 112 that the handoff request has been accepted for the handoff of wireless device 130A to wireless network 120. The confirmation may also indicate that wireless network 120 has adapted its coverage area to now cover the location of wireless device 130A. Coverage manager 112 may also ~~included~~ include logic and/or features configured to start a confirmation interval (e.g., via interval feature 212) that establishes a period of time to wait for a confirmation. If a confirmation is received from wireless network 120 before the confirmation interval expires, processing may continue from decision block 470 to block 480. Otherwise, if the confirmation interval expires and no confirmation has been received, processing moves to decision block 490.

[**0067**] Continuing from block **510** to decision block **520** (Adapt Coverage Area?), adaption manager **122** may include logic and/or features configured to determine whether to adapt the coverage area for wireless network **120** (e.g., via ~~cost feature **214**~~ cost feature **314**). In some examples, adaption manager **122** may evaluate the costs associated with a handoff of wireless device **130**A to wireless network **120** and base a determination on the associated costs. Those costs may be based on criteria to include a predetermined network load placed on wireless network **120** if wireless device **130**A is handed off. The costs may also be based on an effect of adapting the coverage area on other wireless devices coupled to wireless network **120** (e.g., wireless device **140**A-I). If a determination is made by adaption manager **122** to adapt the coverage area, processing continues from decision block **520** to block **530**. Otherwise, processing comes to an end.

[**0068**] Continuing from decision block **520** to block **530** (Adapt One or More Beams), adaption manager **122** may include logic and/or features configured to adapt one or more beams generated from or by antenna array **124** to facilitate coverage of wireless device **130**A by wireless network **120** (e.g., via ~~beam feature **216**~~ beam feature **316**). In some examples, a combination of beams generated by antenna array **124** may be directional beams. For these examples, adaption manager **122** may cause at least one of the directional beams to be adapted in order to change the coverage area (e.g., similar to coverage area **125**-**1**) of wireless network **120** to enable wireless device **130**A to be covered by wireless network **120**.

[**0069**] Continuing from block **530** to block **540** (Transmit Confirmation), adaption manager **122** may include logic and/or features configured to transmit a confirmation to indicate acceptance of the handoff request from wireless network **110** for wireless device **130**A (e.g., via ~~beam feature **216**~~ beam feature **316**). In some examples, the confirmation may be transmitted via communication channel **160** or **170** and may indicate acceptance of the handoff request. The confirmation may also indicate that wireless network **120**'s coverage area has been adapted to now cover wireless device **130**A.

[**0074**] Depending on the desired configuration, processor 710 can be of any type including but not limited to a microprocessor (μP), a microcontroller (μC), a digital signal processor (DSP), or any combination thereof. Processor 710 can include one or more levels of caching, such as a level one cache 711 and a level two cache 712, a processor core 713, and registers 714. The processor core 713 can include an arithmetic logic unit (ALU), a floating point unit (FPU), a digital signal processing core (DSP Core), or any combination thereof. A memory controller 715 can also be used with the processor 710, or in some implementations the memory controller 715 can be an internal part of the processor 710.

[**0078**]Computing device 700 can also include an interface bus 742 for facilitating communication from various interface devices (e.g., output interfaces, peripheral interfaces, and

communication interfaces) to the basic configuration 701 via the bus/interface controller 740. Example output interfaces 760 include a graphics processing unit 761 and an audio processing unit 762, which can be configured to communicate to various external devices such as a display or speakers via one or more A/V ports 763. Example ~~peripheral interfaces 760~~ peripheral interfaces 770 include a serial interface controller 771 or a parallel interface controller 772, which can be configured to communicate with external devices such as input devices (e.g., keyboard, mouse, pen, voice input device, touch input device, etc.) or other peripheral devices (e.g., printer, scanner, etc.) via one or more I/O ports 773. An example communication interface 780 includes a network controller 781, which can be arranged to facilitate communications with one or more other computing devices 790 over a network communication via one or more communication ports 782. A network communication connection is one example of a communication media. Communication media may typically be embodied by computer readable instructions, data structures, program modules, or other data in a modulated data signal, such as a carrier wave or other transport mechanism, and includes any information delivery media. A "modulated data signal" can be a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media can include wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, radio frequency (RF), infrared (IR) and other wireless media. The term computer readable media as used herein can include both storage media and communication media.

Samsung Ex. 1002, Page 563 of 615

AMENDMENTS TO THE DRAWINGS

A replacement sheet is hereby submitted. The replacement sheet does not introduce any new matter.

In the replacement sheet of drawings, Figs. 2, 5 and 7 are amended as follows:

- In Fig. 2, Sheet 4 of 9, in Box "210", Line 1, delete "Cover Logic" and insert - - Coverage Logic - -, therefor.
- In Fig. 5, Sheet 7 of 9, in Box "550", Line 1, delete "Handoff Wire Device" and insert - - Handoff Wireless Device - -, therefor.
- In Fig. 7, Sheet 9 of 9, in Box "(715)", Line 1, delete "Memory Controler" and insert - - Memory Controller - -, therefor.

Attached: Replacement Sheet of Drawings

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims pending:

- At time of the Action: Claims 1-3, 5-16, 18-28 and 30-32
- After this Reply: Claims 1-3, 5-16, 18-28 and 30-32

Currently Canceled or Withdrawn Claims: None

Currently Amended Claims: Claims 6, 21, 24, and 32

New Claims: None

1. (**Previously Presented**) A method implemented at a first wireless network to handoff a mobile wireless device to a second wireless network, the method comprising:

receiving coverage information associated with the wireless device;

determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information, wherein the determining includes determining that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network; and

transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

2. (**Previously Presented**) A method according to claim 1, further comprising:

receiving a confirmation from the second wireless network that the handoff request has

been accepted by the second wireless network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network.

3. (**Original**) A method according to claim 1, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

4. (**Canceled**)

5. (**Previously Presented**) A method according to claim 1, wherein the mapping information of one or more locations for which the second wireless network has previously had coverage comprises a map generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the one or more wireless devices.

6. (**Currently Amended**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting the handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, or an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted.

7. (**Previously Presented**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting the handoff request via a wireless or a wired communication link that

communicatively couples the first wireless network to the second wireless network.

8. (**Previously Presented**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

9. (**Original**) A method according to claim 1, wherein the first wireless network is a different type of wireless network than the second wireless network.

10. (**Previously Presented**) A method implemented at a first wireless network for a mobile wireless device handoff between a second wireless network and the first wireless network, the method comprising:

receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network;

based, at least in part, on the handoff request, adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network; and

transmitting a confirmation from the first wireless network to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

11. (**Previously Presented**) A method according to claim 10, wherein the receiving the handoff

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request comprises receiving the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

12. (**Previously Presented**) A method according to claim 10, wherein the receiving the handoff request comprises receiving the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

13. (**Previously Presented**) A method according to claim 10, wherein the adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load placed on the first wireless network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

14. (**Previously Presented**) An apparatus for a first wireless network to handoff a wireless device to a second wireless network, the apparatus comprising:

a coverage manager having logic, the logic configured to:

receive coverage information associated with the wireless device;

determine whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the coverage information, wherein the logic is further configured to determine that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network; and

transmit a handoff request to the second wireless network based, at least in part, on the

determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

15. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to:

receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

16. (**Original**) An apparatus according to claim 14, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

17. (**Canceled**)

18. (**Previously Presented**) An apparatus according to claim 14, wherein the logic is further configured to generate the mapping information based, at least in part, on information received from wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the wireless devices.

19. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted, or whether the

wireless device is a mobile wireless device.

20. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

21. (**Currently Amended**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the ~~other~~another wireless device serves as a relay between the first wireless network and the second wireless network.

22. (**Previously Presented**) A system for a wireless device handoff between a first wireless network and a second wireless network, the system comprising:

an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network; and

an adaption manager having logic, the logic configured to:

receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network,

cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network, and

transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to

the first wireless network.

23. (**Previously Presented**) A system according to claim 22, wherein to receive the handoff request comprises to receive the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

24. (**Currently Amended**) A system according to claim 22, wherein to receive the handoff request comprises to receive the handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the ~~other~~another wireless device serves as a relay between the first wireless network and the second wireless network.

25. (**Previously Presented**) A system according to claim 22, wherein to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first wireless network due to the handoff of the wireless device or an impact of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

26. (**Previously Presented**) A computer program product comprising a non-transitory medium having instructions for a first wireless network to handoff a wireless device to a second wireless network, which, when executed by logic, cause the logic to:

receive coverage information associated with the wireless device;

determine whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the coverage information, wherein to determine comprises to

determine that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network; and

transmit a handoff request to the second wireless network based, at least in part, on a determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

27. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

28. (**Original**) A computer program product according to claim 26, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

29. (**Canceled**)

30. (**Previously Presented**) A computer program product according to claim 26, wherein the mapping information of one or more locations for which the second wireless network has had coverage in the past comprises a map generated based on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network detection of a detectable signal from the second wireless network to the one or more wireless devices.

31. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

32. (**Currently Amended**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the ~~other~~ another wireless device serves as a relay between the first wireless network and the second wireless network.

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REMARKS

Amendments to the Specification

The specification as published is amended to correct the §371(c) Date section and to add the Cross-Reference to Related Applications section. By entry of this amendment, the specification is made consistent with other papers that are of record in the file wrapper of the present application. The specification is further amended at paragraphs [0023], [0032], [0047], [0062], [0067]-[0069], [0074], and [0078] to correct for minor typographical errors. Entry of the amendments to the specification is respectfully requested.

Amendments to the Drawings

The drawings **Figs. 2, 5, and 7** are amended to correct for minor typographical errors. No new matter is added. Entry of the amendments to **Figs. 2, 5, and 7** are respectfully requested.

Amendments to the Claims

Claims 1-3, 5-16, 18-28 and 30-32 are currently allowed. **Claims 21, 24, and 32** are currently editorially amended to correct for minor typographical errors or to provide proper antecedent basis for the recited features. The scope of the amended claims has not changed and no additional search or examination is required. No new matter is added. Therefore, entry and favorable consideration of **Claims 1-3, 5-16, 18-28 and 30-32** are respectfully requested.

Conclusion

In view of the foregoing amendments, it is respectfully requested that the amendments made to the present application be entered prior to patent issue, as allowed by 37 C.F.R. §1.312.

Respectfully submitted,

Brundidge & Stanger, PC

Dated: June 11, 2015

/David S. Lee/
David S. Lee
Reg. No. 38,222

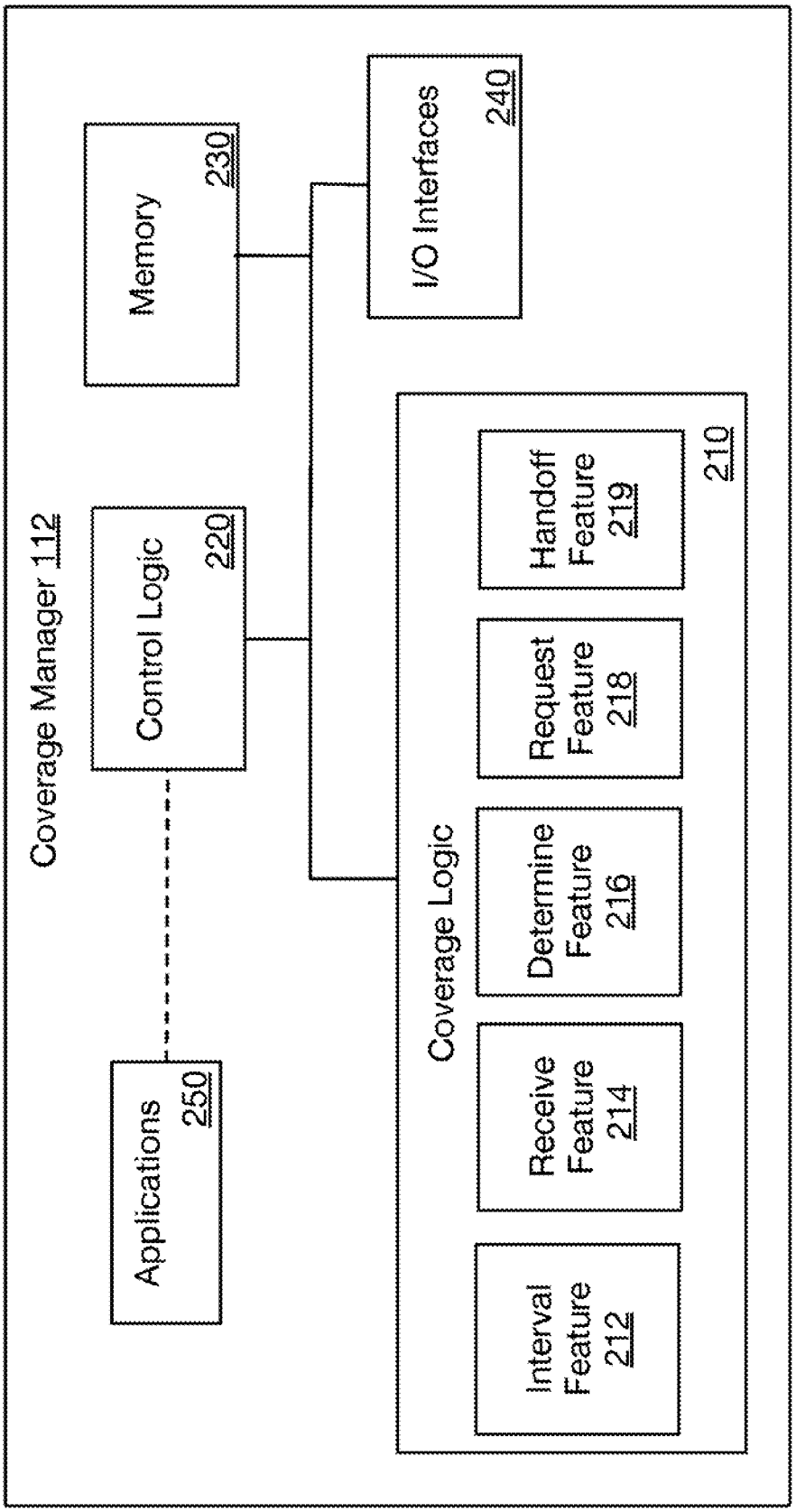

Coverage Manager 112
Memory 230
I/O Interfaces 240
Control Logic 220
Applications 250
Coverage Logic 210
Interval Feature 212
Receive Feature 214
Determine Feature 216
Request Feature 218
Handoff Feature 219

FIG. 2

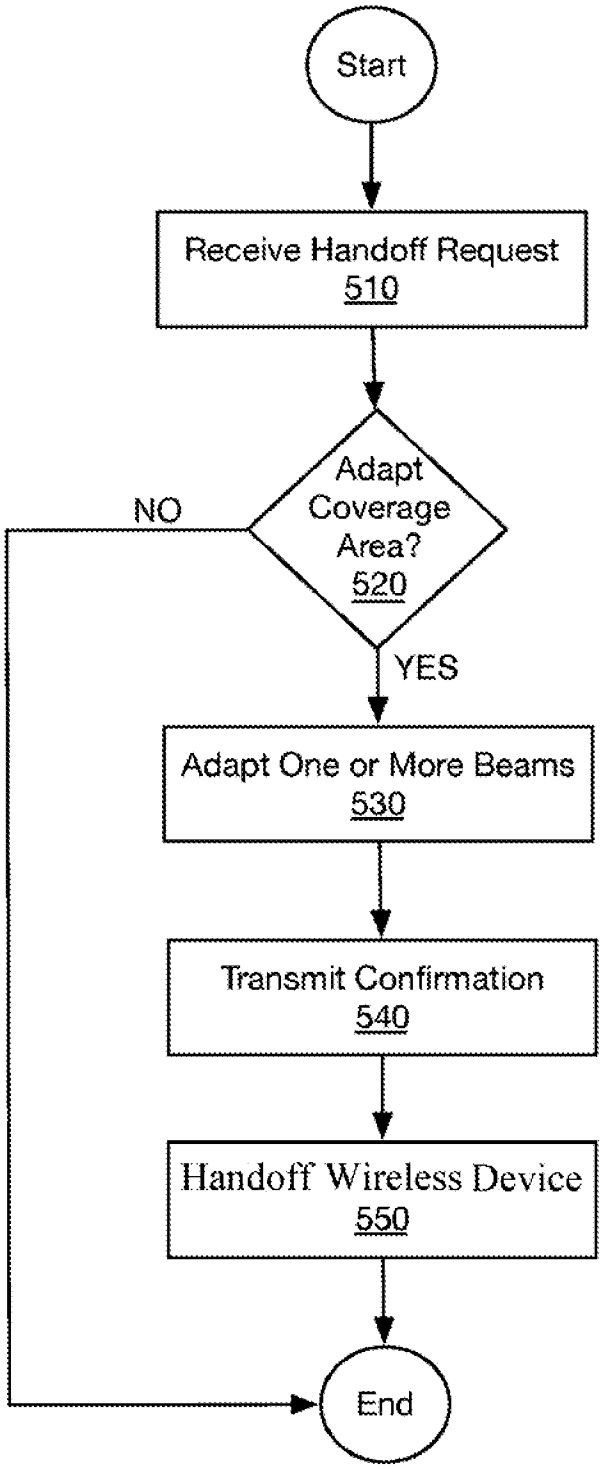

Start
Receive Handoff Request
510
Adapt
Coverage
Area?
520
NO
YES
Adapt One or More Beams
530
Transmit Confirmation
540
Handoff Wireless Device
550
End

FIG.5

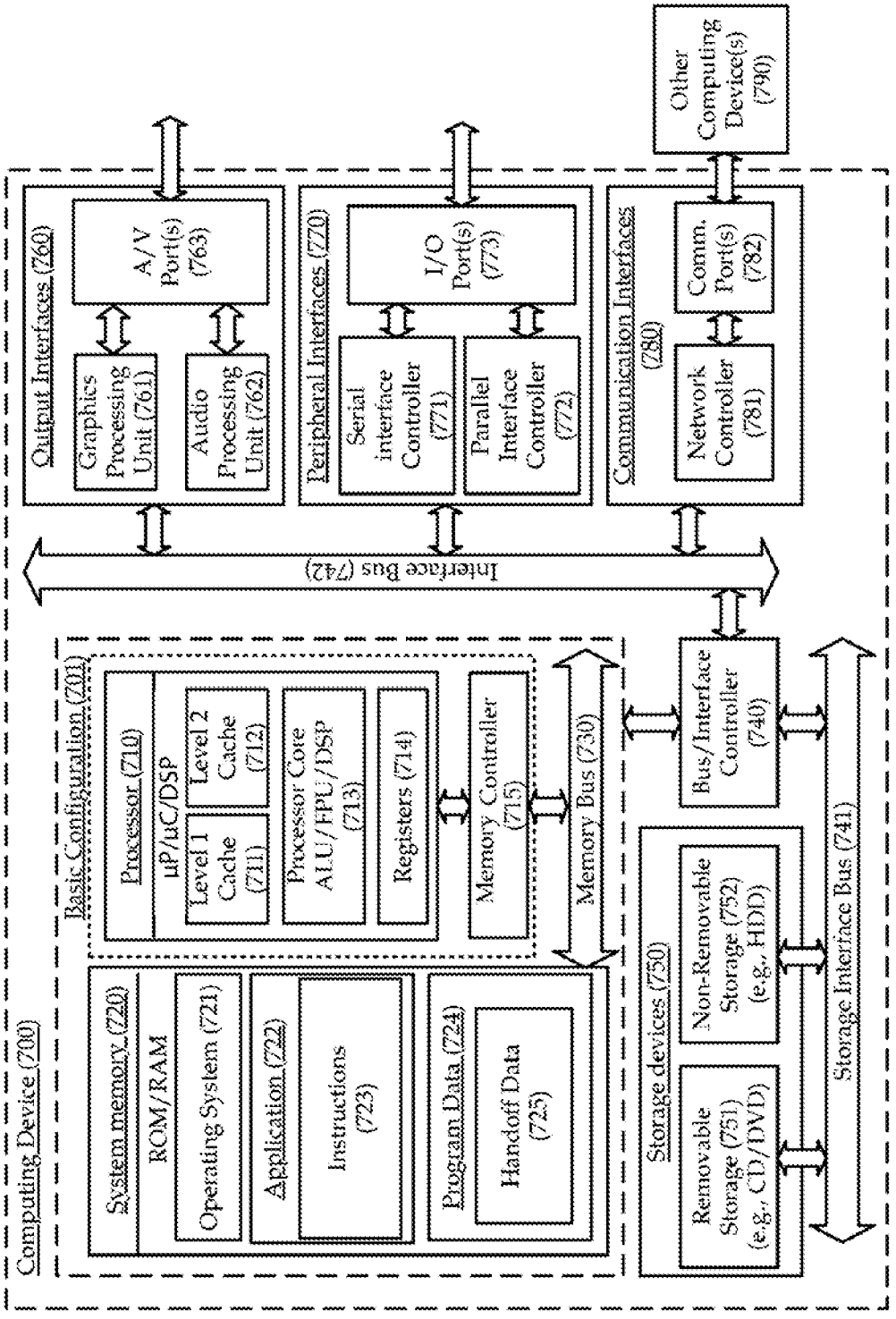

Computing Device (700)
Basic Configuration (701)
Processor (710)
μP/μC/DSP
Level 1 Cache (711)
Level 2 Cache (712)
Processor Core ALU/FPU/DSP (713)
Registers (714)
Memory Controller (715)
System memory (720)
ROM/RAM
Operating System (721)
Application (722)
Instructions (723)
Program Data (724)
Handoff Data (725)
Memory Bus (730)
Storage devices (750)
Removable Storage (751) (e.g., CD/DVD)
Non-Removable Storage (752) (e.g., HDD)
Storage Interface Bus (741)
Bus/Interface Controller (740)
Interface Bus (742)
Output Interfaces (760)
Graphics Processing Unit (761)
Audio Processing Unit (762)
A/V Port(s) (763)
Peripheral Interfaces (770)
Serial interface Controller (771)
Parallel Interface Controller (772)
I/O Port(s) (773)
Communication Interfaces (780)
Network Controller (781)
Comm. Port(s) (782)
Other Computing Device(s) (790)

FIG. 7

Electronic Acknowledgement Receipt

EFS ID:	22599188
Application Number:	13263835
International Application Number:	
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Customer Number:	86636
Filer:	David S. Lee/Mariah Duell
Filer Authorized By:	David S. Lee
Attorney Docket Number:	2796.737BS
Receipt Date:	11-JUN-2015
Filing Date:	10-OCT-2011
Time Stamp:	11:45:02
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	Amendment after Notice of Allowance (Rule 312)	US-811342-02-US-NAT_20150611_312AMD.pdf	117943 040cefbcc49cb9e2cc385b52e27013c9a9444aba	no	19

Warnings:	
Information:	

2	Drawings-only black and white line drawings	US-811342-02-US-NAT_20150611_Replacement_Sheet.pdf	322007 f57d39b3025f093e0d99f4464a23db202c115a94	no	3

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

TITLE OF INVENTION:

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$960	$0	$960	$0	06/18/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS

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 Brundidge & Stanger, P.C.
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: EMPIRE TECHNOLOGY DEVELOPMENT LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY): WILMINGTON, DELAWARE

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:

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☐ 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 50-4888 (enclose an extra copy of this form).

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

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

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

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Authorized Signature /David S. Lee/ Date June 18, 2015

Typed or printed name David S. Lee Registration No. 38,222

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EFS ID:	22668255
Application Number:	13263835
International Application Number:	
Confirmation Number:	1463
Title of Invention:	WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS
First Named Inventor/Applicant Name:	Ezekiel Kruglick
Customer Number:	86636
Filer:	David S. Lee/Mariah Duell
Filer Authorized By:	David S. Lee
Attorney Docket Number:	2796.737BS
Receipt Date:	18-JUN-2015
Filing Date:	10-OCT-2011
Time Stamp:	13:15:53
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	Issue Fee Payment (PTO-85B)	US-811342-02-US-NAT_20150618_Issue_fee_payment.pdf	74058 77340632e631fd418077b2bdab9586c6bb6f2eb0	no	2

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

TITLE OF INVENTION:

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$960	$0	$960	$0	06/18/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS

06/19/2015 ZJUHAR2 00000030 13263835
01 FC:1501 960.00 OP

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,
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1 Brundidge & Stanger, P.C.
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: EMPIRE TECHNOLOGY DEVELOPMENT LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY): WILMINGTON, DELAWARE

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
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- ☐ 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 50-4888 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
- ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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

Authorized Signature /David S. Lee/ Date June 18, 2015

06/19/2015 ZJUHAR2 00012688 13263835
06/06/2014 INTEFSU -960.00 OP
01 FC:1501

Typed or printed name David S. Lee Registration No. 38,222

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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Adjustment date: 06/19/2015 ZJUHAR2
06/06/2014 INTEFSW 00012688 13263835
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PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13263835
Filing Date	2011-10-10
First Named Inventor	Ezekiel Kruglick
Art Unit	2646
Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

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/TB/	1	20090017823	A1	2009-01-15	Sachs et al.	

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/TB/	1	1643785	EP	A1	2006-04-05	ALCATEL 75008 Paris (FR)		☐
/TB/	2	2007066882	WO	A1	2007-06-14	LG ELECTRONICS INC.		☐
/TB/	3	2010123417	WO	A1	2010-10-28	TELEFONAKTIEBOLAGET LM ERICSSON		☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13263835
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Examiner Name	BEAMER, TEMICA M
Attorney Docket Number	2796.737BS

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EXAMINER SIGNATURE

Examiner Signature	/TEMICA BEAMER/	Date Considered	06/18/2015

*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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13263835
	Filing Date	2011-10-10
	First Named Inventor	Ezekiel Kruglick
	Art Unit	2646
	Examiner Name	BEAMER, TEMICA M
	Attorney Docket Number	2796.737BS

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.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

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	/David S. Lee/	Date (YYYY-MM-DD)	2015-03-30
Name/Print	David S. Lee	Registration Number	38,222

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.**

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The information provided by you in this form will be subject to the following routine uses:

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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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

86636 7590 06/22/2015

BRUNDIDGE & STANGER, P.C.
2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER
BEAMER, TEMICA M

ART UNIT	PAPER NUMBER
2646	

MAIL DATE	DELIVERY MODE
06/22/2015	PAPER

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

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

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/263,835	10 October, 2011	KRUGLICK, EZEKIEL	2796.737BS

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ALEXANDRIA, VA 22314

EXAMINER	
TEMICA M. BEAMER	
ART UNIT	PAPER
2646	20150618

DATE MAILED:

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Commissioner for Patents

The IDS filed 3/30/2015 has been reviewed.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

PTO-90C (Rev.04-03)

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	10/10/2011	Ezekiel Kruglick	2796.737BS	1463

86636 7590 06/25/2015

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2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER
BEAMER, TEMICA M

ART UNIT	PAPER NUMBER
2646	

MAIL DATE	DELIVERY MODE
06/25/2015	PAPER

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/263,835	10 October, 2011	KRUGLICK, EZEKIEL	2796.737BS

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2318 MILL ROAD, SUITE 1020
ALEXANDRIA, VA 22314

EXAMINER	
TEMICA M. BEAMER	
ART UNIT	PAPER
2646	20150621

DATE MAILED:

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Commissioner for Patents

The amendment filed 6/11/2011 under 37 CFR 1.312 has been reviewed.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

PTO-90C (Rev.04-03)

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

DETAILED ACTION

Response to Amendment

2. The amendment filed on 6/11/2015 under 37 CFR 1.312 has been entered.

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TEMICA M. BEAMER whose telephone number is (571)272-7797. The examiner can normally be reached on Monday-Thursday (alternate Fridays) 9:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lester Kincaid can be reached on (571) 272-7922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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.

/TEMICA M. BEAMER/
Primary Examiner, Art Unit 2646

OK TO ENTER: /TB/

06/21/2015

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No..... 13/263,835
Filing Date ..... October 10, 2011
Confirmation No. 1463
Inventorship..... Ezekiel Kruglick
Group Art Unit..... 2646
Examiner ..... BEAMER, TEMICA M
Attorney Docket No. 2796.737BS
Title: .....WIRELESS DEVICE HANDOFF BETWEEN WIRELESS NETWORKS

AMENDMENT UNDER 37 C.F.R. § 1.312

To: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

From: David S. Lee
Customer No. 86636
Brundidge & Stanger, PC
2318 Mill Road, Suite 1020
Alexandria, VA 22314

Madam:

Subsequent to the Notice of Allowance dated March 18, 2015, in connection with the above-identified application, the following amendments and remarks are respectfully submitted. An explanation regarding the propriety of the Amendment is included within the Remarks section. Favorable consideration is respectfully requested.

Fees will be paid by credit card through the EFS Web; however the Commissioner is hereby authorized to charge any deficiency of fees and credit any overpayments to Deposit Account Number 50-4888.

INTRODUCTORY COMMENTS

Amendment to the Specification section begins on page 3.

Amendment to the Drawings section begins on page 8.

The Listing of the Claims section begins on page 9.

Remarks section begins on page 18.

AMENDMENTS TO THE DRAWINGS

A replacement sheet is hereby submitted. The replacement sheet does not introduce any new matter.

In the replacement sheet of drawings, Figs. 2, 5 and 7 are amended as follows:

- In Fig. 2, Sheet 4 of 9, in Box "210", Line 1, delete "Cover Logic" and insert - - Coverage Logic - -, therefor.
- In Fig. 5, Sheet 7 of 9, in Box "550", Line 1, delete "Handoff Wire Device" and insert - - Handoff Wireless Device - -, therefor.
- In Fig. 7, Sheet 9 of 9, in Box "(715)", Line 1, delete "Memory Controler" and insert - - Memory Controller - -, therefor.

Attached: Replacement Sheet of Drawings

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims pending:

- At time of the Action: Claims 1-3, 5-16, 18-28 and 30-32
- After this Reply: Claims 1-3, 5-16, 18-28 and 30-32

Currently Canceled or Withdrawn Claims: None

Currently Amended Claims: Claims 6, 21, 24, and 32

New Claims: None

1. (**Previously Presented**) A method implemented at a first wireless network to handoff a mobile wireless device to a second wireless network, the method comprising:

receiving coverage information associated with the wireless device;

determining whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the received coverage information, wherein the determining includes determining that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network; and

transmitting a handoff request to the second wireless network based, at least in part, on the determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

2. (**Previously Presented**) A method according to claim 1, further comprising:

receiving a confirmation from the second wireless network that the handoff request has

been accepted by the second wireless network, wherein based, at least in part, on the received confirmation, the wireless device is handed off to the second wireless network.

3. (**Original**) A method according to claim 1, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

4. (**Canceled**)

5. (**Previously Presented**) A method according to claim 1, wherein the mapping information of one or more locations for which the second wireless network has previously had coverage comprises a map generated based, at least in part, on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the one or more wireless devices.

6. (**Currently Amended**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting the handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, or an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted.

7. (**Previously Presented**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting the handoff request via a wireless or a wired communication link that

communicatively couples the first wireless network to the second wireless network.

8. (**Previously Presented**) A method according to claim 1, wherein the transmitting the handoff request comprises transmitting the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

9. (**Original**) A method according to claim 1, wherein the first wireless network is a different type of wireless network than the second wireless network.

10. (**Previously Presented**) A method implemented at a first wireless network for a mobile wireless device handoff between a second wireless network and the first wireless network, the method comprising:

receiving a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network;

based, at least in part, on the handoff request, adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network; and

transmitting a confirmation from the first wireless network to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to the first wireless network.

11. (**Previously Presented**) A method according to claim 10, wherein the receiving the handoff

request comprises receiving the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

12. (**Previously Presented**) A method according to claim 10, wherein the receiving the handoff request comprises receiving the handoff request via another mobile wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the another mobile wireless device serves as a relay between the first wireless network and the second wireless network.

13. (**Previously Presented**) A method according to claim 10, wherein the adapting one or more beams comprises adapting one or more beams based, at least in part, on one of a predetermined network load placed on the first wireless network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

14. (**Previously Presented**) An apparatus for a first wireless network to handoff a wireless device to a second wireless network, the apparatus comprising:

a coverage manager having logic, the logic configured to:

receive coverage information associated with the wireless device;

determine whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the coverage information, wherein the logic is further configured to determine that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network; and

transmit a handoff request to the second wireless network based, at least in part, on the

determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

15. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to:

receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

16. (**Original**) An apparatus according to claim 14, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

17. (**Canceled**)

18. (**Previously Presented**) An apparatus according to claim 14, wherein the logic is further configured to generate the mapping information based, at least in part, on information received from wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network includes a detectable signal from the second wireless network to the wireless devices.

19. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request based, at least in part, on at least one of an estimated cost to handoff the wireless device to the second wireless network, an estimated signal strength from the second wireless network at the location of the wireless device if the handoff request is accepted, or whether the

wireless device is a mobile wireless device.

20. (**Original**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

21. (**Currently Amended**) An apparatus according to claim 14, wherein the logic is further configured to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the ~~other~~another wireless device serves as a relay between the first wireless network and the second wireless network.

22. (**Previously Presented**) A system for a wireless device handoff between a first wireless network and a second wireless network, the system comprising:

an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network; and

an adaption manager having logic, the logic configured to:

receive a handoff request from the second wireless network, the handoff request based, at least in part, on a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network,

cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network, and

transmit a confirmation to the second wireless network to indicate acceptance of the handoff request, wherein the wireless device is handed off from the second wireless network to

the first wireless network.

23. (**Previously Presented**) A system according to claim 22, wherein to receive the handoff request comprises to receive the handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

24. (**Currently Amended**) A system according to claim 22, wherein to receive the handoff request comprises to receive the handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the ~~other~~another wireless device serves as a relay between the first wireless network and the second wireless network.

25. (**Previously Presented**) A system according to claim 22, wherein to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first wireless network due to the handoff of the wireless device or an impact of adapting one or more beams on other wireless devices currently communicatively coupled to the first wireless network.

26. (**Previously Presented**) A computer program product comprising a non-transitory medium having instructions for a first wireless network to handoff a wireless device to a second wireless network, which, when executed by logic, cause the logic to:

receive coverage information associated with the wireless device;

determine whether the wireless device is capable of being covered by the second wireless network based, at least in part, on the coverage information, wherein to determine comprises to

determine that the wireless device is not currently covered by the second wireless network but is capable of being covered by the second wireless network; and

transmit a handoff request to the second wireless network based, at least in part, on a determination that the wireless device is capable of being covered by the second wireless network,

wherein the coverage information includes mapping information of one or more locations of the wireless device for which the second wireless network has previously had coverage.

27. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to receive a confirmation that the handoff request has been accepted by the second wireless network, wherein the wireless device is handed off to the second wireless network.

28. (**Original**) A computer program product according to claim 26, wherein the coverage information includes location information of the wireless device and an indication that the wireless device does not detect a signal from the second wireless network.

29. (**Canceled**)

30. (**Previously Presented**) A computer program product according to claim 26, wherein the mapping information of one or more locations for which the second wireless network has had coverage in the past comprises a map generated based on information received from one or more wireless devices communicatively coupled to the first wireless network and covered by the second wireless network, wherein covered by the second wireless network detection of a detectable signal from the second wireless network to the one or more wireless devices.

31. (**Original**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via a wireless or a wired communication link that communicatively couples the first wireless network to the second wireless network.

32. (**Currently Amended**) A computer program product according to claim 26, further comprising instructions to cause the logic to transmit a handoff request via another wireless device that is configured to be communicatively coupled to both the first wireless network and the second wireless network, wherein the ~~other~~ another wireless device serves as a relay between the first wireless network and the second wireless network.

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REMARKS

Amendments to the Specification

The specification as published is amended to correct the §371(c) Date section and to add the Cross-Reference to Related Applications section. By entry of this amendment, the specification is made consistent with other papers that are of record in the file wrapper of the present application. The specification is further amended at paragraphs [0023], [0032], [0047], [0062], [0067]-[0069], [0074], and [0078] to correct for minor typographical errors. Entry of the amendments to the specification is respectfully requested.

Amendments to the Drawings

The drawings **Figs. 2, 5, and 7** are amended to correct for minor typographical errors. No new matter is added. Entry of the amendments to **Figs. 2, 5, and 7** are respectfully requested.

Amendments to the Claims

Claims 1-3, 5-16, 18-28 and 30-32 are currently allowed. **Claims 21, 24, and 32** are currently editorially amended to correct for minor typographical errors or to provide proper antecedent basis for the recited features. The scope of the amended claims has not changed and no additional search or examination is required. No new matter is added. Therefore, entry and favorable consideration of **Claims 1-3, 5-16, 18-28 and 30-32** are respectfully requested.

Conclusion

In view of the foregoing amendments, it is respectfully requested that the amendments made to the present application be entered prior to patent issue, as allowed by 37 C.F.R. §1.312.

Respectfully submitted,

Brundidge & Stanger, PC

Dated: June 11, 2015

/David S. Lee/
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[0062]

[~~0068~~] Continuing from decision block **520** to block **530** (Adapt One or More Beams), adaption manager **122** may include logic and/or features configured to adapt one or more beams generated from or by antenna array **124** to facilitate coverage of wireless device **130**A by wireless network **120** (e.g., via ~~beam feature **216**~~ beam feature **316**). In some examples, a combination of beams generated by antenna array **124** may be directional beams. For these examples, adaption manager **122** may cause at least one of the directional beams to be adapted in order to change the coverage area (e.g., similar to coverage area **125-1**) of wireless network **120** to enable wireless device **130**A to be covered by wireless network **120**.

[0063]

[~~0069~~] Continuing from block **530** to block **540** (Transmit Confirmation), adaption manager **122** may include logic and/or features configured to transmit a confirmation to indicate acceptance of the handoff request from wireless network **110** for wireless device **130**A (e.g., via ~~beam feature **216**~~ beam feature **316**). In some examples, the confirmation may be transmitted via communication channel **160** or **170** and may indicate acceptance of the handoff request. The confirmation may also indicate that wireless network **120**'s coverage area has been adapted to now cover wireless device **130**A.

[0068]

[~~0074~~] Depending on the desired configuration, processor 710 can be of any type including but not limited to a microprocessor (μP), a microcontroller (μC), a digital signal processor (DSP), or any combination thereof. Processor 710 can include one or more levels of caching, such as a level one cache 711 and a level two cache 712, a processor core 713, and registers 714. The processor core 713 can include an arithmetic logic unit (ALU), a floating point unit (FPU), a digital signal processing core (DSP Core), or any combination thereof. A memory controller 715 can also be used with the processor 710, or in some implementations the memory controller 715 can be an internal part of the processor 710.

[0072]

[~~0078~~]Computing device 700 can also include an interface bus 742 for facilitating communication from various interface devices (e.g., output interfaces, peripheral interfaces, and

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6/30/2015

[0056]
[0062] Continuing from block 460 to decision block 470 (Conf. Received?), coverage manager 112 may include logic and/or features configured to determine whether a confirmation has been received from wireless network 120 (e.g., via receive feature 218). In some examples, the received confirmation indicates to coverage manager 112 that the handoff request has been accepted for the handoff of wireless device 130A to wireless network 120. The confirmation may also indicate that wireless network 120 has adapted its coverage area to now cover the location of wireless device 130A. Coverage manager 112 may also ~~included~~ include logic and/or features configured to start a confirmation interval (e.g., via interval feature 212) that establishes a period of time to wait for a confirmation. If a confirmation is received from wireless network 120 before the confirmation interval expires, processing may continue from decision block 470 to block 480. Otherwise, if the confirmation interval expires and no confirmation has been received, processing moves to decision block 490.

[0061]
[0067] Continuing from block **510** to decision block **520** (Adapt Coverage Area?), adaption manager **122** may include logic and/or features configured to determine whether to adapt the coverage area for wireless network **120** (e.g., via ~~cost feature **214**~~ cost feature **314**). In some examples, adaption manager **122** may evaluate the costs associated with a handoff of wireless device **130**A to wireless network **120** and base a determination on the associated costs. Those costs may be based on criteria to include a predetermined network load placed on wireless network **120** if wireless device **130**A is handed off. The costs may also be based on an effect of adapting the coverage area on other wireless devices coupled to wireless network **120** (e.g., wireless device **140**A-I). If a determination is made by adaption manager **122** to adapt the coverage area, processing continues from decision block **520** to block **530**. Otherwise, processing comes to an end.

wireless device **140**A as a relay to communicate with the other wireless network via communication channel **160**. Additionally and/or alternatively, wireless network **110** may be communicatively coupled to wireless network **120** via communication channel **170** as shown in FIGS. 1A-C.

Change(s) applied to document, /T.C.T./ 6/30/2015

[0026]
~~[0032]~~ FIG. 1C depicts a view of wireless communication system **100** that shows numerous wireless devices communicatively coupled to wireless network **120**. As shown in FIG. 1C, ~~wireless devices 140A-1~~ wireless devices **140**A-I and **130**A may couple to wireless network **120** via communication links **126**A-J. In some examples, as described more below, adaption manager **122** of wireless network **120** may include logic and/or features configured to receive a handoff request from wireless network **110** (e.g., via communication channel **160** or **170**). As described above, the handoff request may be based on a determination by wireless network **110** that wireless device **130**A may not be currently covered by wireless network **120** but may be capable of being covered by wireless network **120**. Adaption manager **122** may also include logic and/or features to adapt one or more beams of antenna array **124** to adjust wireless network **120**'s coverage area (e.g., back to coverage area **125-1**) based at least on the handoff request. For example, the one or more beams of antenna array **124** may be configured to provide directional signal transmissions for wireless network **120** via the use of beamforming techniques to include, but not limited to, the use of conventional beamformers or adaptive beamformers.

[0041]
~~[0047]~~ The example adaption manager **122** of FIG. 3 includes adapt logic **310**, control logic **320**, memory **330**, input/output (I/O) interfaces **340** and optionally one or more applications **350**. As illustrated in FIG. 3, adapt logic **310** is coupled to control logic **320**, memory **330** and I/O interfaces **340**. Also illustrated in FIG. 3, the optional applications **350** are arranged in cooperation with control logic **320**. Adapt logic **310** may further include one or more of a receive feature **312**, a cost feature **314**, a beam feature **316** or a ~~handoff feature 218~~ handoff feature **318**, or any reasonable combination thereof.

AMENDMENTS TO THE SPECIFICATION

The following will replace all prior versions of the listed paragraphs in the application. The amendment to the specification does not introduce any new matter.

1. Please correct §371(c) Date on the Face Page, in Field (86), Line 3 of the specification as published as follow:

Please delete "May 8, 2012" and insert - - October 10, 2011 - -, therefor.

2. Please add the cross-reference to related applications section of the specification as follows:

CROSS-REFERENCE TO RELATED APPLICATIONS

This Application is the National Stage filing under 35 U.S.C. § 371 of PCT Application Ser. No. PCT/US2011/034470 filed on April 29, 2011.

3. Please replace paragraphs [0023], [0032], [0047], [0062], [0067]-[0069], [0074], and [0078] of the specification as published with the following substitute paragraphs, respectively. The amendment to the specification does not introduce any new matter.

Change(s) applied to document, /T.C.T/ 6/30/2015

[0017]

~~[0023]~~ According to some examples, as shown in FIGS. 1A-C, wireless device **130**A may communicatively couple to wireless network **110** via communication link **116**A. Also, wireless device **140**A may communicatively couple to wireless network **120** via communication link **126**A. In some examples, wireless device **140**A may also be communicatively coupled to network **110** via ~~communication link **1161**~~ communication link **116**I. As described more below, since wireless device **140**A may be communicatively coupled to both wireless networks, a communication channel **160** may be established that includes communication links **116**I and **126**A. Either wireless network **110** or wireless network **120** may use

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/263,835	07/28/2015	9094888	2796.737BS	1463

86636 7590 07/08/2015

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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 384 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):

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