

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371		Attorney Docket No. 4906P51954US1
		U.S. Application No. (if known, see 37 CFR 1.5)
International Application No. PCT/CN2017/101576	International Filing Date 13 SEPTEMBER 2017	Priority Date Claimed 04 JANUARY 2017
Title of Invention ON-DEMAND REQUEST FOR SYSTEM INFORMATION		
First Named Inventor Rui FAN		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.		
<p>1. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received.</p> <p>2. <input checked="" type="checkbox"/> A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)).</p> <p>3. An English language translation of the International Application (35 U.S.C. 371(c)(2))</p> <p>a. <input type="checkbox"/> is attached hereto.</p> <p>b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</p> <p>4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))</p> <p>a. <input type="checkbox"/> is attached.</p> <p>b. <input type="checkbox"/> was previously filed in the international phase under PCT Rule 4.17(iv).</p>		
Items 5 to 8 below concern amendments made in the international phase.		
<u>PCT Article 19 and 34 amendments</u>		
<p>5. <input type="checkbox"/> Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)).</p> <p>6. <input type="checkbox"/> English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)).</p> <p>7. <input type="checkbox"/> English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)).</p>		
<u>Cancellation of amendments made in the international phase</u>		
<p>8a. <input type="checkbox"/> Do not enter the amendment made in the international phase under PCT Article 19.</p> <p>8b. <input type="checkbox"/> Do not enter the amendment made in the international phase under PCT Article 34.</p>		
NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).		
The following items 9 to 17 concern a document(s) or information included.		
<p>9. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>10. <input checked="" type="checkbox"/> A preliminary amendment.</p> <p>11. <input checked="" type="checkbox"/> An Application Data Sheet under 37 CFR 1.76.</p> <p>12. <input type="checkbox"/> A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b).</p> <p>13. <input checked="" type="checkbox"/> A power of attorney and/or change of address letter.</p> <p>14. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.3 and 37 CFR 1.821-1.825.</p> <p>15. <input type="checkbox"/> Assignment papers (<i>cover sheet and document(s)</i>). Name of Assignee: _____</p> <p>16. <input type="checkbox"/> 37 CFR 3.73(c) Statement (<i>when there is an Assignee</i>).</p>		

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 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, 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: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 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.

U.S. APPLN. No. (if known – see 37 CFR 1.5)	INTERNATIONAL APPLICATION No. PCT/CN2017/101576	ATTORNEY DOCKET No. 4906P51954US1
17. <input type="checkbox"/> Other items or information:		
The following fees have been submitted.		CALCULATIONS
		PTO USE ONLY
18. <input checked="" type="checkbox"/> Basic national fee (37 CFR 1.492(a))	\$280	\$ 280.00
19. <input checked="" type="checkbox"/> 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 \$720	\$ 720.00
20. <input checked="" type="checkbox"/> Search fee (37 CFR 1.492(b)) 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 \$120 \$480 \$600	\$ 600.00
TOTAL OF 18, 19, and 20 =		\$ 1,600.00
<input type="checkbox"/> 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)). Fee for each additional 50 sheets of paper or fraction thereof		\$400
Total Sheets	Extra Sheets	Number of each addition 50 or fraction thereof (round up to a whole number)
42 - 100 =	/ 50 =	x \$400
Surcharge of \$140.00 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
Total claims	23 - 20 =	3
Independent claims	3 - 3 =	0
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		+ \$780
Processing fee of \$140.00 for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)).		\$
TOTAL OF ABOVE CALCULATIONS =		\$ 240.00
<input checked="" type="checkbox"/> Applicant asserts small entity status. See 37 CFR 1.27. Fees above are reduced by 1/2.		
<input checked="" type="checkbox"/> Applicant certifies micro entity status. See 37 CFR 1.29. Fees above are reduced by 3/4. Applicant must attach form PTO/SB/15A or B or equivalent.		
TOTAL NATIONAL FEE =		\$ 1,840.00
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 =		\$ 1,840.00
Amount to be refunded:		\$
Amount to be charged:		\$1,840.00

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.

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 Director is hereby authorized to charge additional fees which may be required, or credit any overpayment, to Deposit Account No. 506674 as follows:

i. any required fee.

ii. any required fee except for excess claims fees required under 37 CFR 1.492(d) and (e) and multiple dependent claim fee required under 37 CFR 1.492(f).

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 to pay 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.

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

This application (1) claims priority to or the benefit of an application filed before March 16, 2013, and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE 1: By providing this statement under 37 CFR 1.55 or 1.78, **this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.**

NOTE 2: A U.S. national stage application may not claim priority to the international application of which it is the national phase. The filing date of a U.S. national stage application is the international filing date. See 35 U.S.C. 363.

Correspondence Address

The address associated with Customer Number: 131247 OR Correspondence address below

Name					
Address					
City		State		Zip Code	
Country				Telephone	
Email					

Signature	/William W. Kidd; Reg. No. 31,772/	Date	2017-10-20
Name (Print/Type)	William W. Kidd	Registration No. (Attorney/Agent)	31,772

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.

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	4906P51954US1
		Application Number	
Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION		
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.)

Inventor Information:

Inventor 1					<input type="button" value="Remove"/>
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Rui		FAN		
Residence Information (Select One) US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
City	Beijing	Country of Residenceⁱ	CN		
Mailing Address of Inventor:					
Address 1	No. 5 Lize East Street, Chaoyang District				
Address 2					
City	Beijing	State/Province			
Postal Code	100102	Countryⁱ	CN		
Inventor 2					<input type="button" value="Remove"/>
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Jinhua		LIU		
Residence Information (Select One) US Residency <input checked="" type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
City	Beijing	Country of Residenceⁱ	CN		
Mailing Address of Inventor:					
Address 1	No. 5 Lize East Street, Chaoyang District				
Address 2					
City	Beijing	State/Province			
Postal Code	100102	Countryⁱ	CN		
Inventor 3					<input type="button" value="Remove"/>
Legal Name					

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	4906P51954US1
		Application Number	
Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Pål		FRENGER	
Residence Information (Select One)				
US Residency		<input checked="" type="radio"/> Non US Residency		Active US Military Service
City	Linköping	Country of Residence ⁱ	SE	
Mailing Address of Inventor:				
Address 1	Enskiftesgatan 8			
Address 2				
City	Linköping	State/Province		
Postal Code	SE-583 34	Country ⁱ	SE	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.				<input type="button" value="Add"/>

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).	
<input type="checkbox"/> An Address is being provided for the correspondence information of this application.	
Customer Number	131247
Email Address	<input type="button" value="Add Email"/> <input type="button" value="Remove Email"/>

Application Information:

Title of the Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION		
Attorney Docket Number	4906P51954US1	Small Entity Status Claimed	<input type="checkbox"/>
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	2	Suggested Figure for Publication (if any)	1

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

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	4906P51954US1
		Application Number	
Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION		

Publication Information:

<input type="checkbox"/>	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
<input type="checkbox"/>	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). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.			
Please Select One:	<input checked="" type="radio"/> Customer Number	<input type="radio"/> US Patent Practitioner	<input type="radio"/> Limited Recognition (37 CFR 11.9)
Customer Number	131247		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim 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.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	<input type="button" value="Remove"/>	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	a 371 of international	PCT/CN2017/101576	2017-09-13
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			<input type="button" value="Add"/>

Foreign Priority Information:

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

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	4906P51954US1
		Application Number	
Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION		

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
PCT/CN2017/070130	WO	2017-01-04	E5A1
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

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

<input type="checkbox"/> This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	4906P51954US1
		Application Number	
Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is 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 State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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	4906P51954US1
		Application Number	
Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant	1	<input type="button" value="Remove"/>	
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
<input type="button" value="Clear"/>			
<input type="radio"/> Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
▼			
Name of the Deceased or Legally Incapacitated Inventor: <input type="text"/>			
If the Applicant is an Organization check here. <input checked="" type="checkbox"/>			
Organization Name	Telefonaktiebolaget LM Ericsson (publ)		
Mailing Address Information For Applicant:			
Address 1	SE-164 83		
Address 2			
City	Stockholm	State/Province	
Country	SE	Postal Code	
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. <input type="button" value="Add"/>			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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	4906P51954US1
		Application Number	
Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION		

Assignee	1
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Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here.

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1				
Address 2				
City		State/Province		
Country i		Postal Code		
Phone Number		Fax Number		
Email Address				

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a juristic entity (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	William W. Kidd; Reg. No. 31,772/			Date (YYYY-MM-DD)	2017-10-20
First Name	William	Last Name	Kidd	Registration Number	31,772

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

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	4906P51954US1
		Application Number	
Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION		

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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.

Attorney Docket No: 4906P51954US1

Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application:

Examiner: Not yet assigned

First Named Inventor:

Art Unit: Not yet assigned

Rui FAN

Confirmation No: Not yet assigned

Application No. Not yet assigned

Filed: Herewith

For: ON-DEMAND REQUEST FOR SYSTEM
INFORMATION

EFS Filing
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P.O. Box 1450
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Please amend the application as follows prior to substantive examination.

SPECIFICATION

Please add the following paragraph after the title on page 1:

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a National stage of International Application No. PCT/CN2017/101576, filed September 13, 2017, which claims priority to International Application No. PCT/CN2017/070130, filed January 4, 2017, which are hereby incorporated by reference.

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions of the claims in the application:

1. (Currently Amended) A method for requesting system information, comprising:
transmitting ~~(102)~~ a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and
receiving ~~(104)~~ one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.

2. (Currently Amended) The method according to claim 1, wherein the ~~transmission~~ transmitting of the request comprises transmitting a preamble for indicating the at least one system information block group.

3. (Currently Amended) The method according to claim 2, wherein the ~~transmission~~ transmitting of the request comprises:
selecting, from a plurality of preambles, a preamble associated with the at least one system information block group; and
transmitting the request to the network node, wherein the request includes the selected preamble.

4. (Currently Amended) The method according to claim ~~2 or 3~~, wherein the at least one system information block group is indicated by transmission timing of the preamble.

5. (Original) The method according to claim 4, wherein the transmission of the request comprises transmitting the request to the network node in accordance with a selected transmission timing associated with the at least one system information block group.

6. (Currently Amended) The method according to ~~any one of claims 1 to 5~~ claim 1, further comprising:
 - receiving notification information from the network node, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information.
7. (Original) The method according to claim 6, wherein the notification information is included in minimum system information.
8. (Currently Amended) The method according to ~~any one of claims 1 to 7~~ claim 1, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.
9. (Currently Amended) The method according to ~~any one of claims 1 to 8~~ claim 1, further comprising:
 - receiving an indicator from the network node, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node.
10. (Currently Amended) The method according to ~~any one of claims 1 to 9~~ claim 1, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the user terminal.
11. (Currently Amended) The method according to ~~any one of claims 6 to 10~~ claim 6, wherein the notification information indicates a correspondence between all of preambles and system information block groups.
12. (Currently Amended) An apparatus ~~(300)~~ for requesting system information, comprising:
 - at least one processor ~~(301)~~; and

at least one memory ~~(302)~~ comprising computer program code ~~(303)~~, ~~the at least one memory (302) and the computer program code (303) configured to, with which, when executed by the at least one processor (301), cause the apparatus (300) at least to:~~

transmit a request for at least one system information block group, each of which comprises one or more system information blocks, to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and
receive one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.

13. (Currently Amended) The apparatus according to claim 12, wherein the at least one memory and the computer program code ~~are configured to, with which, when executed by the at least one processor, cause the apparatus to transmit the request by transmitting a preamble for indicating the at least one system information block group.~~

14. (Currently Amended) The apparatus according to claim 13, wherein the at least one memory and the computer program code ~~are configured to, with which, when executed by the at least one processor, cause the apparatus to transmit the request by:~~

~~selecting~~select, from a plurality of preambles, a preamble associated with the at least one system information block group; and

~~transmitting~~transmit the request to the network node, wherein the request includes the selected preamble.

15. (Currently Amended) The apparatus according to claim 13 ~~or 14~~, wherein the at least one system information block group is indicated by transmission timing of the preamble.

16. (Currently Amended) The apparatus according to claim 15, wherein the at least one memory and the computer program code ~~are configured to, with which, when executed by the at least one processor, cause the apparatus to transmit the request by transmitting the request to the~~

network node in accordance with a selected transmission timing associated with the at least one system information block group.

17. (Currently Amended) The apparatus according to ~~any one of claims 12 to 16~~ claim 12, wherein the at least one memory and the computer program code ~~are configured to, with which, when executed by the~~ at least one processor, further cause the apparatus ~~at least further~~ to:

receive notification information from the network node, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information.

18. (Original) The apparatus according to claim 17, wherein the notification information is included in minimum system information.

19. (Currently Amended) The apparatus according to ~~any one of claims 12 to 18~~ claim 12, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.

20. (Currently Amended) The apparatus according to ~~any one of claims 12 to 19~~ claim 12, wherein the at least one memory and the computer program code ~~are configured to, with which, when executed by the~~ at least one processor, further cause the apparatus ~~at least further~~ to:

receive an indicator from the network node, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node.

21. (Currently Amended) The apparatus according to ~~any one of claims 12 to 20~~ claim 12, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the apparatus.

22. (Currently Amended) The apparatus according to ~~any one of claims 17 to 21~~ claim 17, wherein the notification information indicates a correspondence between all of preambles and system information block groups.

23. (Cancelled)

24. (Currently Amended) A method for transmission of system information, comprising:
receiving ~~(202)~~ a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and
transmitting ~~(204)~~ one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.

25-47. (Cancelled)

ABSTRACT

Please replace the abstract with the following amended abstract:

A method for requesting system information ~~is proposed~~. The method ~~may comprise~~ comprises transmitting a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node. The one or more system information blocks ~~may be~~ is/are grouped according to a feature of the one or more system information blocks. The method may further comprise receiving one or more system information block groups from the network node. The one or more system information block groups may comprise the at least one system information block group.

REMARKS

Claims 1-47 were pending in the PCT. Applicant has amended claims 1-4, 6, 8-17, 19-22 and 24 and cancelled claims 23 and 25-47. Accordingly, claims 1-22 and 24 are pending. Applicant is also submitting amendments to the specification and the abstract. No new matter has been added.

If any additional fee is required, please charge deposit account No. 506674.

Respectfully submitted,

NICHOLSON DE VOS WEBSTER & ELLIOTT LLP
(Customer No. 131247)

Dated: 10/20/2017

/William W. Kidd; Reg. No. 31,772/
William W. Kidd
Reg. No. 31,772
Phone: (512) 809-7001
Email: bill.kidd@ndwe.com

99 Almaden Boulevard, Suite 710
San Jose, CA 95113
Phone: (408) 675-0441
Fax: (408) 675-0442

CEPCT

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Submission Number:	138166		
Application Number:	PCT/CN2017/101576		
Date of Receipt:	13 September 2017		
Receiving Office:	China Intellectual Property Office		
Your Reference:	PF170510PCT		
Applicant:	TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)		
Number of Applicants:	2		
Title:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION		
Documents Submitted:	PF170510PCT-appb-P000001.pdf	93688	13 September 2017 16:11:18
	PF170510PCT-appb.xml	759	13 September 2017 16:11:18
	PF170510PCT-cgpa-I000001.pdf	93616	13 September 2017 16:11:18
	PF170510PCT-fees.xml	3354	13 September 2017 16:11:18
	PF170510PCT-othd-000001.pdf	70519	13 September 2017 16:11:18
	PF170510PCT-requ.xml	6611	13 September 2017 16:11:18
	PF170510PCT-vlog.xml	2228	13 September 2017 16:11:18
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0	For receiving Office use only	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	Form PCT/RO/101 PCT Request	
0-4-1	Prepared Using	CEPCT Version 1.01.00 MT/FOP 20140331/0.20.5.21
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	State Intellectual Property Office of the People's Republic of China (RO/CN)
0-7	Applicant's or agent's file reference	PF170510PCT
I	Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
II	Applicant	
II-1	This person is	Applicant only
II-2	Applicant for	All designated States
II-4	Name	TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)
II-5	Address	SE-164 83 Stockholm Sweden
II-6	State of nationality	SE
II-7	State of residence	SE
II-8	Telephone No.	
II-9	Facsimile No.	
II-11	Applicant's registration No. with the Office	

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III-1	Applicant and/or inventor	
III-1-1	This person is	Applicant and inventor
III-1-2	Applicant for	SC
III-1-4	Name (LAST, First)	FAN, Rui
III-1-5	Address	No.5 Lize East Street, Chaoyang District Beijing 100102 China
III-1-6	State of nationality	CN
III-1-7	State of residence	CN
III-1-11	Applicant's registration No. with the Office	
III-2	Applicant and/or inventor	
III-2-1	This person is	Inventor only
III-2-3	Inventor for	
III-2-4	Name (LAST, First)	LIU, Jinhua
III-2-5	Address	No.5 Lize East Street, Chaoyang District Beijing 100102 China
III-3	Applicant and/or inventor	
III-3-1	This person is	Inventor only
III-3-3	Inventor for	
III-3-4	Name (LAST, First)	FRENGER, Pal
III-3-5	Address	Enskiftesgatan 8, SE-583 34 LINKOEPING Sweden

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IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	Agent
IV-1-1	Name	ZHONGZI LAW OFFICE
IV-1-2	Address	7F, New Era Building, 26 Pinganli Xidajie, Xicheng District Beijing 100034 China
IV-1-3	Telephone No.	86-10-66091188
IV-1-4	Facsimile No.	86-10-66091199
IV-1-5	e-mail	mail@zhongziip.com
IV-1-5(a)	E-mail authorization The receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority are authorized to use this e-mail address, if the Office or Authority so wishes, to send notifications issued in respect of this international application:	as advance copies followed by paper notifications
IV-1-6	Agent's registration No.	11247
V	DESIGNATIONS	
V-1	The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.	
V-2	Item V-2 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.	
VI-1	Priority claim of earlier international application	
VI-1-1	Filing date	04 January 2017 (04.01.2017)
VI-1-2	Number	PCT/CN2017/070130
VI-1-3	PCT receiving Office	CN

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VI-2	Priority document request The International Bureau is requested to obtain from a digital library a certified copy of the earlier application(s) identified above as item(s), using, where applicable, the access code(s) indicated:	VI-1 Access code: E5A1	
VI-3	Incorporation by reference : where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.		
VII-1	International Searching Authority Chosen	State Intellectual Property Office of the People's Republic of China (ISA/CN)	
VIII	Declarations	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	-	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	-	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	-	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	-	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	-	
IX	Check list	Number of sheets	Electronic file(s) attached
IX-1	Request (including declaration sheets)	5	✓
IX-2	Description	21	✓
IX-3	Claims	10	✓
IX-4	Abstract	1	✓
IX-5	Drawings	2	✓
IX-7	TOTAL	39	

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	Accompanying Items	Paper document(s) attached	Electronic file(s) attached
IX-8	Fee calculation sheet	-	✓
IX-11	Copy of general power of attorney	-	✓
IX-18	PCT-SAFE physical media	-	-
IX-20	Figure of the drawings which should accompany the abstract	Fig.1	
IX-21	Language of filing of the international application	English	
X-1	Signature of applicant, agent or common representative	//ZHONGZI LAW OFFICE/	
X-1-1	Name	ZHONGZI LAW OFFICE	
X-1-2	Name of signatory	ZHONGZI LAW OFFICE	
X-1-3	Capacity (if such capacity is not obvious from reading the request)	Agent	

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10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
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10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/CN
10-6	Transmittal of search copy delayed until search fee is paid	

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PCT (ANNEX - FEE CALCULATION SHEET)

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0	For receiving Office use only			
0-1	International Application No.			
0-2	Date stamp of the receiving Office			
0-4	Form PCT/RO/101 (Annex)			
0-4-1	PCT Fee Calculation Sheet Prepared Using		CEPCT	
			Version 1.01.00 MT/FOP 20140331/0.20.5.21	
0-9	Applicant's or agent's file reference		PF170510PCT	
2	Applicant		TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)	
12	Calculation of prescribed fees	Fee amount/multiplier	Total amounts (CNY)	Total amounts (EQF)
12-1	Transmittal fee T	↔	500	
12-2-1	Search fee S	↔	2100	
12-2-2	International search to be carried out by	CN		
12-3	International filing fee (first 30 sheets) i1		1330 EQF	
12-4	Remaining sheets 9			
12-5	Additional amount (X) i2		15 EQF	
12-6	Total additional amount i		135 EQF	
12-7	i1 + i2 =		1465 EQF	
12-12	Electronic Filing reduction (Image) R		EQF-200	
12-13	Total International filing fee (i+R) I	↔		1265
12-14	Fee for priority document			
	Number of priority documents requested 0			
12-15	Fee per document (X) RP		150 CNY	
12-16	Total priority document fee: P	↔		
12-17	Fee for restoration of priority rights RP			
	Number of requests for restoration of priority rights 0			
	Total amount of fees for restoration of priority rights			
12-19	TOTAL FEES PAYABLE (T+S+I+P+RP)	↔	2600.0	1265.0

PCT (ANNEX - FEE CALCULATION SHEET)

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12-21	Mode of payment	Authorization to charge current account
12-22	Current account instructions The receiving Office	State Intellectual Property Office of the People's Republic of China (RO/CN)
12-23	Current account No.	0200049619200062436
12-24	Date	2017年 September 13日 (13.09.2017)
12-25	Name and signature	ZHONGZI LAW OFFICE ZHONGZI LAW OFFICE

ON-DEMAND REQUEST FOR SYSTEM INFORMATION

FIELD OF THE INVENTION

[0001] The present disclosure generally relates to communications, and more specifically, relates to wireless communications.

BACKGROUND

[0002] In a communication network such as Long Term Evolution (LTE) system, system information (SI) is important as it can provide necessary information to a user terminal, such as a user equipment (UE) or a wireless device, for linking with the communication network. In new radio (NR), SI may be classified into minimum SI and other SI. Minimum SI is the SI that a user terminal must read before it can know how to access the network. Other SI is the SI not within minimum SI. SI may be transmitted to the user terminal in a master information block (MIB) and/or a system information block (SIB). For example, minimum SI may correspond to MIB, SIB1 and SIB2 in LTE. Other SI may correspond to those remaining SIBs. Since other SI is not necessary for a user terminal to access network, in order to achieve energy efficiency, it may be desirable that the SI may be requested on demand.

SUMMARY

[0003] This summary is provided to introduce a selection of concepts in a simplified form that are further described below in detailed description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

[0004] The present disclosure proposes a solution of on-demand request for SI, which may enable a communication network to transmit or broadcast SI, such as

other SI as mentioned previously, according to a request for the SI from a user terminal.

[0005] According to a first aspect of the present disclosure, there is provided a method for requesting SI, which may be performed at an apparatus such as a user terminal. The method may comprise transmitting a request for at least one SIB group, each of which comprises one or more SIBs, from a user terminal to a network node. The one or more SIBs may be grouped according to a feature of the one or more SIBs. The method may further comprise receiving one or more SIB groups from the network node. The one or more SIB groups may comprise the at least one SIB group.

[0006] In an exemplary embodiment, the method according to the first aspect of the present disclosure may further comprise receiving notification information from the network node. For example, transmission of the at least one SIB group may be predefined or derived based at least partly on the notification information.

[0007] In an exemplary embodiment, the method according to the first aspect of the present disclosure may further comprise receiving an indicator from the network node. The indicator may indicate at least one of: which SIB group is being transmitted from the network node, and which SIB group is scheduled to be transmitted from the network node.

[0008] According to a second aspect of the present disclosure, there is provided an apparatus for requesting SI. The apparatus may comprise at least one processor and at least one memory comprising computer program code. The at least one memory and the computer program code may be configured to, with the at least one processor, cause the apparatus at least to perform any step of the method according to the first aspect of the present disclosure.

[0009] According to a third aspect of the present disclosure, there is provided a

computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer. The computer program codes may comprise code for performing any step of the method according to the first aspect of the present disclosure.

[0010] According to a fourth aspect of the present disclosure, there is provided an apparatus for requesting SI. The apparatus may comprise a transmitting module and a receiving module. In accordance with some exemplary embodiments, the transmitting module may be operable to carry out at least the transmitting step of the method according to the first aspect of the present disclosure. The receiving module may be operable to carry out at least the receiving step of the method according to the first aspect of the present disclosure.

[0011] In accordance with an exemplary embodiment, the transmission of the request may comprise transmitting a preamble for indicating the at least one SIB group.

[0012] In accordance with an exemplary embodiment, the transmission of the request may comprise: selecting, from a plurality of preambles, a preamble associated with the at least one SIB group; and transmitting the request to the network node. The request may include the selected preamble.

[0013] In accordance with an exemplary embodiment, the at least one SIB group may be indicated by transmission timing of the preamble.

[0014] In accordance with an exemplary embodiment, the transmission of the request may comprise transmitting the request to the network node in accordance with a selected transmission timing associated with the at least one SIB group.

[0015] According to a fifth aspect of the present disclosure, there is provided a method for transmission of SI, which may be performed at an apparatus such as a

network node. The method may comprise receiving a request for at least one SIB group, each of which comprises one or more SIBs, from a user terminal to a network node. The one or more SIBs may be grouped according to a feature of the one or more SIBs. The method may further comprise transmitting one or more SIB groups from the network node. The one or more SIB groups may comprise the at least one SIB group.

[0016] In accordance with an exemplary embodiment, the method according to the fifth aspect of the present disclosure may further comprise: transmitting notification information to the user terminal. For example, transmission of the at least one SIB group may be predefined or derived based at least partly on the notification information.

[0017] In accordance with an exemplary embodiment, the method according to the fifth aspect of the present disclosure may further comprise transmitting an indicator from the network node. The indicator may indicate at least one of: which SIB group is being transmitted from the network node, and which SIB group is scheduled to be transmitted from the network node.

[0018] According to a sixth aspect of the present disclosure, there is provided an apparatus for transmission of SI. The apparatus may comprise at least one processor and at least one memory comprising computer program code. The at least one memory and the computer program code may be configured to, with the at least one processor, cause the apparatus at least to perform any step of the method according to the fifth aspect of the present disclosure.

[0019] According to a seventh aspect of the present disclosure, there is provided a computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer. The computer program codes may comprise code for performing any step of the method according

to the fifth aspect of the present disclosure.

[0020] According to an eighth aspect of the present disclosure, there is provided an apparatus for transmission of SI. The apparatus may comprise a receiving module and a transmitting module. In accordance with some exemplary embodiments, the receiving module may be operable to carry out at least the receiving step of the method according to the fifth aspect of the present disclosure. The transmitting module may be operable to carry out at least the transmitting step of the method according to the fifth aspect of the present disclosure.

[0021] In accordance with an exemplary embodiment, the reception of the request may comprise receiving a preamble for indicating the at least one SIB group.

[0022] In accordance with an exemplary embodiment, the reception of the request may comprise receiving the preamble which was selected from a plurality of preambles. The selected preamble may be associated with the at least one SIB group.

[0023] In accordance with an exemplary embodiment, the at least one SIB group may be indicated by transmission timing of the preamble.

[0024] In accordance with an exemplary embodiment, the reception of the request may comprise receiving the request from the user terminal in accordance with a selected transmission timing associated with the at least one SIB group.

[0025] In accordance with an exemplary embodiment, the notification information may be included in minimum SI.

[0026] In accordance with an exemplary embodiment, the notification information may indicate a correspondence between all of preambles and SIB groups.

[0027] In accordance with some exemplary embodiments, the feature of the one or more SIBs may comprise at least one of functionality and periodicity of the one or

more SIBs.

[0028] In accordance with some exemplary embodiments, the request for the at least one SIB group may comprise a preamble for indicating the at least one SIB group. The at least one SIB group may be indicated by or associated with a preamble sequence or the transmission timing of the preamble. For example, the indication of the at least one SIB group by the preamble may be predefined or derived based at least partly on the notification information from the network node.

[0029] In accordance with some exemplary embodiments, the one or more SIB groups from the network node may further comprise at least another SIB group which is not requested by the user terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The disclosure itself, the preferable mode of use and further objectives are best understood by reference to the following detailed description of the embodiments when read in conjunction with the accompanying drawings, in which:

[0031] Fig.1 is a flowchart illustrating a method for requesting SI according to an embodiment of the present disclosure;

[0032] Fig.2 is a flowchart illustrating a method for transmission of SI according to another embodiment of the present disclosure;

[0033] Fig.3 is a block diagram illustrating an apparatus according to an embodiment of the present disclosure; and

[0034] Fig.4 is a block diagram illustrating another apparatus according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0035] The embodiments of the present disclosure are described in detail with reference to the accompanying drawings. Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present disclosure should be or are in any single embodiment of the disclosure. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present disclosure. Furthermore, the described features, advantages, and characteristics of the disclosure may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the disclosure may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the disclosure.

[0036] In a wireless network such as new radio (NR), SI may be broadcasted by a network node, such as a base station or a next generation Node B (gNB), in a cell to all user terminals monitoring the specific cell. It is important for a user terminal to maintain the required SI because otherwise it cannot interact with the network in an interoperable manner. As mentioned previously, minimum SI in NR corresponds to MIB, SIB1 and SIB2 in LTE. There are some assumptions about how to request other SI from the network. For example, some messages like MSG1 and/or MSG3 may be used to carry a request for other SI.

[0037] If using one preamble of MSG1 to carry a request for all other SI, then it may result in unnecessary transmission of some undesired other SI. This is because there is quite a lot of other SI in the system and the network may have to broadcast all other SI when it receives such preamble to request other SI. However, a user terminal

may not need all the other SI.

[0038] If using MSG3 to request other SI, since there could be contention during a random access procedure, the network may not be able to detect MSG3 reliably in time. In addition, there are additional overhead and delay because more messages are transmitted for requesting other SI.

[0039] The present disclosure proposes a solution of on-demand request for SI. In the proposed solution, one or more SIBs may be classified into a SIB group according to their relevance or correlation. When a user terminal wants to request some specific SI, it can request from a network node a SIB group in which the specific SI is contained. Then, the network node can know which SIB group the user terminal actually needs, and broadcast the requested SIB group accordingly. In this way, the network node can transmit or broadcast the SI to the user terminal with more energy efficiency. On the other hand, transmission resources and energy also can be saved from the view point of the user terminal, since it does not need to send additional SI request if another user terminal has already sent a request for the same SI as required by the user terminal.

[0040] Fig.1 is a flowchart illustrating a method for requesting SI according to an embodiment of the present disclosure. The method illustrated in Fig.1 may be performed by an apparatus implemented at a user terminal or communicatively coupled to a user terminal. In accordance with the exemplary embodiment, the user terminal may comprise a UE, a mobile station, a wireless device, a personal digital assistant (PDA), a laptop computer, a tablet computer, a smart phone, a portable device, or any other user device being capable of participating in communication of a wireless network.

[0041] According to the exemplary method illustrated in Fig.1, a request for at least one SIB group, each of which comprises one or more SIBs, may be transmitted

from a user terminal to a network node, as shown in block 102. In the exemplary embodiment, the one or more SIBs may be grouped or classified according to a feature of the one or more SIBs. It will be realized that the SI corresponding to the SIB mentioned here may comprise other SI than minimum SI in the context of NR. It is noted that the terms of “SI” and “SIB” used herein and the exemplary illustration of grouping of one or more SIBs are not limited to NR and LTE. The proposed methods, apparatus and related products herein may also be applicable to other suitable network environments, although some exemplary embodiments are described with respect to NR and LTE. As described previously, minimum SI corresponds to MIB, SIB1 and SIB2 in LTE, and accordingly other SI corresponds to SIB3 until SIB21. The feature of the one or more SIBs may be learned from the SIB definition in LTE. For example, the feature of the one or more SIBs may comprise at least one of functionality and periodicity of the SIBs. However, other suitable rules may also be expected to be applicable for learning more features of SIBs.

[0042] Table 1 exemplarily shows the functional description of some SIBs in LTE. It can be seen from Table 1 that the SIBs carrying SI are not fully independent to each other. For example, SIB3 to SIB8 are all related to how to do cell reselection, although each SIB has different responsibility. Therefore, SIB3 to SIB8 can be grouped together. For SIB10 to SIB12, these SIBs are all related to warning and alert. Therefore, SIB10 to SIB12 can be group together. For SIB18 to SIB19, the SIBs are both related to device-to-device (D2D) sidelink communication. Accordingly, SIB18 to SIB19 can be grouped together. The remaining SIBs can be grouped together. Thus, the SIBs listed in Table 1 may be classified into four groups.

Table 1

SIB	Description
SIB3	Parameters required for intra-frequency, inter-frequency and I-RAT cell re-selections

SIB4	Information regarding INTRA-frequency neighboring cells (E-UTRA)
SIB5	Information regarding INTER-frequency neighboring cells (E-UTRA)
SIB6	Information for re-selection to INTER-RAT (UTRAN cells)
SIB7	Information for re-selection to INTER-RAT (GERAN cells)
SIB8	Information for re-selection to INTER-RAT (CDMA2000)
...	...
SIB10	ETWS (Earthquake and Tsunami Warning System) information (Primary notification)
SIB11	ETWS (Earthquake and Tsunami Warning System) information (Secondary notification)
SIB12	Commercial Mobile Alert Service (CMAS) information.
...	...
SIB18	Sidelink UE information procedure, sidelink communication related resource configuration information
SIB19	Sidelink UE information procedure, sidelink discovery related resource configuration information
...	...

[0043] It can be seen that different SIBs and the SI thereof may be grouped according to their functionalities. Optionally, the SIBs may be classified into more or less groups than four groups. For example, since the transmission of SIBs related to warning and alert is triggered by the network instead of by a user terminal, the SI associated with SIB10 to SIB12 does not need to be requested by the user terminal at all. Then in total there are three SIB groups to be requested. Other ways to group these SIBs are also possible. For example, the SIBs related to cell reselection may be classified into one group, while all others may be classified into another group.

[0044] Another feature of SIBs which may be used to classify the SIBs is periodicity. For example, SIBs with the same or similar transmission periodicity may be grouped together. Use LTE SIB transmission periodicity as an example, where the SIBs each with periodicity of 80ms, 160ms, 320ms, 640ms, 1280ms, 2560ms and 5120ms may be classified into seven SIB groups. Alternatively, the SIBs may be classified into three SIB groups with the first group comprising SIBs with periodicities of 80ms, 160ms, the second group comprising SIBs with periodicities of

320ms, 640ms, and the third group comprising SIBs with periodicities of 1280ms, 2560ms, 5120ms. It will be realized that one or more SIBs may be classified into the desired number of groups according to the periodicity of SIBs.

[0045] In accordance with the exemplary method illustrated in Fig.1, the transmission of the request for the at least one SIB group may comprise transmitting a preamble for indicating the at least one SIB group.

[0046] In an exemplary embodiment, the transmission of the request may comprise selecting, from a plurality of preambles, a preamble associated with the at least one SIB group; and transmitting the request to the network node. The request may include the selected preamble.

[0047] In an exemplary embodiment, the at least one SIB group may be indicated by transmission timing of the preamble. Optionally, the transmission of the request may comprise transmitting the request to the network node in accordance with a selected transmission timing associated with the at least one SIB group.

[0048] In an exemplary embodiment, the at least one SIB group may be associated with a preamble (also referred to as a sequence of the preamble or a preamble sequence for ease of description) or the selected transmission timing of the preamble. Thus, the user terminal can selectively request the required SIB group from the network node.

[0049] In an exemplary embodiment, selective requests for SIB groups may be transmitted from the user terminal by using different preamble sequences, which may be differentiated by indexes of the preambles. One preamble sequence may correspond to a predetermined combination of SIB groups. Take 3 preambles as an example. In alternative I, preambles 1 to 3 may be used to indicate SIB groups 1 to 3, respectively, where SIB group 1 is related to cell reselection, SIB group 2 is related to

sidelink communication, and SIB group 3 comprises the remaining one or more SIBs. According to this alternative, a user terminal needing multiple SIB groups (for example, comprising SIB groups 1 and 2) may be required to send multiple SIB group requests (for example, comprising preambles 1 and 2) to a network node.

[0050] It will be realized that the usage of multiple preambles can be in different ways. For example, in alternative II, preambles 1 to 3 may be used to indicate SIB group 1, SIB groups 1+2, and SIB groups 1+2+3, respectively. According to this alternative, a user terminal can always select a corresponding preamble to get all desired SIB groups. Compared to alternative I, alternative II may save the preamble resource/transmission but the probability to transmit the undesired SI is higher than alternative I.

[0051] Thus, when SIB groups in the network are indicated by using different preambles, the user terminal can send the corresponding preamble to the network node if the user terminal wants to request SI from at least one of the SIB groups. When the network node detects such preamble, it can therefore only transmit or broadcast SI within the indicated SIB groups according to the detected preamble.

[0052] In accordance with the exemplary method illustrated in Fig.1, the user terminal may receive notification information transmitted from the network node. In this case, transmission of the at least one SIB group may be predefined or derived based at least partly on the notification information. Optionally, the notification information may be included in minimum SI.

[0053] In an exemplary embodiment, the notification information may indicate a correspondence between all of preambles and SIB groups. Optionally, the correspondence between the at least one SIB group and the associated preamble or the indication of the at least one SIB group by the preamble may be predefined or derived based at least partly on the notification information from the network node.

For example, the preambles which are used to request on-demand transmission of SI carried by one or more SIBs can be predefined according to a specified rule known by the user terminal and the network node.

[0054] In an exemplary embodiment, if the correspondence between preambles and SIB groups is informed in minimum SI, the minimum SI can indicate only one preamble for one SIB group, while there is a specified rule for the user terminal to derive other preambles for other SIB groups. For example, it is assumed that the specified rule is that all the preambles for requesting SIB groups are with consecutive indexes, and each preamble with an index increased by one indicates one more SIB group. As such, for alternative II as mentioned previously, if it is informed in the minimum SI that a preamble with index 'n' is used to indicate SIB group 1, then according to the specified rule, the user terminal may know that a preamble with index 'n+1' is used to indicate SIB groups 1+2, and a preamble with index 'n+2' is used to indicate SIB groups 1+2+3. It will be appreciated that other suitable rules also may be applicable to determine preambles for selective request and transmission of SI. For example, the preambles for requesting SIB groups may be with inconsecutive indexes, and/or the correspondence between all of preambles and SIB groups may be informed in the minimum SI from the network node.

[0055] In another exemplary embodiment, selective requests for SIB groups may be transmitted from the user terminal by using different preamble timing. In this embodiment, only one preamble may be used to request SIB group transmission from the network node, but the timing at which the preamble is sent can be utilized to determine which SIB group is requested. Therefore, compared with the embodiment where different preambles are used to indicate multiple SIB groups, using different transmission timing of one preamble to indicate multiple SIB groups may save transmission resources.

[0056] Assuming there are three SIB groups, including SIB group A with periodicities of 80ms, 160ms, SIB group B with periodicities of 320ms, 640ms, and SIB group C with periodicities of 1280ms, 2560ms, 5120ms. The respective minimum periodicities of SIB groups A, B and C are 80ms, 320ms and 1280ms, respectively. Then the timing at which a SIB group is requested by sending a preamble determines which SIB group is requested. In an exemplary embodiment, the requested SIB group may be determined according to whether the frame corresponding to the preamble sent by the user terminal has an integer multiple period of the minimum periodicity of the SIB group. As a further rule, if the period of that frame is an integer multiple of the minimum periodicities of several SIB groups, then the SIB group with the largest periodicity (or alternatively the SIB group with the smallest periodicity) may be determined as the requested SIB group. In another exemplary embodiment, the requested SIB group may be determined according to the frame corresponding to the preamble sent by the user terminal and the latest next frame in which SI can be transmitted or broadcasted. In this embodiment, the frame corresponding to the preamble may have a period which is not an integer multiple of the minimum periodicity of the SIB group.

[0057] Use the LTE frame as an example, where the frame length is 10ms. If the number of the frame corresponding to the preamble is 24, then the period of the frame is 240ms, which is an integer multiple of the minimum periodicity 80ms of SIB group A. This means that the user terminal wants to request SIB group A. Similarly, if the number of the frame corresponding to the preamble is 96, then the period of the frame is 960ms, which is an integer multiple of the minimum periodicity 80ms of SIB group A and the minimum periodicity 320ms of SIB group B. This means that the user terminal wants to request both SIB group A and SIB group B but not SIB group C. Or as the further rule, it is SIB group B that is requested instead of SIB group A plus B, because the minimum periodicity of SIB group B is larger than that of SIB

group A. Alternatively, if the frame number corresponding to the preamble is 22, then the number of the latest next frame to transmit or broadcast SI is 24, according to a predefined criterion. Since the period of this latest next frame is 240ms, which is an integer multiple of the minimum periodicity of SIB group A, this could mean that the user terminal wants to request just SIB group A.

[0058] Thus, when the user terminal wants to request a certain SIB group, it can send a preamble as a request to the network node at the specific timing or frame. When the network node detects this preamble, it can determine which SIB group the user terminal wants to request, according to the transmission timing of the preamble. Accordingly, the network node can only transmit or broadcast SI within the corresponding SIB group in the network. This can eliminate unnecessary SI transmissions in the network.

[0059] Referring back to Fig.1, the user terminal may receive one or more SIB groups from the network node, as shown in block 104. The one or more SIB groups may comprise the at least one SIB group requested by the user terminal in block 102. Optionally, the one or more SIB groups may further comprise at least another SIB group which is not requested by the user terminal. For example, preamble 3 is used to indicate SIB groups 1+2+3, as described previously in alternative II. If the user terminal wants to obtain SI within SIB group 1, then the user terminal may also obtain SIB groups 2 and 3 in addition to SIB group 1, when using preamble 3 to request SIB group 1 from the network node. Apparently, SIB groups 2 and 3 are not actually needed by the user terminal. In another example, since the network node may transmit or broadcast multiple SIB groups requested by different user terminals in the network, the user terminal may receive one or more SIB groups requested by other user terminals.

[0060] Fig.2 is a flowchart illustrating a method for transmission of SI according

to another embodiment of the present disclosure. The method illustrated in Fig.2 may be performed by an apparatus implemented at a network node or communicatively coupled to a network node. In accordance with the exemplary embodiment, the network node may comprise an evolved Node B (eNB), a gNB, an access point (AP), a base station (BS), a communication node, a control center, a relay station, a repeater, or any other network device being capable of participating in communication of a wireless network.

[0061] Corresponding to steps of the exemplary method for requesting SI performed by a user terminal as illustrated in Fig.1, the network node may receive a request for at least one SIB group, each of which comprises one or more SIBs, from the user terminal as shown in block 202. As described in connection with Fig.1, the one or more SIBs may be grouped according to a feature of the one or more SIBs, such as functionality and/or periodicity of the one or more SIBs. In block 204, one or more SIB groups may be transmitted or broadcasted from the network node. The one or more SIB groups may comprise the at least one SIB group requested by the user terminal. Optionally, the one or more SIB groups may further comprise at least another SIB group requested by other user terminal.

[0062] In an exemplary embodiment, the reception of the request may comprise receiving a preamble for indicating the at least one SIB group. The preamble may be selected from a plurality of preambles and associated with the at least one SIB group. Optionally, the at least one SIB group may be indicated by transmission timing of the preamble. Accordingly, the reception of the request may comprise receiving the request from the user terminal in accordance with a selected transmission timing associated with the at least one SIB group.

[0063] As mentioned previously, the network node may inform the user terminal of the correspondence between a SIB group and a preamble used to indicate the SIB

group, so that the user terminal can selectively request transmission of group based SIB(s). In order to make the selective transmission of group based SIB(s) more effective, the network node may provide some scheduling information of group based SIB(s) in a cell served by the network node. Then, the user terminal can detect from such scheduling information whether the required SI is being broadcasted or not.

[0064] According to an exemplary embodiment, the network node may transmit an indicator to indicate at least one of: which SIB group is being transmitted or broadcasted from the network node, and which SIB group is scheduled to be transmitted or broadcasted from the network node. Correspondingly, the user terminal may receive this indicator (which is also referred to as a group based SIB indicator) from the network node. As such, the user terminal can learn from the indicator whether the required SI is available in the cell served by the network node. For example, if a SIB group containing the required SI is indicated by the indicator from the network node, it is not necessary for the user terminal to transmit a request for this SIB group to the network node.

[0065] In an exemplary embodiment, the group based SIB indicator may be provided in minimum SI by the network node for indicating the group based SIB(s) and validity information. For alternative I described previously, two bits may be used as the group based SIB indicator to indicate the SIB group transmission: 00 – no transmission of SIB group; 01 – transmission of SIB group 1; 10 – transmission of SIB group 2; 11 – transmission of SIB group 3. Similarly, for alternative II described previously, two bits can be used as the group based SIB indicator to indicate the SIB group transmission: 00 – no transmission of SIB group; 01 – transmission of SIB group 1; 10 – transmission of SIB groups 1+2; 11 – transmission of SIB groups 1+2+3.

[0066] The user terminal can check the group based SIB indicator in the

minimum SI broadcasted by the network node. When the user terminal read such indicator in the minimum SI, it can know which SIB group(s) is now available in the corresponding cell. Then the user terminal can decide if it needs to send a request for a SIB group to the network node. If the group based SIB indicator in the minimum SI indicates that the SIB group is being transmitted/broadcasted or will be transmitted/broadcasted by the network node, which means that the SIB group is available in the cell, the user terminal would not send a corresponding preamble to the network node to request this SIB group.

[0067] In a further embodiment, even if the user terminal transmits a SIB group request for at least one SIB group, the network node can override the SIB group request by indicating the transmission of more SIB groups. For example, the network node may combine multiple SIB group requests from either one or multiple user terminals, and determine the transmission of SIB group(s) and the corresponding indicator settings.

[0068] The proposed methods as illustrated with respect to Figs. 1-2 can classify one or more SIBs into a SIB group, and the SIB group or a combination of several SIB groups may be associated with a unique preamble or a unique timing to request a SIB group. When a user terminal wants to request a SIB group, it can according to its actual needs send a distinct preamble or send a preamble at certain timing to a network node to request the corresponding SIB group. The network node can then know which SIB group the user terminal needs, and broadcast it accordingly. In this way, the network node can avoid to transmit the undesired SI to the user terminal.

[0069] Thus it can be seen that with grouping of one or more SIBs for on-demand transmission, the network node can only send a specified SIB group instead of all SIB groups, in response to a SIB group request from the user terminal. This may be achieved by using different preambles or different preamble transmission timing. In

addition, using a group based SIB indicator to indicate the availability of one or more SIB groups instead of an indicator per SIB, can reduce the number of bits needed in minimum SI quite a lot, thereby making the selective transmission of SI more effective.

[0070] The various blocks or information flows shown in Figs.1-2 may be viewed as method steps, and/or as operations that result from operation of computer program code, and/or as a plurality of coupled logic circuit elements constructed to carry out the associated function(s). The schematic flow chart diagrams described above are generally set forth as logical flow chart diagrams. As such, the depicted order and labeled steps are indicative of specific embodiments of the presented methods. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more steps, or portions thereof, of the illustrated methods. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

[0071] Fig.3 is a block diagram illustrating an apparatus 300 according to some embodiments of the present disclosure. As shown in Fig.3, the apparatus 300 may comprise at least one processor 301 and at least one memory 302 storing computer program code 303. The at least one memory 302 and the computer program code 303 may be configured to, with the at least one processor 301, cause the apparatus 300 at least to perform any step of the method as described in connection with Fig.1 or Fig.2. Alternatively or additionally, the at least one memory 302 and the computer program code 303 may be configured to, with the at least one processor 301, cause the apparatus 300 at least to perform more or less steps to implement the proposed methods.

[0072] Fig.4 is a block diagram illustrating another apparatus 400 according to some embodiments of the present disclosure. As shown in Fig.4, the apparatus 400

may comprise a transmitting module 401 and a receiving module 402. In an exemplary embodiment, the apparatus 400 may be implemented at a user terminal. The transmitting module 401 may be operable to carry out the operation in block 102, and the receiving module 402 may be operable to carry out the operation in block 104. In another exemplary embodiment, the apparatus 400 may be implemented at a network node. The receiving module 402 may be operable to carry out the operation in block 202, and the transmitting module 401 may be operable to carry out the operation in block 204. Optionally, the transmitting module 401 and/or the receiving module 402 may be operable to carry out more or less steps to implement the proposed methods.

[0073] In general, the various exemplary embodiments may be implemented in hardware or special purpose circuits, software, logic or any combination thereof. For example, some aspects may be implemented in hardware, while other aspects may be implemented in firmware or software which may be executed by a controller, microprocessor or other computing device, although the disclosure is not limited thereto. While various aspects of the exemplary embodiments of this disclosure may be illustrated and described as block diagrams, flow charts, or using some other pictorial representation, it is well understood that these blocks, apparatus, systems, techniques or methods described herein may be implemented in, as non-limiting examples, hardware, software, firmware, special purpose circuits or logic, general purpose hardware or controller or other computing devices, or some combination thereof.

[0074] As such, it should be appreciated that at least some aspects of the exemplary embodiments of the disclosure may be practiced in various components such as integrated circuit chips and modules. It should thus be appreciated that the exemplary embodiments of this disclosure may be realized in an apparatus that is embodied as an integrated circuit, where the integrated circuit may comprise circuitry

(as well as possibly firmware) for embodying at least one or more of a data processor, a digital signal processor, baseband circuitry and radio frequency circuitry that are configurable so as to operate in accordance with the exemplary embodiments of this disclosure.

[0075] It should be appreciated that at least some aspects of the exemplary embodiments of the disclosure may be embodied in computer-executable instructions, such as in one or more program modules, executed by one or more computers or other devices. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types when executed by a processor in a computer or other device. The computer executable instructions may be stored on a computer readable medium such as a hard disk, optical disk, removable storage media, solid state memory, Random Access Memory (RAM), etc. As will be appreciated by one of skill in the art, the function of the program modules may be combined or distributed as desired in various embodiments. In addition, the function may be embodied in whole or partly in firmware or hardware equivalents such as integrated circuits, field programmable gate arrays (FPGA), and the like.

[0076] The present disclosure includes any novel feature or combination of features disclosed herein either explicitly or any generalization thereof. Various modifications and adaptations to the foregoing exemplary embodiments of this disclosure may become apparent to those skilled in the relevant arts in view of the foregoing description, when read in conjunction with the accompanying drawings. However, any and all modifications will still fall within the scope of the non-Limiting and exemplary embodiments of this disclosure.

CLAIMS

What is claimed is:

1. A method for requesting system information, comprising:
 - transmitting (102) a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and
 - receiving (104) one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.
2. The method according to claim 1, wherein the transmission of the request comprises transmitting a preamble for indicating the at least one system information block group.
3. The method according to claim 2, wherein the transmission of the request comprises:
 - selecting, from a plurality of preambles, a preamble associated with the at least one system information block group; and
 - transmitting the request to the network node, wherein the request includes the selected preamble.
4. The method according to claim 2 or 3, wherein the at least one system information block group is indicated by transmission timing of the preamble.
5. The method according to claim 4, wherein the transmission of the request

comprises transmitting the request to the network node in accordance with a selected transmission timing associated with the at least one system information block group.

6. The method according to any one of claims 1 to 5, further comprising:
receiving notification information from the network node, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information.

7. The method according to claim 6, wherein the notification information is included in minimum system information.

8. The method according to any one of claims 1 to 7, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.

9. The method according to any one of claims 1 to 8, further comprising:
receiving an indicator from the network node, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node.

10. The method according to any one of claims 1 to 9, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the user terminal.

11. The method according to any one of claims 6 to 10, wherein the notification information indicates a correspondence between all of preambles and system information block groups.

12. An apparatus (300) for requesting system information, comprising:
at least one processor (301); and
at least one memory (302) comprising computer program code (303),
the at least one memory (302) and the computer program code (303) configured to, with the at least one processor (301), cause the apparatus (300) at least to:
transmit a request for at least one system information block group, each of which comprises one or more system information blocks, to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and
receive one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.
13. The apparatus according to claim 12, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to transmit the request by transmitting a preamble for indicating the at least one system information block group.
14. The apparatus according to claim 13, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to transmit the request by:
selecting, from a plurality of preambles, a preamble associated with the at least one system information block group; and
transmitting the request to the network node, wherein the request includes the selected preamble.
15. The apparatus according to claim 13 or 14, wherein the at least one system

information block group is indicated by transmission timing of the preamble.

16. The apparatus according to claim 15, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to transmit the request by transmitting the request to the network node in accordance with a selected transmission timing associated with the at least one system information block group.

17. The apparatus according to any one of claims 12 to 16, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least further to:

receive notification information from the network node, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information.

18. The apparatus according to claim 17, wherein the notification information is included in minimum system information.

19. The apparatus according to any one of claims 12 to 18, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.

20. The apparatus according to any one of claims 12 to 19, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least further to:

receive an indicator from the network node, wherein the indicator indicates at least one of: which system information block group is being transmitted from the

network node, and which system information block group is scheduled to be transmitted from the network node.

21. The apparatus according to any one of claims 12 to 20, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the apparatus.

22. The apparatus according to any one of claims 17 to 21, wherein the notification information indicates a correspondence between all of preambles and system information block groups.

23. An apparatus (400) for requesting system information, comprising:

a transmitting module (401) configured to transmit a request for at least one system information block group, each of which comprises one or more system information blocks, to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and

a receiving module (402) configured to receive one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.

24. A method for transmission of system information, comprising:

receiving (202) a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and

transmitting (204) one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.

25. The method according to claim 24, wherein the reception of the request comprises receiving a preamble for indicating the at least one system information block group.

26. The method according to claim 25, wherein the reception of the request comprises receiving the preamble which was selected from a plurality of preambles, and wherein the selected preamble is associated with the at least one system information block group.

27. The method according to claim 25 or 26, wherein the at least one system information block group is indicated by transmission timing of the preamble.

28. The method according to claim 27, wherein the reception of the request comprises receiving the request from the user terminal in accordance with a selected transmission timing associated with the at least one system information block group.

29. The method according to any one of claims 24 to 28, further comprises: transmitting notification information to the user terminal, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information.

30. The method according to claim 29, wherein the notification information is included in minimum system information.

31. The method according to any one of claims 24 to 30, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.

32. The method according to any one of claims 24 to 31, further comprising:

transmitting an indicator to the user terminal, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node.

33. The method according to any one of claims 24 to 32, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the user terminal.

34. The method according to any one of claims 29 to 33, wherein the notification information indicates a correspondence between all of preambles and system information block groups.

35. An apparatus (300) for transmission of system information, comprising:

at least one processor (301); and

at least one memory (302) comprising computer program code (303),

the at least one memory (302) and the computer program code (303) configured to, with the at least one processor (301), cause the apparatus (300) at least to:

receive a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and

transmit one or more system information block groups, wherein the one or more system information block groups comprise the at least one system information block group.

36. The apparatus according to claim 35, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to receive the request by receiving a preamble for indicating the at least one system information block group.

37. The apparatus according to claim 36, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to receive the request by receiving the preamble which was selected from a plurality of preambles, and wherein the selected preamble is associated with the at least one system information block group.

38. The apparatus according to claim 36 or 37, wherein the at least one system information block group is indicated by transmission timing of the preamble.

39. The apparatus according to claim 38, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to receive the request by receiving the request from the user terminal in accordance with a selected transmission timing associated with the at least one system information block group.

40. The apparatus according to any one of claims 35 to 39, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least further to transmit notification information to the user terminal, and wherein transmission of the at least one system information

block group is predefined or derived based at least partly on the notification information.

41. The apparatus according to claim 40, wherein the notification information is included in minimum system information.

42. The apparatus according to any one of claims 35 to 41, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.

43. The apparatus according to any one of claims 35 to 42, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least further to:

transmit an indicator to the user terminal, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node.

44. The apparatus according to any one of claims 35 to 43, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the user terminal.

45. The apparatus according to any one of claims 40 to 44, wherein the notification information indicates a correspondence between all of preambles and system information block groups.

46. An apparatus (400) for transmission of system information, comprising:

a receiving module (402) configured to receive a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and

a transmitting module (401) configured to transmit one or more system information block groups, wherein the one or more system information block groups comprise the at least one system information block group.

47. A computer program product comprising a computer-readable medium bearing computer program codes (303) embodied therein for use with a computer, wherein the computer program codes (303) comprise codes for performing the method according to any one of claims 1-11 and claims 24-34.

ABSTRACT

A method for requesting system information is proposed. The method may comprise transmitting a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node. The one or more system information blocks may be grouped according to a feature of the one or more system information blocks. The method may further comprise receiving one or more system information block groups from the network node. The one or more system information block groups may comprise the at least one system information block group.

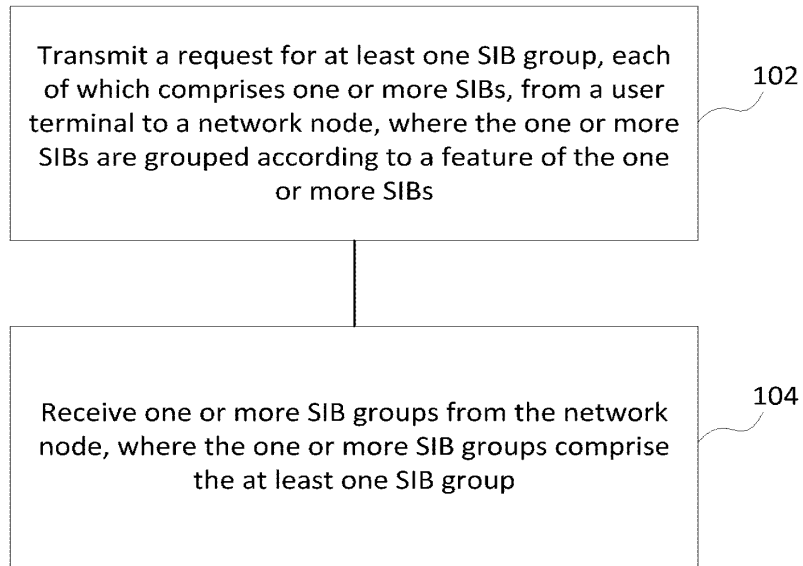


Fig.1

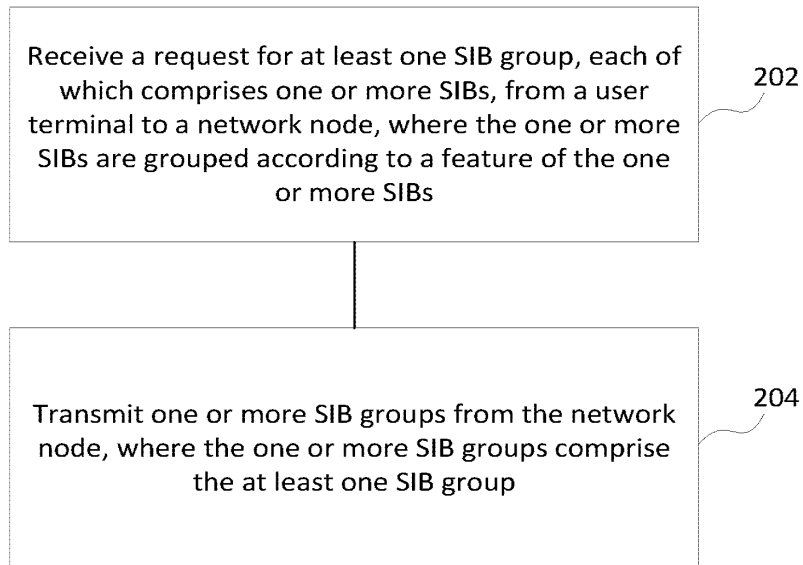


Fig.2

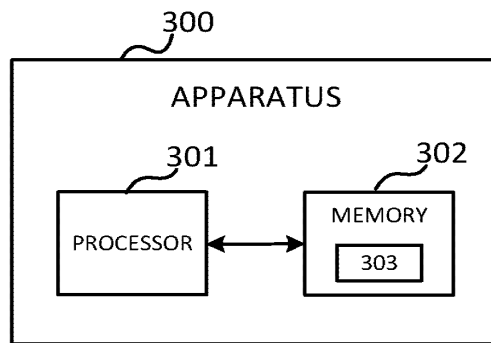


Fig.3

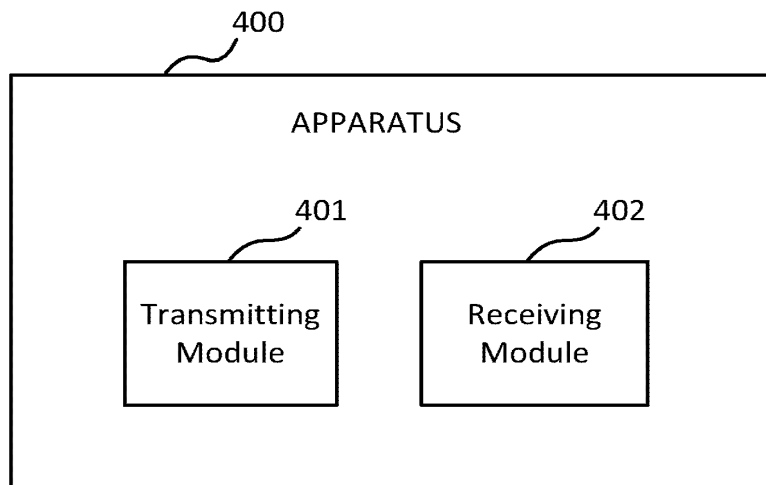


Fig.4

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	
Filing Date	
First Named Inventor	Rui FAN
Title	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
Art Unit	
Examiner Name	
Attorney Docket Number	4906P51954US1

SIGNATURE of Applicant or Patent Practitioner			
Signature	/William W. Kidd; Reg. No. 31,772/	Date (Optional)	2017-10-20
Name	William W. Kidd	Registration Number	31,772
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

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I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)

- Inventor or Joint Inventor (title not required below)
- Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	Date (Optional)	December 18, 2015
Name	Roger S. Burleigh	
Title	Director - Patent Unit U.S.A.	

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

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This collection of information is required by 37 CFR 1.131, 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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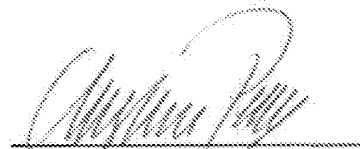
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Stockholm, March 17th, 2017

Telefonaktiebolaget LM Ericsson (publ),



Nina Macpherson
Senior Vice President
and Chief Legal Officer



Christina Petersson
Vice President and
Head of IPR Legal Services

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION			
First Named Inventor/Applicant Name:	Rui FAN			
Filer:	William W. Kidd/Julie Farrar			
Attorney Docket Number:	4906P51954US1			
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:				
NATIONAL STAGE FEE	1631	1	280	280
NATIONAL STAGE SEARCH - ALL OTHER CASES	1632	1	600	600
NATIONAL STAGE EXAM - ALL OTHER CASES	1633	1	720	720
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1615	3	80	240
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1840

Electronic Acknowledgement Receipt

EFS ID:	30721579
Application Number:	15568431
International Application Number:	PCT/CN2017/101576
Confirmation Number:	2730
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
First Named Inventor/Applicant Name:	Rui FAN
Customer Number:	131247
Filer:	William W. Kidd/Julie Farrar
Filer Authorized By:	William W. Kidd
Attorney Docket Number:	4906P51954US1
Receipt Date:	20-OCT-2017
Filing Date:	
Time Stamp:	19:01:26
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$1840
RAM confirmation Number	102317INTEFSW19022100
Deposit Account	506674
Authorized User	Julie Farrar

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37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)
 37 CFR 1.21 (Miscellaneous fees and charges)
 37 CFR 1.492 (National application filing, search, and examination fees)

37 CFR 1.492(a) (Basic national fee only)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	P51954_US1_2017-10-20_371-Transmittal.pdf	387260 c7d1f4863d68f4dafd0d1c15d3e90b3f68f5d67b	no	4

Warnings:

Information:

2	Application Data Sheet	P51954_US1_2017-10-20_ADS.pdf	1823197 90f883f5c948d93563649d32eada283afa686294	no	9
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Warnings:

Information:

3		P51954_US1_2017-10-20_Preliminary_Amendment.pdf	30592 9ca5e735bde0365eb160576361f9dc96f2b8000a	yes	9
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Multipart Description/PDF files in .zip description

Document Description	Start	End
Preliminary Amendment	1	1
Specification	2	2
Claims	3	7
Abstract	8	8
Applicant Arguments/Remarks Made in an Amendment	9	9

Warnings:

Information:

4	Documents submitted with 371 Applications	P51954_US1_2017-10-20_DOC371_PCTCN2017101576.pdf	507194 4ae243b1764671ff5583e2ff34ac39130afe810a	no	42
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Warnings:

Information:

5	Power of Attorney	P51954_US1_2017-10-20_LME_Ericsson_executed_POA_AIA82A_B.pdf	1438307 f80a63d47a29318ecc789fb4a8d7129341941d60	no	3
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:					
6	Fee Worksheet (SB06)	fee-info.pdf	36964 e919f9f4ae332e0ebb62f70941fc1b85b5371b9a	no	2
Warnings:					
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Total Files Size (in bytes):			4223514		
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OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

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7F, New Era Building, 26 Pinganli Xidajie, Xicheng
District
Beijing 100034
CHINE

Date of mailing (<i>day/month/year</i>) 04 October 2017 (04.10.2017)	
Applicant's or agent's file reference PF170510PCT	IMPORTANT NOTIFICATION
International application No. PCT/CN2017/101576	International filing date (<i>day/month/year</i>) 13 September 2017 (13.09.2017)

1. The following indications appeared on record concerning:

 the applicant the inventor the agent the common representative

Name and Address FRENGER, Pal Enskiftesgatan 8, SE-583 34 Linköeping Sweden	State of Nationality	State of Residence
	Telephone No.	
	Facsimile No.	
	E-mail address	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

 the person the name the address the nationality the residence

Name and Address FRENGER, Pål Enskiftesgatan 8, SE-583 34 Linköeping Sweden	State of Nationality	State of Residence
	Telephone No.	
	Facsimile No.	
	E-mail address <input type="checkbox"/> Notifications by e-mail authorized	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

 the receiving Office the International Preliminary Examining Authority
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 other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Shi Linlin e-mail pct.team2@wipo.int Telephone No. +41 22 338 74 02
Facsimile No. +41 22 338 89 65	

Form PCT/IB/306 (January 2009)

I/EECEY2GWP9Q7J0

PCT REQUEST

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0	For receiving Office use only	
0-1	International Application No.	PCT/CN2017/101576
0-2	International Filing Date	13 September 2017 (13.09.2017)
0-3	Name of receiving Office and "PCT International Application"	RO/CN
0-4	Form PCT/RO/101 PCT Request	
0-4-1	Prepared Using	CEPCT Version 1.01.00 MT/FOP 20140331/0.20.5.21
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	State Intellectual Property Office of the People's Republic of China (RO/CN)
0-7	Applicant's or agent's file reference	PF170510PCT
I	Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
II	Applicant	
II-1	This person is	Applicant only
II-2	Applicant for	All designated States
II-4	Name	TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)
II-5	Address	SE-164 83 Stockholm Sweden
II-6	State of nationality	SE
II-7	State of residence	SE
II-8	Telephone No.	
II-9	Facsimile No.	
II-11	Applicant's registration No. with the Office	

PCT REQUEST

Print Out (Original in Electronic Form)

III-1	Applicant and/or inventor	
III-1-1	This person is	Applicant and inventor
III-1-2	Applicant for	SC
III-1-4	Name (LAST, First)	FAN, Rui
III-1-5	Address	No.5 Lize East Street, Chaoyang District Beijing 100102 China
III-1-6	State of nationality	CN
III-1-7	State of residence	CN
III-1-11	Applicant's registration No. with the Office	
III-2	Applicant and/or inventor	
III-2-1	This person is	Inventor only
III-2-3	Inventor for	
III-2-4	Name (LAST, First)	LIU, Jinhua
III-2-5	Address	No.5 Lize East Street, Chaoyang District Beijing 100102 China
III-3	Applicant and/or inventor	
III-3-1	This person is	Inventor only
III-3-3	Inventor for	
III-3-4	Name (LAST, First)	FRENGER, Pal
III-3-5	Address	Enskiftesgatan 8, SE-583 34 LINKOEPING Sweden

PCT REQUEST

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IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	Agent
IV-1-1	Name	ZHONGZI LAW OFFICE
IV-1-2	Address	7F, New Era Building, 26 Pinganli Xidajie, Xicheng District Beijing 100034 China
IV-1-3	Telephone No.	86-10-66091188
IV-1-4	Facsimile No.	86-10-66091199
IV-1-5	e-mail	mail@zhongziip.com
IV-1-5(a)	E-mail authorization The receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority are authorized to use this e-mail address, if the Office or Authority so wishes, to send notifications issued in respect of this international application:	as advance copies followed by paper notifications
IV-1-6	Agent's registration No.	11247
V	DESIGNATIONS	
V-1	The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.	
V-2	Item V-2 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.	
VI-1	Priority claim of earlier international application	
VI-1-1	Filing date	04 January 2017 (04.01.2017)
VI-1-2	Number	PCT/CN2017/070130
VI-1-3	PCT receiving Office	CN

PCT REQUEST

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VI-2	Priority document request The International Bureau is requested to obtain from a digital library a certified copy of the earlier application(s) identified above as item(s), using, where applicable, the access code(s) indicated:	VI-1 Access code: E5A1	
VI-3	Incorporation by reference : where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.		
VII-1	International Searching Authority Chosen	State Intellectual Property Office of the People's Republic of China (ISA/CN)	
VIII	Declarations	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	-	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	-	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	-	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	-	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	-	
IX	Check list	Number of sheets	Electronic file(s) attached
IX-1	Request (including declaration sheets)	5	✓
IX-2	Description	21	✓
IX-3	Claims	10	✓
IX-4	Abstract	1	✓
IX-5	Drawings	2	✓
IX-7	TOTAL	39	

PCT REQUEST

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	Accompanying Items	Paper document(s) attached	Electronic file(s) attached
IX-8	Fee calculation sheet	-	✓
IX-11	Copy of general power of attorney	-	✓
IX-18	PCT-SAFE physical media	-	-
IX-20	Figure of the drawings which should accompany the abstract	Fig.1	
IX-21	Language of filing of the international application	English	
X-1	Signature of applicant, agent or common representative	//ZHONGZI LAW OFFICE/	
X-1-1	Name	ZHONGZI LAW OFFICE	
X-1-2	Name of signatory	ZHONGZI LAW OFFICE	
X-1-3	Capacity (if such capacity is not obvious from reading the request)	Agent	

FOR RECEIVING OFFICE USE ONLY

10-1	Date of actual receipt of the purported international application	13 September 2017 (13.09.2017)
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/CN
10-6	Transmittal of search copy delayed until search fee is paid	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	Date of receipt of the record copy by the International Bureau	
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference PF170510PCT	FOR FURTHER ACTION		See item 4 below
International application No. PCT/CN2017/101576	International filing date (<i>day/month/year</i>) 13 September 2017 (13.09.2017)	Priority date (<i>day/month/year</i>) 04 January 2017 (04.01.2017)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)			

<p>1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>																								
<p>3. This report contains indications relating to the following items:</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> <p>4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).</p>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
<input checked="" type="checkbox"/>	Box No. I	Basis of the report																						
<input type="checkbox"/>	Box No. II	Priority																						
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability																						
<input type="checkbox"/>	Box No. IV	Lack of unity of invention																						
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																						
<input type="checkbox"/>	Box No. VI	Certain documents cited																						
<input type="checkbox"/>	Box No. VII	Certain defects in the international application																						
<input type="checkbox"/>	Box No. VIII	Certain observations on the international application																						

<p align="center">The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. +41 22 338 82 70</p>	<p>Date of issuance of this report 09 July 2019 (09.07.2019)</p>
	<p>Authorized officer</p> <p align="center">Xin Wang</p> <p>e-mail: pct.team2@wipo.int</p>

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: 100034 China 7F, New Era Building, 26 Pinganli Xidajie, Xicheng District, Beijing ZHONGZI LAW OFFICE
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PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing <i>(day/month/year)</i> 30 November 2017	
Applicant's or agent's file reference PF170510PCT	FOR FURTHER ACTION See paragraph 2 below
International application No. PCT/CN2017/101576	International filing date <i>(day/month/year)</i> 13 September 2017
Priority date <i>(day/month/year)</i> 04 January 2017	
International Patent Classification (IPC) or both national classification and IPC H04L 29/06(2006.01)i; H04W 72/12(2009.01)i	
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (PUBL) et al	

<p>1. This opinion contains indications relating to the following items:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Box No. I Basis of the opinion <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Rule 43<i>bis</i>.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application <p>2. FURTHER ACTION</p> <p>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<i>bis</i>(b) that written opinions of this International Searching Authority will not be so considered.</p> <p>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.</p> <p>For further options, see Form PCT/ISA/220.</p>
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Name and mailing address of the ISA/ STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA China 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088 Facsimile No. (86—10) 62019451	Date of completion of this opinion 24 November 2017	Authorized officer PENG,Liang Telephone No. (86-10)62413350
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Form PCT/ISA/237 (Cover sheet) (July 2011)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/CN2017/101576

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 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/CN2017/101576

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement		
1. Statement	Novelty (N)	Claims	1-47 ----- None -----
			YES NO
	Inventive step (IS)	Claims	1-47 ----- None -----
			YES NO
	Industrial applicability (IA)	Claims	1-47 ----- None -----
			YES NO
2. Citations and explanations :			
[1] Reference is made to the following document:			
[2] D1: CN 101217689 A, 09.07.2008			
[3] Novelty and Inventive Step:			
[4] D1 discloses (see description, page 1 lines 13 -17, page 5 line 2- page 6 line 10) a method for requesting system information, comprising: transmitting a request for at least one system information block group, each of which comprises one or more system information blocks from a user terminal to a network node, and receiving one or more system information block groups from the network node based on schedule information of the system information.			
[5] The technical features "the one or more system information blocks are grouped according to a feature of the one or more system information blocks" and "the one or more system information block groups comprise the at least one system information block group" as defined in claims 1, 24 are not explicitly or implicitly disclosed in D1. Therefore claims 1, 24 are novel in the sense of PCT Article 33(2). Meanwhile, claims 1, 24 are neither indicated nor obviously rendered from the prior art, so claims 1, 24 are not obvious to a person skilled in the art on the basis of the prior art. Therefore claims 1, 24 involve an inventive step under PCT Article 33(3).			
[6] Claims 2-11 are dependent on claim 1 directly or indirectly, claims 25-34 are dependent on claim 24 directly or indirectly, therefore they also meet the requirements of PCT with respect to novelty (PCT Article 33(2)) and an inventive step (PCT Article 33(3)).			
[7] Claim 12 claims an apparatus which comprises the processor and memory, wherein the processor is configured to implement corresponding steps in claim 1. Hence, based on the analysis of claim 1, claim 12 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).			
[8] Claim 23 claims an apparatus, each component in the product of claim 23 completely corresponds to each step in the process of claim 1. Hence, based on the analysis of claim 1, claim 23 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).			
[9] Claim 35 claims an apparatus which comprises the processor and memory, wherein the processor is configured to implement corresponding steps in claim 24. Hence, based on the analysis of claim 24, claim 35 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).			
[10] Claim 46 claims an apparatus, each component in the product of claim 46 completely corresponds to each step in the process of claim 24. Hence, based on the analysis of claim 24, claim 46 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).			
[11] Claims 13-22 are dependent on claim 12 directly or indirectly, claims 36-45 are dependent on claim 35 directly or indirectly, therefore they also meet the requirements of PCT with respect to novelty (PCT Article 33(2)) and an inventive step (PCT Article 33(3)).			
[12] Claim 47 claims a computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer, wherein the computer program codes comprise codes for performing the method according to any one of claims 1-11 and claims 24-34. Hence, based on the analysis of claims 1-11 and claims 24-34, claim 47 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).			

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/CN2017/101576

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

[13] **Industrial Applicability:**

[14] Claims 1 - 47 can find industrial applicability in the technical field of wireless communication, and thus meet the requirements of PCT Article 33(4).

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization

International Bureau

(43) International Publication Date
12 July 2018 (12.07.2018)



(10) International Publication Number
WO 2018/126731 A1

- (51) **International Patent Classification:**
H04L 29/06 (2006.01) *H04W 72/12* (2009.01)
- (21) **International Application Number:** PCT/CN2017/101576
- (22) **International Filing Date:** 13 September 2017 (13.09.2017)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
PCT/CN2017/070130
04 January 2017 (04.01.2017) CN
- (71) **Applicant:** TELEFONAKTIEBOLAGET LM ERICSSON (PUBL) [SE/SE]; S-164 83 Stockholm (SE).
- (72) **Inventor; and**
(71) **Applicant (for SC only):** FAN, Rui [CN/CN]; No.5 Lize East Street, Chaoyang District, Beijing 100102 (CN).
- (72) **Inventors:** LIU, Jinhua; No.5 Lize East Street, Chaoyang District, Beijing 100102 (CN). FRENGER, Pål; Enskiftesgatan 8, S-583 34 Linköping (SE).
- (74) **Agent:** ZHONGZI LAW OFFICE; 7F, New Era Building, 26 Pinganli Xidajie, Xicheng District, Beijing 100034 (CN).
- (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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, 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, KM, ML, MR, NE, SN, TD, TG).

(54) **Title:** ON-DEMAND REQUEST FOR SYSTEM INFORMATION

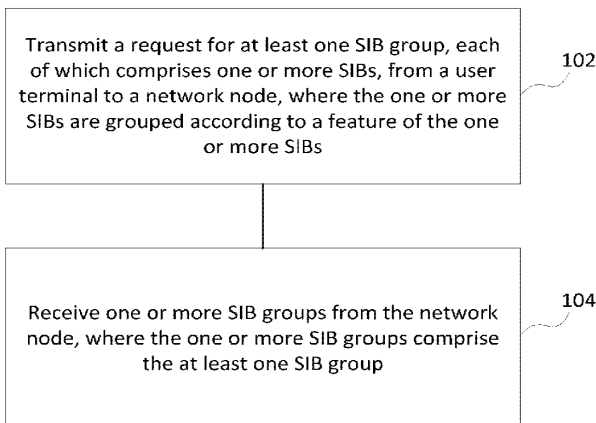


Fig.1

(57) **Abstract:** A method for requesting system information is proposed. The method may comprise transmitting a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node. The one or more system information blocks may be grouped according to a feature of the one or more system information blocks. The method may further comprise receiving one or more system information block groups from the network node. The one or more system information block groups may comprise the at least one system information block group.

[Continued on next page]

WO 2018/126731 A1

Published:

— with international search report (Art. 21(3))

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The International Bureau certifies that a copy of the patent application indicated below has been available to the WIPO Digital Access Service since the date of availability indicated, and that the patent application has been available to the indicated Office(s) as of the date specified following the relevant Office code:

Document details: Country/Office: CN

Filing date: 04 Jan 2017 (04.01.2017)

Application number: PCT/CN2017/070130

Date of availability of document: 11 Jan 2017 (11.01.2017)

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Date of issue of this certificate: 05 Oct 2017 (05.10.2017)

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STATE INTELLECTUAL PROPERTY OFFICE
OF THE PEOPLE'S REPUBLIC OF CHINA



证 明

CERTIFICATE

本证明之附件是向中国专利局作为受理局提交的下列国际申请文件副本。

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY OF THE BELOW IDENTIFIED INTERNATIONAL APPLICATION THAT WAS FILED WITH THE CHINESE PATENT OFFICE AS RECEIVING OFFICE.

国 际 申 请 号 : PCT/CN2017/070130

INTERNATIONAL APPLICATION NUMBER

国 际 申 请 日 : 2017年01月04日

INTERNATIONAL FILING DATE

发 明 名 称 : ON-DEMAND REQUEST FOR SYSTEM INFORMATION

TITLE OF INVENTION

局长
COMMISSIONER
申长雨

2017 年 01 月 11 日

PCT REQUEST

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0	For receiving Office use only	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	Form PCT/RO/101 PCT Request	
0-4-1	Prepared Using	CEPCT Version 1.01.00 MT/FOP 20140331/0.20.5.21
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	State Intellectual Property Office of the People's Republic of China (RO/CN)
0-7	Applicant's or agent's file reference	PF160799PCT
I	Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
II	Applicant	
II-1	This person is	Applicant only
II-2	Applicant for	All designated States
II-4	Name	TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)
II-5	Address	SE-164 83 Stockholm Sweden
II-6	State of nationality	SE
II-7	State of residence	SE
II-8	Telephone No.	
II-9	Facsimile No.	
II-11	Applicant's registration No. with the Office	

PCT REQUEST

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III-1	Applicant and/or inventor	
III-1-1	This person is	Applicant and inventor
III-1-2	Applicant for	SC
III-1-4	Name (LAST, First)	FAN, Rui
III-1-5	Address	No.5 Lize East Street, Chaoyang District Beijing 100102 China
III-1-6	State of nationality	CN
III-1-7	State of residence	CN
III-1-11	Applicant's registration No. with the Office	
III-2	Applicant and/or inventor	
III-2-1	This person is	Inventor only
III-2-3	Inventor for	
III-2-4	Name (LAST, First)	LIU, Jinhua
III-2-5	Address	No.5 Lize East Street, Chaoyang District Beijing 100102 China
III-3	Applicant and/or inventor	
III-3-1	This person is	Inventor only
III-3-3	Inventor for	
III-3-4	Name (LAST, First)	FRENGER, Pal
III-3-5	Address	Enskiftesgatan 8, SE-583 34 LINKOEPING Sweden

PCT REQUEST

Print Out (Original in Electronic Form)

IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	Agent
IV-1-1	Name	ZHONGZI LAW OFFICE
IV-1-2	Address	7F, New Era Building, 26 Pinganli Xidajie, Xicheng District Beijing 100034 China
IV-1-3	Telephone No.	86-10-66091188
IV-1-4	Facsimile No.	86-10-66091199
IV-1-5	e-mail	mail@zhongziip.com
IV-1-5(a)	E-mail authorization The receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority are authorized to use this e-mail address, if the Office or Authority so wishes, to send notifications issued in respect of this international application:	as advance copies followed by paper notifications
IV-1-6	Agent's registration No.	11247
V	DESIGNATIONS	
V-1	The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.	
V-2	Item V-2 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.	
VI-1	Priority Claim	NONE
VII-1	International Searching Authority Chosen	State Intellectual Property Office of the People's Republic of China (ISA/CN)

PCT REQUEST

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VIII	Declarations	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	-	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	-	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	-	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	-	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	-	
IX	Check list	Number of sheets	Electronic file(s) attached
IX-1	Request (including declaration sheets)	5	✓
IX-2	Description	19	✓
IX-3	Claims	6	✓
IX-4	Abstract	1	✓
IX-5	Drawings	2	✓
IX-7	TOTAL	33	
	Accompanying Items	Paper document(s) attached	Electronic file(s) attached
IX-8	Fee calculation sheet	-	✓
IX-11	Copy of general power of attorney	-	✓
IX-18	PCT-SAFE physical media	-	-
IX-20	Figure of the drawings which should accompany the abstract	Fig.1	
IX-21	Language of filing of the international application	English	
X-1	Signature of applicant, agent or common representative	/ZHONGZI LAW OFFICE/	
X-1-1	Name	ZHONGZI LAW OFFICE	
X-1-2	Name of signatory	ZHONGZI LAW OFFICE	
X-1-3	Capacity (if such capacity is not obvious from reading the request)	Agent	

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10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/CN
10-6	Transmittal of search copy delayed until search fee is paid	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	Date of receipt of the record copy by the International Bureau	
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ON-DEMAND REQUEST FOR SYSTEM INFORMATION

FIELD OF THE INVENTION

[0001] The present disclosure generally relates to communications, and more specifically, relates to wireless communications.

BACKGROUND

[0002] In a communication network such as Long Term Evolution (LTE) system, system information (SI) is important as it can provide necessary information to a user terminal, such as a user equipment (UE) or a wireless device, for linking with the communication network. In new radio (NR), SI may be classified into minimum SI and other SI. Minimum SI is the SI that a user terminal must read before it can know how to access the network. Other SI is the SI not within minimum SI. SI may be transmitted to the user terminal in a master information block (MIB) and/or a system information block (SIB). For example, minimum SI may correspond to MIB, SIB1 and SIB2 in LTE. Other SI may correspond to those remaining SIBs. Since other SI is not necessary for a user terminal to access network, in order to achieve energy efficiency, it may be desirable that the SI may be requested on demand.

SUMMARY

[0003] This summary is provided to introduce a selection of concepts in a simplified form that are further described below in detailed description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

[0004] The present disclosure proposes a solution of on-demand request for SI, which may enable a communication network to transmit or broadcast SI, such as

other SI as mentioned previously, according to a request for the SI from a user terminal.

[0005] According to a first aspect of the present disclosure, there is provided a method for requesting SI, which may be performed at an apparatus such as a user terminal. The method may comprise transmitting a request for at least one group of SI from a user terminal to a network node. The SI may be grouped according to a feature of the SI. The method may further comprise receiving one or more groups of SI from the network node. The one or more groups of SI may comprise the at least one group of SI.

[0006] In an exemplary embodiment, the method according to the first aspect of the present disclosure may further comprise receiving an indicator from the network node. The indicator may indicate at least one of: which group of SI is being transmitted from the network node, and which group of SI is scheduled to be transmitted from the network node.

[0007] According to a second aspect of the present disclosure, there is provided an apparatus for requesting SI. The apparatus may comprise at least one processor and at least one memory comprising computer program code. The at least one memory and the computer program code may be configured to, with the at least one processor, cause the apparatus at least to perform any step of the method according to the first aspect of the present disclosure.

[0008] According to a third aspect of the present disclosure, there is provided a computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer. The computer program codes may comprise code for performing any step of the method according to the first aspect of the present disclosure.

[0009] According to a fourth aspect of the present disclosure, there is provided an apparatus for requesting SI. The apparatus may comprise a transmitting module and a receiving module. In accordance with some exemplary embodiments, the transmitting module may be operable to carry out at least the transmitting step of the method according to the first aspect of the present disclosure. The receiving module may be operable to carry out at least the receiving step of the method according to the first aspect of the present disclosure.

[0010] According to a fifth aspect of the present disclosure, there is provided a method for transmission of SI, which may be performed at an apparatus such as a network node. The method may comprise receiving a request for at least one group of SI from a user terminal to a network node. The SI may be grouped according to a feature of the SI. The method may further comprise transmitting one or more groups of SI from the network node. The one or more groups of SI may comprise the at least one group of SI.

[0011] In an exemplary embodiment, the method according to the fifth aspect of the present disclosure may further comprise transmitting an indicator from the network node. The indicator may indicate at least one of: which group of SI is being transmitted from the network node, and which group of SI is scheduled to be transmitted from the network node.

[0012] According to a sixth aspect of the present disclosure, there is provided an apparatus for transmission of SI. The apparatus may comprise at least one processor and at least one memory comprising computer program code. The at least one memory and the computer program code may be configured to, with the at least one processor, cause the apparatus at least to perform any step of the method according to the fifth aspect of the present disclosure.

[0013] According to a seventh aspect of the present disclosure, there is provided

a computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer. The computer program codes may comprise code for performing any step of the method according to the fifth aspect of the present disclosure.

[0014] According to an eighth aspect of the present disclosure, there is provided an apparatus for transmission of SI. The apparatus may comprise a receiving module and a transmitting module. In accordance with some exemplary embodiments, the receiving module may be operable to carry out at least the receiving step of the method according to the fifth aspect of the present disclosure. The transmitting module may be operable to carry out at least the transmitting step of the method according to the fifth aspect of the present disclosure.

[0015] In accordance with some exemplary embodiments, the feature of the SI may comprise at least one of functionality and periodicity of the SI.

[0016] In accordance with some exemplary embodiments, the request for the at least one group of SI may comprise a preamble for indicating the at least one group of SI. The at least one group of SI may be indicated by a sequence of the preamble or the transmission timing of the preamble. For example, the indication of the at least one group of SI by the preamble may be predefined or derived based at least partly on notification information from the network node.

[0017] In accordance with some exemplary embodiments, the one or more groups of SI from the network node may further comprise at least another group of SI which is not requested by the user terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The disclosure itself, the preferable mode of use and further objectives are

best understood by reference to the following detailed description of the embodiments when read in conjunction with the accompanying drawings, in which:

[0019] Fig.1 is a flowchart illustrating a method for requesting SI according to an embodiment of the present disclosure;

[0020] Fig.2 is a flowchart illustrating a method for transmission of SI according to another embodiment of the present disclosure;

[0021] Fig.3 is a block diagram illustrating an apparatus according to an embodiment of the present disclosure; and

[0022] Fig.4 is a block diagram illustrating another apparatus according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0023] The embodiments of the present disclosure are described in detail with reference to the accompanying drawings. Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present disclosure should be or are in any single embodiment of the disclosure. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present disclosure. Furthermore, the described features, advantages, and characteristics of the disclosure may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the disclosure may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the

disclosure.

[0024] In a wireless network such as new radio (NR), SI may be broadcasted by a network node, such as a base station or a next generation Node B (gNB), in a cell to all user terminals monitoring the specific cell. It is important for a user terminal to maintain the required SI because otherwise it cannot interact with the network in an interoperable manner. As mentioned previously, minimum SI in NR corresponds to MIB, SIB1 and SIB2 in LTE. There are some assumptions about how to request other SI from the network. For example, some messages like MSG1 and/or MSG3 may be used to carry a request for other SI.

[0025] If using one preamble of MSG1 to carry a request for all other SI, then it may result in unnecessary transmission of some undesired other SI. This is because there is quite a lot of other SI in the system and the network may have to broadcast all other SI when it receives such preamble to request other SI. However, a user terminal may not need all the other SI.

[0026] If using MSG3 to request other SI, since there could be contention during a random access procedure, the network may not be able to detect MSG3 reliably in time. In addition, there are additional overhead and delay because more messages are transmitted for requesting other SI.

[0027] The present disclosure proposes a solution of on-demand request for SI. In the proposed solution, SI may be classified into several relevant or correlated groups. When a user terminal wants to request some specific SI, it can request from a network node a group of SI in which the specific SI is comprised. Then, the network node can know which group of SI the user terminal actually needs, and broadcast the requested group of SI accordingly. In this way, the network node can transmit or broadcast the SI to the user terminal with more energy efficiency. On the other hand, transmission resources and energy also can be saved from the view point of the user

terminal, since it does not need to send additional SI request if another user terminal has already sent a request for the same SI as required by the user terminal.

[0028] Fig.1 is a flowchart illustrating a method for requesting SI according to an embodiment of the present disclosure. The method illustrated in Fig.1 may be performed by an apparatus implemented at a user terminal or communicatively coupled to a user terminal. In accordance with the exemplary embodiment, the user terminal may comprise a UE, a mobile station, a wireless device, a personal digital assistant (PDA), a laptop computer, a tablet computer, a smart phone, a portable device, or any other user device being capable of participating in communication of a wireless network.

[0029] According to the exemplary method illustrated in Fig.1, a request for at least one group of SI may be transmitted from a user terminal to a network node at step 102. In the exemplary embodiment, the SI may be grouped or classified according to a feature of the SI. It will be realized that the SI mentioned here may comprise other SI than minimum SI in the context of NR. It is noted that the term of “SI” used herein and the exemplary illustration of grouping of SI are not limited to NR and LTE. The proposed methods, apparatus and related products herein may also be applicable to other suitable network environments, although some exemplary embodiments are described with respect to NR and LTE. As described previously, minimum SI corresponds to MIB, SIB1 and SIB2 in LTE, and accordingly other SI corresponds to SIB3 until SIB21. The feature of the SI may be learned from the SIB definition in LTE. For example, the feature of the SI may comprise at least one of functionality and periodicity of the SI. However, other suitable rules may also be expected to be applicable for learning more features of SI.

[0030] Table 1 exemplarily shows the functional description of some SIBs in LTE. It can be seen from Table 1 that the SIBs carrying SI are not fully independent

to each other. For example, SIB3 to SIB8 are all related to how to do cell reselection, although each SIB has different responsibility. Therefore, the SI in these SIBs can be grouped together. For SIB10 to SIB12, these SIBs are all related to warning and alert. Therefore, the SI in these SIBs can be group together. For SIB18 to SIB19, the SIBs are both related to device-to-device (D2D) sidelink communication. Accordingly, the SI in these two SIBs can be grouped together. The remaining SI can be grouped together. Thus, the SI carried by the SIBs listed in Table 1 may be classified into four groups.

Table 1

SIB	Description
SIB3	Parameters required for intra-frequency, inter-frequency and I-RAT cell re-selections
SIB4	Information regarding INTRA-frequency neighboring cells (E-UTRA)
SIB5	Information regarding INTER-frequency neighboring cells (E-UTRA)
SIB6	Information for re-selection to INTER-RAT (UTRAN cells)
SIB7	Information for re-selection to INTER-RAT (GERAN cells)
SIB8	Information for re-selection to INTER-RAT (CDMA2000)
...	...
SIB10	ETWS (Earthquake and Tsunami Warning System) information (Primary notification)
SIB11	ETWS (Earthquake and Tsunami Warning System) information (Secondary notification)
SIB12	Commercial Mobile Alert Service (CMAS) information.
...	...
SIB18	Sidelink UE information procedure, sidelink communication related resource configuration information
SIB19	Sidelink UE information procedure, sidelink discovery related resource configuration information
...	...

[0031] It can be seen that different SIBs and the SI thereof may be grouped according to their functionalities. Optionally, the SI may be classified into more or less groups than four groups. For example, since the transmission of SI related to

warning and alert is triggered by the network instead of by a user terminal, the SI associated with SIB10 to SIB12 does not need to be requested by the user terminal at all. Then in total there are three groups of SI to be requested. Other ways to group SI are also possible. For example, SI related to cell reselection may be classified into one group, while all others may be classified into another group.

[0032] Another feature of SI which may be used to classify the SI is periodicity. For example, SI with the same or similar transmission periodicity may be grouped together. Use LTE SI transmission periodicity as an example, where the SI each with periodicity of 80ms, 160ms, 320ms, 640ms, 1280ms, 2560ms and 5120ms may be classified into seven groups of SI. Alternatively, the SI may be classified into three groups SI with the first group comprising SI with periodicities of 80ms, 160ms, the second group comprising SI with periodicities of 320ms, 640ms, and the third group comprising SI with periodicities of 1280ms, 2560ms, 5120ms. It will be realized that SI may be classified into the desired number of groups according to the periodicity of SI.

[0033] In accordance with the exemplary method illustrated in Fig.1, the user terminal can transmit a request for at least one group of SI to the network node. The request may comprise a preamble for indicating the at least one group of SI. For example, the at least one group of SI may be indicated by a sequence of the preamble or the transmission timing of the preamble. Thus, the user terminal can selectively request the required SI from the network node.

[0034] In an exemplary embodiment, selective requests for SI groups may be transmitted from the user terminal by using different preamble sequences, which may be differentiated by indexes of the preambles. One preamble sequence may correspond to a predetermined combination of SI groups. Take 3 preambles as an example. In alternative I, preambles 1 to 3 may be used to indicate SI groups 1 to 3,

respectively, where SI group 1 is related to cell reselection, SI group 2 is related to sidelink communication, and SI group 3 comprises the remaining SI. According to this alternative, a user terminal needing multiple SI groups (for example, comprising SI groups 1 and 2) may be required to send multiple SI requests (for example, comprising preambles 1 and 2) to a network node.

[0035] It will be realized that the usage of multiple preambles can be in different ways. For example, in alternative II, preambles 1 to 3 may be used to indicate SI group 1, SI groups 1+2, and SI groups 1+2+3, respectively. According to this alternative, a user terminal can always select a corresponding preamble to get all desired SI. Compared to alternative I, alternative II may save the preamble resource/transmission but the probability to transmit the undesired SI is higher than alternative I.

[0036] Thus, when SI groups in the network are indicated by using different preamble sequences, the user terminal can send the corresponding preamble to the network node if the user terminal wants to request SI from at least one of the SI groups. When the network node detects such preamble, it can therefore only transmit or broadcast SI within the indicated SI groups according to the detected preamble.

[0037] In accordance with the exemplary method illustrated in Fig.1, the indication of the at least one group of SI by the preamble may be predefined or derived based at least partly on notification information from the network node. For example, the preambles which are used to request on-demand transmission of SI carried by SIBs can be predefined according to a specified rule known by the user terminal and the network node. Alternatively or additionally, the correspondence between preambles and SI groups also can be informed in certain notification information, such as minimum SI from the network node.

[0038] In an exemplary embodiment, if the correspondence between preambles

and SI groups is informed in minimum SI, the minimum SI can indicate only one preamble for one group of SI, while there is a specified rule for the user terminal to derive other preambles for other groups of SI. For example, it is assumed that the specified rule is that all the preambles for requesting SI are with consecutive indexes, and each preamble with an index increased by one indicates one more group of SI. As such, for alternative II as mentioned previously, if it is informed in the minimum SI that a preamble with index 'n' is used to indicate SI group 1, then according to the specified rule, the user terminal may know that a preamble with index 'n+1' is used to indicate SI groups 1+2, and a preamble with index 'n+2' is used to indicate SI groups 1+2+3. It will be appreciated that other suitable rules also may be applicable to determine preambles for selective request and transmission of SI. For example, the preambles for requesting SI may be with inconsecutive indexes, and/or the correspondence between all of preambles and SI groups may be informed in the minimum SI from the network node.

[0039] In another exemplary embodiment, selective requests for SI groups may be transmitted from the user terminal by using different preamble timing. In this embodiment, only one preamble sequence may be used to request SI transmission from the network node, but the timing at which the preamble is sent can be utilized to determine which group of SI is requested. Therefore, compared with the embodiment where different preamble sequences are used to indicate multiple SI groups, using different transmission timing of one preamble to indicate multiple SI groups may save transmission resources.

[0040] Assuming there are three SI groups, including SI group A with periodicities of 80ms, 160ms, SI group B with periodicities of 320ms, 640ms, and SI group C with periodicities of 1280ms, 2560ms, 5120ms. The respective minimum periodicities of SI groups A, B and C are 80ms, 320ms and 1280ms, respectively. Then the timing at which a SI group is requested by sending a preamble determines

which SI group is requested. In an exemplary embodiment, the requested SI group may be determined according to whether the frame corresponding to the preamble sent by the user terminal has an integer multiple period of the minimum periodicity of the SI group. As a further rule, if the period of that frame is an integer multiple of the minimum periodicities of several SI groups, then the SI group with the largest periodicity (or alternatively the SI group with the smallest periodicity) may be determined as the requested SI group. In another exemplary embodiment, the requested SI group may be determined according to the frame corresponding to the preamble sent by the user terminal and the latest next frame in which SI can be transmitted or broadcasted. In this embodiment, the frame corresponding to the preamble may have a period which is not an integer multiple of the minimum periodicity of the SI group.

[0041] Use the LTE frame as an example, where the frame length is 10ms. If the number of the frame corresponding to the preamble is 24, then the period of the frame is 240ms, which is an integer multiple of the minimum periodicity 80ms of SI group A. This means that the user terminal wants to request SI group A. Similarly, if the number of the frame corresponding to the preamble is 96, then the period of the frame is 960ms, which is an integer multiple of the minimum periodicity 80ms of SI group A and the minimum periodicity 320ms of SI group B. This means that the user terminal wants to request both SI group A and SI group B but not SI group C. Or as the further rule, it is SI group B that is requested instead of SI group A plus B, because the minimum periodicity of SI group B is larger than that of SI group A. Alternatively, if the frame number corresponding to the preamble is 22, then the number of the latest next frame to transmit or broadcast SI is 24, according to a predefined criterion. Since the period of this latest next frame is 240ms, which is an integer multiple of the minimum periodicity of SI group A, this could mean that the user terminal wants to request just SI group A.

[0042] Thus, when the user terminal wants to request certain SI, it can send a preamble as a request to the network node at the specific timing or frame. When the network node detects this preamble, it can determine which SI group the user terminal wants to request, according to the transmission timing of the preamble. Accordingly, the network node can only transmit or broadcast SI within the corresponding SI group in the network. This can eliminate unnecessary SI transmissions in the network.

[0043] Referring back to Fig.1, the user terminal may receive one or more groups of SI from the network node at step 104. The one or more groups of SI may comprise the at least one group of SI requested by the user terminal at step 102. Optionally, the one or more groups of SI may further comprise at least another group of SI which is not requested by the user terminal. For example, preamble 3 is used to indicate SI groups 1+2+3, as described previously in alternative II. If the user terminal wants to obtain SI within SI group 1, then the user terminal may also obtain SI groups 2 and 3 in addition to SI group 1, when using preamble 3 to request SI group 1 from the network node. Apparently, SI groups 2 and 3 are not actually needed by the user terminal. In another example, since the network node may transmit or broadcast multiple groups of SI requested by different user terminals in the network, the user terminal may receive one or more groups of SI requested by other user terminals.

[0044] Fig.2 is a flowchart illustrating a method for transmission of SI according to another embodiment of the present disclosure. The method illustrated in Fig.2 may be performed by an apparatus implemented at a network node or communicatively coupled to a network node. In accordance with the exemplary embodiment, the network node may comprise an evolved Node B (eNB), a gNB, an access point (AP), a base station (BS), a communication node, a control center, a relay station, a repeater, or any other network device being capable of participating in communication of a wireless network.

[0045] Corresponding to steps of the exemplary method for requesting SI performed by a user terminal as illustrated in Fig.1, the network node may receive a request for at least one group of SI from the user terminal at step 202. As described in connection with Fig.1, the SI may be grouped according to a feature of the SI, such as functionality and/or periodicity of the SI. At step 204, one or more groups of SI may be transmitted or broadcasted from the network node. The one or more groups of SI may comprise the at least one group of SI requested by the user terminal. Optionally, the one or more groups of SI may further comprise at least another group of SI requested by other user terminal.

[0046] As mentioned previously, the network node may inform the user terminal of the correspondence between a group of SI and a preamble used to indicate the group of SI, so that the user terminal can selectively request transmission of group based SI. In order to make the selective transmission of group based SI more effective, the network node may provide some scheduling information of group based SI in a cell served by the network node. Then, the user terminal can detect from such scheduling information whether the required SI is being broadcasted or not.

[0047] According to an exemplary embodiment, the network node may transmit an indicator to indicate at least one of: which group of SI is being transmitted or broadcasted from the network node, and which group of SI is scheduled to be transmitted or broadcasted from the network node. Correspondingly, the user terminal may receive this indicator (which is also referred to as a group based SI indicator) from the network node. As such, the user terminal can learn from the indicator whether the required SI is available in the cell served by the network node. For example, if a group of SI containing the required SI is indicated by the indicator from the network node, it is not necessary for the user terminal to transmit a request for this group of SI to the network node.

[0048] In an exemplary embodiment, the group based SI indicator may be provided in minimum SI by the network node for indicating the group based SI and validity information. For alternative I described previously, two bits may be used as the group based SI indicator to indicate the SI group transmission: 00 – no transmission of SI group; 01 – transmission of SI group 1; 10 – transmission of SI group 2; 11 – transmission of SI group 3. Similarly, for alternative II described previously, two bits can be used as the group based SI indicator to indicate the SI group transmission: 00 – no transmission of SI group; 01 – transmission of SI group 1; 10 – transmission of SI groups 1+2; 11 – transmission of SI groups 1+2+3.

[0049] The user terminal can check the group based SI indicator in the minimum SI broadcasted by the network node. When the user terminal read such indicator in the minimum SI, it can know which SI group(s) is now available in the corresponding cell. Then the user terminal can decide if it needs to send a request for a group of SI to the network node. If the group based SI indicator in the minimum SI indicates that the group of SI is being transmitted/broadcasted or will be transmitted/broadcasted by the network node, which means that the group of SI is available in the cell, the user terminal would not send a corresponding preamble to the network node to request this group of SI.

[0050] In a further embodiment, even if the user terminal transmits a SI request for at least one group of SI, the network node can override the SI request by indicating the transmission of more SI groups. For example, the network node may combine multiple SI requests from either one or multiple user terminals, and determine the transmission of SI group(s) and the corresponding indicator settings.

[0051] The proposed methods as illustrated with respect to Figs. 1-2 can classify SI into several relevant groups, and each SI group or a combination of SI groups may be associated with a unique preamble or a unique timing to request SI. When a user

terminal wants to request some SI, it can according to its actual needs send a distinct preamble or send a preamble at certain timing to a network node to request the corresponding SI group. The network node can then know which SI group the user terminal needs, and broadcast it accordingly. In this way, the network node can avoid to transmit the undesired SI to the user terminal.

[0052] Thus it can be seen that with grouping of SI for on-demand transmission, the network node can only send selective SI instead of all SI, in response to a SI request from the user terminal. This may be achieved by using different preamble sequences or different preamble transmission timing. In addition, using a group based SI indicator to indicate the availability of one or more SI groups instead of indicator per SI, can reduce the number of bits needed in minimum SI quite a lot, thereby making the selective transmission of SI more effective.

[0053] The various blocks or information flows shown in Figs.1-2 may be viewed as method steps, and/or as operations that result from operation of computer program code, and/or as a plurality of coupled logic circuit elements constructed to carry out the associated function(s). The schematic flow chart diagrams described above are generally set forth as logical flow chart diagrams. As such, the depicted order and labeled steps are indicative of specific embodiments of the presented methods. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more steps, or portions thereof, of the illustrated methods. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

[0054] Fig.3 is a block diagram illustrating an apparatus 300 according to some embodiments of the present disclosure. As shown in Fig.3, the apparatus 300 may comprise at least one processor 301 and at least one memory 302 storing computer program code 303. The at least one memory 302 and the computer program code 303

may be configured to, with the at least one processor 301, cause the apparatus 300 at least to perform any step of the method as described in connection with Fig.1 or Fig.2. Alternatively or additionally, the at least one memory 302 and the computer program code 303 may be configured to, with the at least one processor 301, cause the apparatus 300 at least to perform more or less steps to implement the proposed methods.

[0055] Fig.4 is a block diagram illustrating another apparatus 400 according to some embodiments of the present disclosure. As shown in Fig.4, the apparatus 400 may comprise a transmitting module 401 and a receiving module 402. In an exemplary embodiment, the apparatus 400 may be implemented at a user terminal. The transmitting module 401 may be operable to carry out step 102, and the receiving module 402 may be operable to carry out step 104. In another exemplary embodiment, the apparatus 400 may be implemented at a network node. The receiving module 402 may be operable to carry out step 202, and the transmitting module 401 may be operable to carry out step 204. Optionally, the transmitting module 401 and/or the receiving module 402 may be operable to carry out more or less steps to implement the proposed methods.

[0056] In general, the various exemplary embodiments may be implemented in hardware or special purpose circuits, software, logic or any combination thereof. For example, some aspects may be implemented in hardware, while other aspects may be implemented in firmware or software which may be executed by a controller, microprocessor or other computing device, although the disclosure is not limited thereto. While various aspects of the exemplary embodiments of this disclosure may be illustrated and described as block diagrams, flow charts, or using some other pictorial representation, it is well understood that these blocks, apparatus, systems, techniques or methods described herein may be implemented in, as non-limiting examples, hardware, software, firmware, special purpose circuits or logic, general

purpose hardware or controller or other computing devices, or some combination thereof.

[0057] As such, it should be appreciated that at least some aspects of the exemplary embodiments of the disclosure may be practiced in various components such as integrated circuit chips and modules. It should thus be appreciated that the exemplary embodiments of this disclosure may be realized in an apparatus that is embodied as an integrated circuit, where the integrated circuit may comprise circuitry (as well as possibly firmware) for embodying at least one or more of a data processor, a digital signal processor, baseband circuitry and radio frequency circuitry that are configurable so as to operate in accordance with the exemplary embodiments of this disclosure.

[0058] It should be appreciated that at least some aspects of the exemplary embodiments of the disclosure may be embodied in computer-executable instructions, such as in one or more program modules, executed by one or more computers or other devices. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types when executed by a processor in a computer or other device. The computer executable instructions may be stored on a computer readable medium such as a hard disk, optical disk, removable storage media, solid state memory, Random Access Memory (RAM), etc. As will be appreciated by one of skill in the art, the function of the program modules may be combined or distributed as desired in various embodiments. In addition, the function may be embodied in whole or partly in firmware or hardware equivalents such as integrated circuits, field programmable gate arrays (FPGA), and the like.

[0059] The present disclosure includes any novel feature or combination of features disclosed herein either explicitly or any generalization thereof. Various

modifications and adaptations to the foregoing exemplary embodiments of this disclosure may become apparent to those skilled in the relevant arts in view of the foregoing description, when read in conjunction with the accompanying drawings. However, any and all modifications will still fall within the scope of the non-Limiting and exemplary embodiments of this disclosure.

CLAIMS

What is claimed is:

1. A method for requesting system information, comprising:
transmitting (102) a request for at least one group of system information from a user terminal to a network node, wherein the system information is grouped according to a feature of the system information; and
receiving (104) one or more groups of system information from the network node, wherein the one or more groups of system information comprise the at least one group of system information.
2. The method according to claim 1, wherein the request comprises a preamble for indicating the at least one group of system information.
3. The method according to claim 2, wherein the at least one group of system information is indicated by a sequence of the preamble or the transmission timing of the preamble.
4. The method according to claim 2 or 3, wherein the indication of the at least one group of system information by the preamble is predefined or derived based at least partly on notification information from the network node.
5. The method according to any one of claims 1 to 4, wherein the feature of the system information comprises at least one of functionality and periodicity of the system information.
6. The method according to any one of claims 1 to 5, further comprising:

receiving an indicator from the network node, wherein the indicator indicates at least one of: which group of system information is being transmitted from the network node, and which group of system information is scheduled to be transmitted from the network node.

7. The method according to any one of claims 1 to 6, wherein the one or more groups of system information further comprise at least another group of system information which is not requested by the user terminal.

8. An apparatus (300) for requesting system information, comprising:
 at least one processor (301); and
 at least one memory (302) comprising computer program code (303),
 the at least one memory (302) and the computer program code (303) configured to, with the at least one processor (301), cause the apparatus (300) at least to:
 transmit a request for at least one group of system information to a network node, wherein the system information is grouped according to a feature of the system information; and
 receive one or more groups of system information from the network node, wherein the one or more groups of system information comprise the at least one group of system information.

9. The apparatus according to claim 8, wherein the request comprises a preamble for indicating the at least one group of system information.

10. The apparatus according to claim 9, wherein the at least one group of system information is indicated by a sequence of the preamble or the transmission timing of the preamble.

11. The apparatus according to claim 9 or 10, wherein the indication of the at least one group of system information by the preamble is predefined or derived based at least partly on notification information from the network node.

12. The apparatus according to any one of claims 8 to 11, wherein the feature of the system information comprises at least one of functionality and periodicity of the system information.

13. The apparatus according to any one of claims 8 to 12, wherein the at least one memory (302) and the computer program code (303) are configured to, with the at least one processor (301), cause the apparatus (300) at least further to:

receive an indicator from the network node, wherein the indicator indicates at least one of: which group of system information is being transmitted from the network node, and which group of system information is scheduled to be transmitted from the network node.

14. The apparatus according to any one of claims 8 to 13, wherein the one or more groups of system information further comprise at least another group of system information which is not requested by the apparatus.

15. An apparatus (400) for requesting system information, comprising:

transmitting module (401) for transmitting a request for at least one group of system information to a network node, wherein the system information is grouped according to a feature of the system information; and

receiving module (402) for receiving one or more groups of system information from the network node, wherein the one or more groups of system information comprise the at least one group of system information.

16. A method for transmission of system information, comprising:

receiving (202) a request for at least one group of system information from a user terminal to a network node, wherein the system information is grouped according to a feature of the system information; and

transmitting (204) one or more groups of system information from the network node, wherein the one or more groups of system information comprise the at least one group of system information.

17. The method according to claim 16, wherein the request comprises a preamble for indicating the at least one group of system information.

18. The method according to claim 17, wherein the at least one group of system information is indicated by a sequence of the preamble or the transmission timing of the preamble.

19. The method according to claim 17 or 18, wherein the indication of the at least one group of system information by the preamble is predefined or derived based at least partly on notification information from the network node.

20. The method according to any one of claims 16 to 19, wherein the feature of the system information comprises at least one of functionality and periodicity of the system information.

21. The method according to any one of claims 16 to 20, further comprising:

transmitting an indicator from the network node, wherein the indicator indicates at least one of: which group of system information is being transmitted from the network node, and which group of system information is scheduled to be transmitted from the network node.

22. The method according to any one of claims 16 to 21, wherein the one or more groups of system information further comprise at least another group of system information which is not requested by the user terminal.

23. An apparatus (300) for transmission of system information, comprising:

at least one processor (301); and

at least one memory (302) comprising computer program code (303),

the at least one memory (302) and the computer program code (303) configured to, with the at least one processor (301), cause the apparatus (300) at least to:

receive a request for at least one group of system information from a user terminal, wherein the system information is grouped according to a feature of the system information; and

transmit one or more groups of system information, wherein the one or more groups of system information comprise the at least one group of system information.

24. The apparatus according to claim 23, wherein the request comprises a preamble for indicating the at least one group of system information.

25. The apparatus according to claim 24, wherein the at least one group of system information is indicated by a sequence of the preamble or the transmission timing of the preamble.

26. The apparatus according to claim 24 or 25, wherein the indication of the at least one group of system information by the preamble is predefined or derived based at least partly on notification information from the apparatus.

27. The apparatus according to any one of claims 23 to 26, wherein the feature of the

system information comprises at least one of functionality and periodicity of the system information.

28. The apparatus according to any one of claims 23 to 27, wherein the at least one memory (302) and the computer program code (303) are configured to, with the at least one processor (301), cause the apparatus (300) at least further to:

transmit an indicator indicating at least one of: which group of system information is being transmitted from the apparatus, and which group of system information is scheduled to be transmitted from the apparatus.

29. The apparatus according to any one of claims 23 to 28, wherein the one or more groups of system information further comprise at least another group of system information which is not requested by the user terminal.

30. An apparatus (400) for transmission of system information, comprising:

receiving module (402) for receiving a request for at least one group of system information from a user terminal, wherein the system information is grouped according to a feature of the system information; and

transmitting module (401) for transmitting one or more groups of system information, wherein the one or more groups of system information comprise the at least one group of system information.

31. A computer program product comprising a computer-readable medium bearing computer program codes (303) embodied therein for use with a computer, wherein the computer program codes (303) comprise codes for performing the method according to any one of claims 1-7 and claims 16-22.

ABSTRACT

A method for requesting system information is proposed. The method may comprise transmitting a request for at least one group of system information from a user terminal to a network node. The system information may be grouped according to a feature of the system information. The method may further comprise receiving one or more groups of system information from the network node. The one or more groups of system information may comprise the at least one group of system information.

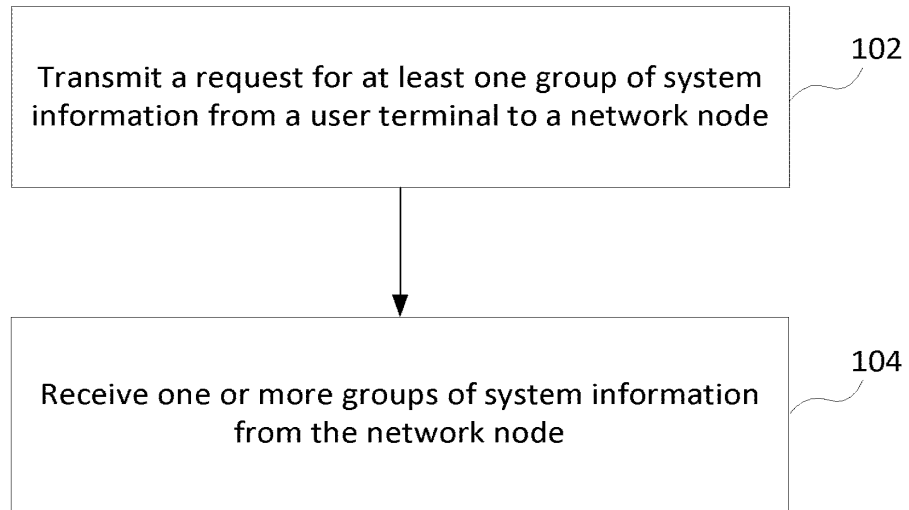


Fig.1

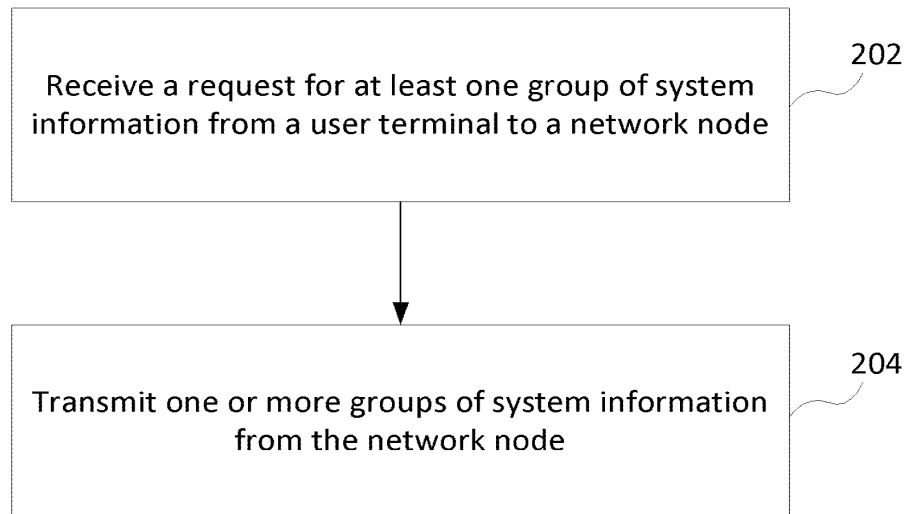


Fig.2

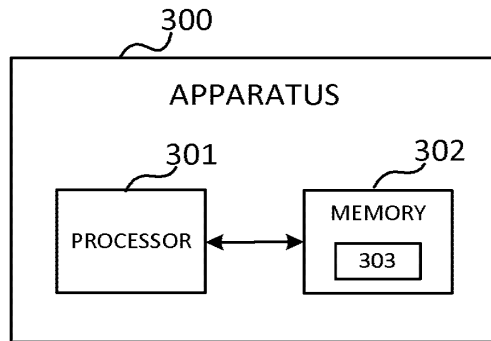


Fig.3

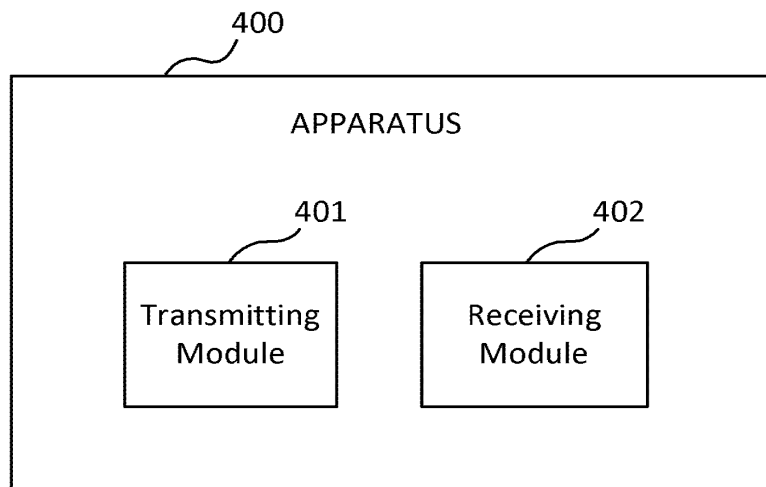


Fig.4

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CLAIMS

What is claimed is:

1. A method for requesting system information, comprising:
transmitting (102) a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and
receiving (104) one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.
2. The method according to claim 1, wherein the transmission of the request comprises transmitting a preamble for indicating the at least one system information block group.
3. The method according to claim 2, wherein the transmission of the request comprises:
selecting, from a plurality of preambles, a preamble associated with the at least one system information block group; and
transmitting the request to the network node, wherein the request includes the selected preamble.
4. The method according to claim 2 or 3, wherein the at least one system information block group is indicated by transmission timing of the preamble.
5. The method according to claim 4, wherein the transmission of the request

comprises transmitting the request to the network node in accordance with a selected transmission timing associated with the at least one system information block group.

6. The method according to any one of claims 1 to 5, further comprising:
receiving notification information from the network node, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information.
7. The method according to claim 6, wherein the notification information is included in minimum system information.
8. The method according to any one of claims 1 to 7, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.
9. The method according to any one of claims 1 to 8, further comprising:
receiving an indicator from the network node, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node.
10. The method according to any one of claims 1 to 9, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the user terminal.
11. The method according to any one of claims 6 to 10, wherein the notification information indicates a correspondence between all of preambles and system information block groups.

12. An apparatus (300) for requesting system information, comprising:
at least one processor (301); and
at least one memory (302) comprising computer program code (303),
the at least one memory (302) and the computer program code (303) configured to, with the at least one processor (301), cause the apparatus (300) at least to:
transmit a request for at least one system information block group, each of which comprises one or more system information blocks, to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and
receive one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.
13. The apparatus according to claim 12, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to transmit the request by transmitting a preamble for indicating the at least one system information block group.
14. The apparatus according to claim 13, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to transmit the request by:
selecting, from a plurality of preambles, a preamble associated with the at least one system information block group; and
transmitting the request to the network node, wherein the request includes the selected preamble.
15. The apparatus according to claim 13 or 14, wherein the at least one system

information block group is indicated by transmission timing of the preamble.

16. The apparatus according to claim 15, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to transmit the request by transmitting the request to the network node in accordance with a selected transmission timing associated with the at least one system information block group.

17. The apparatus according to any one of claims 12 to 16, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least further to:

receive notification information from the network node, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information.

18. The apparatus according to claim 17, wherein the notification information is included in minimum system information.

19. The apparatus according to any one of claims 12 to 18, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.

20. The apparatus according to any one of claims 12 to 19, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least further to:

receive an indicator from the network node, wherein the indicator indicates at least one of: which system information block group is being transmitted from the

network node, and which system information block group is scheduled to be transmitted from the network node.

21. The apparatus according to any one of claims 12 to 20, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the apparatus.

22. The apparatus according to any one of claims 17 to 21, wherein the notification information indicates a correspondence between all of preambles and system information block groups.

23. An apparatus (400) for requesting system information, comprising:

a transmitting module (401) configured to transmit a request for at least one system information block group, each of which comprises one or more system information blocks, to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and

a receiving module (402) configured to receive one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.

24. A method for transmission of system information, comprising:

receiving (202) a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and

transmitting (204) one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.

25. The method according to claim 24, wherein the reception of the request comprises receiving a preamble for indicating the at least one system information block group.

26. The method according to claim 25, wherein the reception of the request comprises receiving the preamble which was selected from a plurality of preambles, and wherein the selected preamble is associated with the at least one system information block group.

27. The method according to claim 25 or 26, wherein the at least one system information block group is indicated by transmission timing of the preamble.

28. The method according to claim 27, wherein the reception of the request comprises receiving the request from the user terminal in accordance with a selected transmission timing associated with the at least one system information block group.

29. The method according to any one of claims 24 to 28, further comprises: transmitting notification information to the user terminal, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information.

30. The method according to claim 29, wherein the notification information is included in minimum system information.

31. The method according to any one of claims 24 to 30, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.
32. The method according to any one of claims 24 to 31, further comprising:
transmitting an indicator to the user terminal, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node.
33. The method according to any one of claims 24 to 32, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the user terminal.
34. The method according to any one of claims 29 to 33, wherein the notification information indicates a correspondence between all of preambles and system information block groups.
35. An apparatus (300) for transmission of system information, comprising:
at least one processor (301); and
at least one memory (302) comprising computer program code (303),
the at least one memory (302) and the computer program code (303) configured to, with the at least one processor (301), cause the apparatus (300) at least to:
receive a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and

transmit one or more system information block groups, wherein the one or more system information block groups comprise the at least one system information block group.

36. The apparatus according to claim 35, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to receive the request by receiving a preamble for indicating the at least one system information block group.

37. The apparatus according to claim 36, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to receive the request by receiving the preamble which was selected from a plurality of preambles, and wherein the selected preamble is associated with the at least one system information block group.

38. The apparatus according to claim 36 or 37, wherein the at least one system information block group is indicated by transmission timing of the preamble.

39. The apparatus according to claim 38, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus to receive the request by receiving the request from the user terminal in accordance with a selected transmission timing associated with the at least one system information block group.

40. The apparatus according to any one of claims 35 to 39, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least further to transmit notification information to the user terminal, and wherein transmission of the at least one system information

block group is predefined or derived based at least partly on the notification information.

41. The apparatus according to claim 40, wherein the notification information is included in minimum system information.

42. The apparatus according to any one of claims 35 to 41, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.

43. The apparatus according to any one of claims 35 to 42, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least further to:

transmit an indicator to the user terminal, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node.

44. The apparatus according to any one of claims 35 to 43, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the user terminal.

45. The apparatus according to any one of claims 40 to 44, wherein the notification information indicates a correspondence between all of preambles and system information block groups.

46. An apparatus (400) for transmission of system information, comprising:

a receiving module (402) configured to receive a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and

a transmitting module (401) configured to transmit one or more system information block groups, wherein the one or more system information block groups comprise the at least one system information block group.

47. A computer program product comprising a computer-readable medium bearing computer program codes (303) embodied therein for use with a computer, wherein the computer program codes (303) comprise codes for performing the method according to any one of claims 1-11 and claims 24-34.

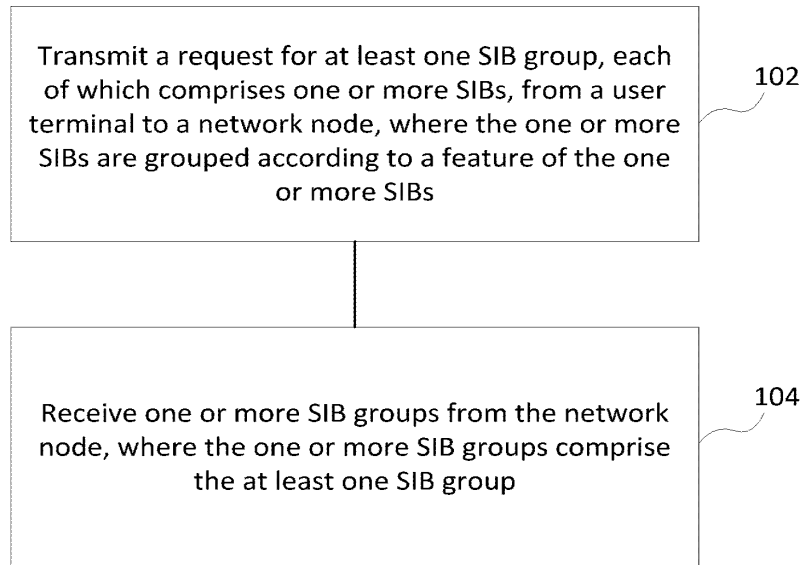


Fig.1

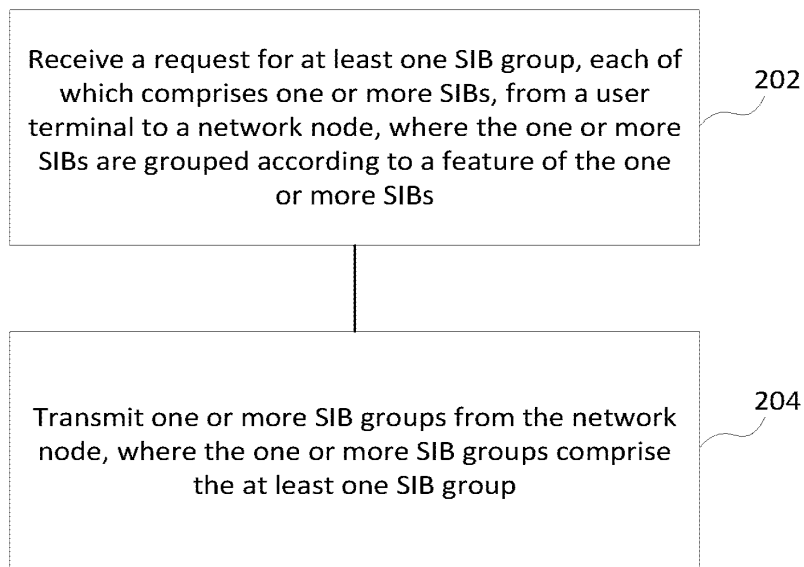


Fig.2

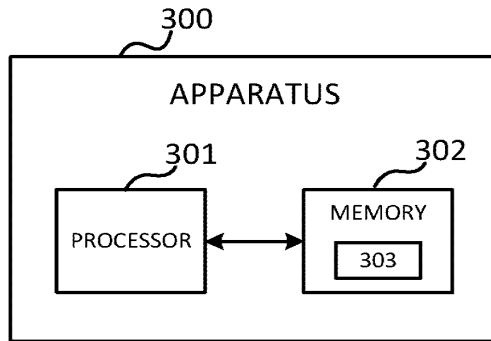


Fig.3

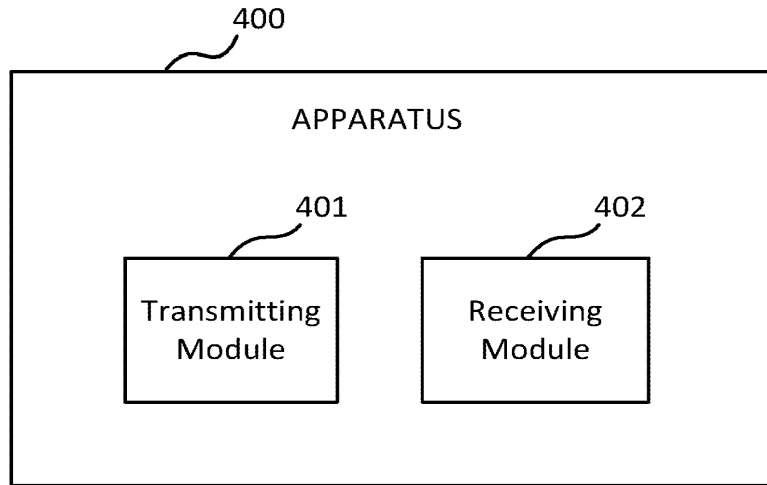


Fig.4

ON-DEMAND REQUEST FOR SYSTEM INFORMATION

FIELD OF THE INVENTION

[0001] The present disclosure generally relates to communications, and more specifically, relates to wireless communications.

BACKGROUND

[0002] In a communication network such as Long Term Evolution (LTE) system, system information (SI) is important as it can provide necessary information to a user terminal, such as a user equipment (UE) or a wireless device, for linking with the communication network. In new radio (NR), SI may be classified into minimum SI and other SI. Minimum SI is the SI that a user terminal must read before it can know how to access the network. Other SI is the SI not within minimum SI. SI may be transmitted to the user terminal in a master information block (MIB) and/or a system information block (SIB). For example, minimum SI may correspond to MIB, SIB1 and SIB2 in LTE. Other SI may correspond to those remaining SIBs. Since other SI is not necessary for a user terminal to access network, in order to achieve energy efficiency, it may be desirable that the SI may be requested on demand.

SUMMARY

[0003] This summary is provided to introduce a selection of concepts in a simplified form that are further described below in detailed description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

[0004] The present disclosure proposes a solution of on-demand request for SI, which may enable a communication network to transmit or broadcast SI, such as

other SI as mentioned previously, according to a request for the SI from a user terminal.

[0005] According to a first aspect of the present disclosure, there is provided a method for requesting SI, which may be performed at an apparatus such as a user terminal. The method may comprise transmitting a request for at least one SIB group, each of which comprises one or more SIBs, from a user terminal to a network node. The one or more SIBs may be grouped according to a feature of the one or more SIBs. The method may further comprise receiving one or more SIB groups from the network node. The one or more SIB groups may comprise the at least one SIB group.

[0006] In an exemplary embodiment, the method according to the first aspect of the present disclosure may further comprise receiving notification information from the network node. For example, transmission of the at least one SIB group may be predefined or derived based at least partly on the notification information.

[0007] In an exemplary embodiment, the method according to the first aspect of the present disclosure may further comprise receiving an indicator from the network node. The indicator may indicate at least one of: which SIB group is being transmitted from the network node, and which SIB group is scheduled to be transmitted from the network node.

[0008] According to a second aspect of the present disclosure, there is provided an apparatus for requesting SI. The apparatus may comprise at least one processor and at least one memory comprising computer program code. The at least one memory and the computer program code may be configured to, with the at least one processor, cause the apparatus at least to perform any step of the method according to the first aspect of the present disclosure.

[0009] According to a third aspect of the present disclosure, there is provided a

computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer. The computer program codes may comprise code for performing any step of the method according to the first aspect of the present disclosure.

[0010] According to a fourth aspect of the present disclosure, there is provided an apparatus for requesting SI. The apparatus may comprise a transmitting module and a receiving module. In accordance with some exemplary embodiments, the transmitting module may be operable to carry out at least the transmitting step of the method according to the first aspect of the present disclosure. The receiving module may be operable to carry out at least the receiving step of the method according to the first aspect of the present disclosure.

[0011] In accordance with an exemplary embodiment, the transmission of the request may comprise transmitting a preamble for indicating the at least one SIB group.

[0012] In accordance with an exemplary embodiment, the transmission of the request may comprise: selecting, from a plurality of preambles, a preamble associated with the at least one SIB group; and transmitting the request to the network node. The request may include the selected preamble.

[0013] In accordance with an exemplary embodiment, the at least one SIB group may be indicated by transmission timing of the preamble.

[0014] In accordance with an exemplary embodiment, the transmission of the request may comprise transmitting the request to the network node in accordance with a selected transmission timing associated with the at least one SIB group.

[0015] According to a fifth aspect of the present disclosure, there is provided a method for transmission of SI, which may be performed at an apparatus such as a

network node. The method may comprise receiving a request for at least one SIB group, each of which comprises one or more SIBs, from a user terminal to a network node. The one or more SIBs may be grouped according to a feature of the one or more SIBs. The method may further comprise transmitting one or more SIB groups from the network node. The one or more SIB groups may comprise the at least one SIB group.

[0016] In accordance with an exemplary embodiment, the method according to the fifth aspect of the present disclosure may further comprise: transmitting notification information to the user terminal. For example, transmission of the at least one SIB group may be predefined or derived based at least partly on the notification information.

[0017] In accordance with an exemplary embodiment, the method according to the fifth aspect of the present disclosure may further comprise transmitting an indicator from the network node. The indicator may indicate at least one of: which SIB group is being transmitted from the network node, and which SIB group is scheduled to be transmitted from the network node.

[0018] According to a sixth aspect of the present disclosure, there is provided an apparatus for transmission of SI. The apparatus may comprise at least one processor and at least one memory comprising computer program code. The at least one memory and the computer program code may be configured to, with the at least one processor, cause the apparatus at least to perform any step of the method according to the fifth aspect of the present disclosure.

[0019] According to a seventh aspect of the present disclosure, there is provided a computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer. The computer program codes may comprise code for performing any step of the method according

to the fifth aspect of the present disclosure.

[0020] According to an eighth aspect of the present disclosure, there is provided an apparatus for transmission of SI. The apparatus may comprise a receiving module and a transmitting module. In accordance with some exemplary embodiments, the receiving module may be operable to carry out at least the receiving step of the method according to the fifth aspect of the present disclosure. The transmitting module may be operable to carry out at least the transmitting step of the method according to the fifth aspect of the present disclosure.

[0021] In accordance with an exemplary embodiment, the reception of the request may comprise receiving a preamble for indicating the at least one SIB group.

[0022] In accordance with an exemplary embodiment, the reception of the request may comprise receiving the preamble which was selected from a plurality of preambles. The selected preamble may be associated with the at least one SIB group.

[0023] In accordance with an exemplary embodiment, the at least one SIB group may be indicated by transmission timing of the preamble.

[0024] In accordance with an exemplary embodiment, the reception of the request may comprise receiving the request from the user terminal in accordance with a selected transmission timing associated with the at least one SIB group.

[0025] In accordance with an exemplary embodiment, the notification information may be included in minimum SI.

[0026] In accordance with an exemplary embodiment, the notification information may indicate a correspondence between all of preambles and SIB groups.

[0027] In accordance with some exemplary embodiments, the feature of the one or more SIBs may comprise at least one of functionality and periodicity of the one or

more SIBs.

[0028] In accordance with some exemplary embodiments, the request for the at least one SIB group may comprise a preamble for indicating the at least one SIB group. The at least one SIB group may be indicated by or associated with a preamble sequence or the transmission timing of the preamble. For example, the indication of the at least one SIB group by the preamble may be predefined or derived based at least partly on the notification information from the network node.

[0029] In accordance with some exemplary embodiments, the one or more SIB groups from the network node may further comprise at least another SIB group which is not requested by the user terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The disclosure itself, the preferable mode of use and further objectives are best understood by reference to the following detailed description of the embodiments when read in conjunction with the accompanying drawings, in which:

[0031] Fig.1 is a flowchart illustrating a method for requesting SI according to an embodiment of the present disclosure;

[0032] Fig.2 is a flowchart illustrating a method for transmission of SI according to another embodiment of the present disclosure;

[0033] Fig.3 is a block diagram illustrating an apparatus according to an embodiment of the present disclosure; and

[0034] Fig.4 is a block diagram illustrating another apparatus according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0035] The embodiments of the present disclosure are described in detail with reference to the accompanying drawings. Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present disclosure should be or are in any single embodiment of the disclosure. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present disclosure. Furthermore, the described features, advantages, and characteristics of the disclosure may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the disclosure may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the disclosure.

[0036] In a wireless network such as new radio (NR), SI may be broadcasted by a network node, such as a base station or a next generation Node B (gNB), in a cell to all user terminals monitoring the specific cell. It is important for a user terminal to maintain the required SI because otherwise it cannot interact with the network in an interoperable manner. As mentioned previously, minimum SI in NR corresponds to MIB, SIB1 and SIB2 in LTE. There are some assumptions about how to request other SI from the network. For example, some messages like MSG1 and/or MSG3 may be used to carry a request for other SI.

[0037] If using one preamble of MSG1 to carry a request for all other SI, then it may result in unnecessary transmission of some undesired other SI. This is because there is quite a lot of other SI in the system and the network may have to broadcast all other SI when it receives such preamble to request other SI. However, a user terminal

may not need all the other SI.

[0038] If using MSG3 to request other SI, since there could be contention during a random access procedure, the network may not be able to detect MSG3 reliably in time. In addition, there are additional overhead and delay because more messages are transmitted for requesting other SI.

[0039] The present disclosure proposes a solution of on-demand request for SI. In the proposed solution, one or more SIBs may be classified into a SIB group according to their relevance or correlation. When a user terminal wants to request some specific SI, it can request from a network node a SIB group in which the specific SI is contained. Then, the network node can know which SIB group the user terminal actually needs, and broadcast the requested SIB group accordingly. In this way, the network node can transmit or broadcast the SI to the user terminal with more energy efficiency. On the other hand, transmission resources and energy also can be saved from the view point of the user terminal, since it does not need to send additional SI request if another user terminal has already sent a request for the same SI as required by the user terminal.

[0040] Fig.1 is a flowchart illustrating a method for requesting SI according to an embodiment of the present disclosure. The method illustrated in Fig.1 may be performed by an apparatus implemented at a user terminal or communicatively coupled to a user terminal. In accordance with the exemplary embodiment, the user terminal may comprise a UE, a mobile station, a wireless device, a personal digital assistant (PDA), a laptop computer, a tablet computer, a smart phone, a portable device, or any other user device being capable of participating in communication of a wireless network.

[0041] According to the exemplary method illustrated in Fig.1, a request for at least one SIB group, each of which comprises one or more SIBs, may be transmitted

from a user terminal to a network node, as shown in block 102. In the exemplary embodiment, the one or more SIBs may be grouped or classified according to a feature of the one or more SIBs. It will be realized that the SI corresponding to the SIB mentioned here may comprise other SI than minimum SI in the context of NR. It is noted that the terms of “SI” and “SIB” used herein and the exemplary illustration of grouping of one or more SIBs are not limited to NR and LTE. The proposed methods, apparatus and related products herein may also be applicable to other suitable network environments, although some exemplary embodiments are described with respect to NR and LTE. As described previously, minimum SI corresponds to MIB, SIB1 and SIB2 in LTE, and accordingly other SI corresponds to SIB3 until SIB21. The feature of the one or more SIBs may be learned from the SIB definition in LTE. For example, the feature of the one or more SIBs may comprise at least one of functionality and periodicity of the SIBs. However, other suitable rules may also be expected to be applicable for learning more features of SIBs.

[0042] Table 1 exemplarily shows the functional description of some SIBs in LTE. It can be seen from Table 1 that the SIBs carrying SI are not fully independent to each other. For example, SIB3 to SIB8 are all related to how to do cell reselection, although each SIB has different responsibility. Therefore, SIB3 to SIB8 can be grouped together. For SIB10 to SIB12, these SIBs are all related to warning and alert. Therefore, SIB10 to SIB12 can be group together. For SIB18 to SIB19, the SIBs are both related to device-to-device (D2D) sidelink communication. Accordingly, SIB18 to SIB19 can be grouped together. The remaining SIBs can be grouped together. Thus, the SIBs listed in Table 1 may be classified into four groups.

Table 1

SIB	Description
SIB3	Parameters required for intra-frequency, inter-frequency and I-RAT cell re-selections

SIB4	Information regarding INTRA-frequency neighboring cells (E-UTRA)
SIB5	Information regarding INTER-frequency neighboring cells (E-UTRA)
SIB6	Information for re-selection to INTER-RAT (UTRAN cells)
SIB7	Information for re-selection to INTER-RAT (GERAN cells)
SIB8	Information for re-selection to INTER-RAT (CDMA2000)
...	...
SIB10	ETWS (Earthquake and Tsunami Warning System) information (Primary notification)
SIB11	ETWS (Earthquake and Tsunami Warning System) information (Secondary notification)
SIB12	Commercial Mobile Alert Service (CMAS) information.
...	...
SIB18	Sidelink UE information procedure, sidelink communication related resource configuration information
SIB19	Sidelink UE information procedure, sidelink discovery related resource configuration information
...	...

[0043] It can be seen that different SIBs and the SI thereof may be grouped according to their functionalities. Optionally, the SIBs may be classified into more or less groups than four groups. For example, since the transmission of SIBs related to warning and alert is triggered by the network instead of by a user terminal, the SI associated with SIB10 to SIB12 does not need to be requested by the user terminal at all. Then in total there are three SIB groups to be requested. Other ways to group these SIBs are also possible. For example, the SIBs related to cell reselection may be classified into one group, while all others may be classified into another group.

[0044] Another feature of SIBs which may be used to classify the SIBs is periodicity. For example, SIBs with the same or similar transmission periodicity may be grouped together. Use LTE SIB transmission periodicity as an example, where the SIBs each with periodicity of 80ms, 160ms, 320ms, 640ms, 1280ms, 2560ms and 5120ms may be classified into seven SIB groups. Alternatively, the SIBs may be classified into three SIB groups with the first group comprising SIBs with periodicities of 80ms, 160ms, the second group comprising SIBs with periodicities of

320ms, 640ms, and the third group comprising SIBs with periodicities of 1280ms, 2560ms, 5120ms. It will be realized that one or more SIBs may be classified into the desired number of groups according to the periodicity of SIBs.

[0045] In accordance with the exemplary method illustrated in Fig.1, the transmission of the request for the at least one SIB group may comprise transmitting a preamble for indicating the at least one SIB group.

[0046] In an exemplary embodiment, the transmission of the request may comprise selecting, from a plurality of preambles, a preamble associated with the at least one SIB group; and transmitting the request to the network node. The request may include the selected preamble.

[0047] In an exemplary embodiment, the at least one SIB group may be indicated by transmission timing of the preamble. Optionally, the transmission of the request may comprise transmitting the request to the network node in accordance with a selected transmission timing associated with the at least one SIB group.

[0048] In an exemplary embodiment, the at least one SIB group may be associated with a preamble (also referred to as a sequence of the preamble or a preamble sequence for ease of description) or the selected transmission timing of the preamble. Thus, the user terminal can selectively request the required SIB group from the network node.

[0049] In an exemplary embodiment, selective requests for SIB groups may be transmitted from the user terminal by using different preamble sequences, which may be differentiated by indexes of the preambles. One preamble sequence may correspond to a predetermined combination of SIB groups. Take 3 preambles as an example. In alternative I, preambles 1 to 3 may be used to indicate SIB groups 1 to 3, respectively, where SIB group 1 is related to cell reselection, SIB group 2 is related to

sidelink communication, and SIB group 3 comprises the remaining one or more SIBs. According to this alternative, a user terminal needing multiple SIB groups (for example, comprising SIB groups 1 and 2) may be required to send multiple SIB group requests (for example, comprising preambles 1 and 2) to a network node.

[0050] It will be realized that the usage of multiple preambles can be in different ways. For example, in alternative II, preambles 1 to 3 may be used to indicate SIB group 1, SIB groups 1+2, and SIB groups 1+2+3, respectively. According to this alternative, a user terminal can always select a corresponding preamble to get all desired SIB groups. Compared to alternative I, alternative II may save the preamble resource/transmission but the probability to transmit the undesired SI is higher than alternative I.

[0051] Thus, when SIB groups in the network are indicated by using different preambles, the user terminal can send the corresponding preamble to the network node if the user terminal wants to request SI from at least one of the SIB groups. When the network node detects such preamble, it can therefore only transmit or broadcast SI within the indicated SIB groups according to the detected preamble.

[0052] In accordance with the exemplary method illustrated in Fig.1, the user terminal may receive notification information transmitted from the network node. In this case, transmission of the at least one SIB group may be predefined or derived based at least partly on the notification information. Optionally, the notification information may be included in minimum SI.

[0053] In an exemplary embodiment, the notification information may indicate a correspondence between all of preambles and SIB groups. Optionally, the correspondence between the at least one SIB group and the associated preamble or the indication of the at least one SIB group by the preamble may be predefined or derived based at least partly on the notification information from the network node.

For example, the preambles which are used to request on-demand transmission of SI carried by one or more SIBs can be predefined according to a specified rule known by the user terminal and the network node.

[0054] In an exemplary embodiment, if the correspondence between preambles and SIB groups is informed in minimum SI, the minimum SI can indicate only one preamble for one SIB group, while there is a specified rule for the user terminal to derive other preambles for other SIB groups. For example, it is assumed that the specified rule is that all the preambles for requesting SIB groups are with consecutive indexes, and each preamble with an index increased by one indicates one more SIB group. As such, for alternative II as mentioned previously, if it is informed in the minimum SI that a preamble with index 'n' is used to indicate SIB group 1, then according to the specified rule, the user terminal may know that a preamble with index 'n+1' is used to indicate SIB groups 1+2, and a preamble with index 'n+2' is used to indicate SIB groups 1+2+3. It will be appreciated that other suitable rules also may be applicable to determine preambles for selective request and transmission of SI. For example, the preambles for requesting SIB groups may be with inconsecutive indexes, and/or the correspondence between all of preambles and SIB groups may be informed in the minimum SI from the network node.

[0055] In another exemplary embodiment, selective requests for SIB groups may be transmitted from the user terminal by using different preamble timing. In this embodiment, only one preamble may be used to request SIB group transmission from the network node, but the timing at which the preamble is sent can be utilized to determine which SIB group is requested. Therefore, compared with the embodiment where different preambles are used to indicate multiple SIB groups, using different transmission timing of one preamble to indicate multiple SIB groups may save transmission resources.

[0056] Assuming there are three SIB groups, including SIB group A with periodicities of 80ms, 160ms, SIB group B with periodicities of 320ms, 640ms, and SIB group C with periodicities of 1280ms, 2560ms, 5120ms. The respective minimum periodicities of SIB groups A, B and C are 80ms, 320ms and 1280ms, respectively. Then the timing at which a SIB group is requested by sending a preamble determines which SIB group is requested. In an exemplary embodiment, the requested SIB group may be determined according to whether the frame corresponding to the preamble sent by the user terminal has an integer multiple period of the minimum periodicity of the SIB group. As a further rule, if the period of that frame is an integer multiple of the minimum periodicities of several SIB groups, then the SIB group with the largest periodicity (or alternatively the SIB group with the smallest periodicity) may be determined as the requested SIB group. In another exemplary embodiment, the requested SIB group may be determined according to the frame corresponding to the preamble sent by the user terminal and the latest next frame in which SI can be transmitted or broadcasted. In this embodiment, the frame corresponding to the preamble may have a period which is not an integer multiple of the minimum periodicity of the SIB group.

[0057] Use the LTE frame as an example, where the frame length is 10ms. If the number of the frame corresponding to the preamble is 24, then the period of the frame is 240ms, which is an integer multiple of the minimum periodicity 80ms of SIB group A. This means that the user terminal wants to request SIB group A. Similarly, if the number of the frame corresponding to the preamble is 96, then the period of the frame is 960ms, which is an integer multiple of the minimum periodicity 80ms of SIB group A and the minimum periodicity 320ms of SIB group B. This means that the user terminal wants to request both SIB group A and SIB group B but not SIB group C. Or as the further rule, it is SIB group B that is requested instead of SIB group A plus B, because the minimum periodicity of SIB group B is larger than that of SIB

group A. Alternatively, if the frame number corresponding to the preamble is 22, then the number of the latest next frame to transmit or broadcast SI is 24, according to a predefined criterion. Since the period of this latest next frame is 240ms, which is an integer multiple of the minimum periodicity of SIB group A, this could mean that the user terminal wants to request just SIB group A.

[0058] Thus, when the user terminal wants to request a certain SIB group, it can send a preamble as a request to the network node at the specific timing or frame. When the network node detects this preamble, it can determine which SIB group the user terminal wants to request, according to the transmission timing of the preamble. Accordingly, the network node can only transmit or broadcast SI within the corresponding SIB group in the network. This can eliminate unnecessary SI transmissions in the network.

[0059] Referring back to Fig.1, the user terminal may receive one or more SIB groups from the network node, as shown in block 104. The one or more SIB groups may comprise the at least one SIB group requested by the user terminal in block 102. Optionally, the one or more SIB groups may further comprise at least another SIB group which is not requested by the user terminal. For example, preamble 3 is used to indicate SIB groups 1+2+3, as described previously in alternative II. If the user terminal wants to obtain SI within SIB group 1, then the user terminal may also obtain SIB groups 2 and 3 in addition to SIB group 1, when using preamble 3 to request SIB group 1 from the network node. Apparently, SIB groups 2 and 3 are not actually needed by the user terminal. In another example, since the network node may transmit or broadcast multiple SIB groups requested by different user terminals in the network, the user terminal may receive one or more SIB groups requested by other user terminals.

[0060] Fig.2 is a flowchart illustrating a method for transmission of SI according

to another embodiment of the present disclosure. The method illustrated in Fig.2 may be performed by an apparatus implemented at a network node or communicatively coupled to a network node. In accordance with the exemplary embodiment, the network node may comprise an evolved Node B (eNB), a gNB, an access point (AP), a base station (BS), a communication node, a control center, a relay station, a repeater, or any other network device being capable of participating in communication of a wireless network.

[0061] Corresponding to steps of the exemplary method for requesting SI performed by a user terminal as illustrated in Fig.1, the network node may receive a request for at least one SIB group, each of which comprises one or more SIBs, from the user terminal as shown in block 202. As described in connection with Fig.1, the one or more SIBs may be grouped according to a feature of the one or more SIBs, such as functionality and/or periodicity of the one or more SIBs. In block 204, one or more SIB groups may be transmitted or broadcasted from the network node. The one or more SIB groups may comprise the at least one SIB group requested by the user terminal. Optionally, the one or more SIB groups may further comprise at least another SIB group requested by other user terminal.

[0062] In an exemplary embodiment, the reception of the request may comprise receiving a preamble for indicating the at least one SIB group. The preamble may be selected from a plurality of preambles and associated with the at least one SIB group. Optionally, the at least one SIB group may be indicated by transmission timing of the preamble. Accordingly, the reception of the request may comprise receiving the request from the user terminal in accordance with a selected transmission timing associated with the at least one SIB group.

[0063] As mentioned previously, the network node may inform the user terminal of the correspondence between a SIB group and a preamble used to indicate the SIB

group, so that the user terminal can selectively request transmission of group based SIB(s). In order to make the selective transmission of group based SIB(s) more effective, the network node may provide some scheduling information of group based SIB(s) in a cell served by the network node. Then, the user terminal can detect from such scheduling information whether the required SI is being broadcasted or not.

[0064] According to an exemplary embodiment, the network node may transmit an indicator to indicate at least one of: which SIB group is being transmitted or broadcasted from the network node, and which SIB group is scheduled to be transmitted or broadcasted from the network node. Correspondingly, the user terminal may receive this indicator (which is also referred to as a group based SIB indicator) from the network node. As such, the user terminal can learn from the indicator whether the required SI is available in the cell served by the network node. For example, if a SIB group containing the required SI is indicated by the indicator from the network node, it is not necessary for the user terminal to transmit a request for this SIB group to the network node.

[0065] In an exemplary embodiment, the group based SIB indicator may be provided in minimum SI by the network node for indicating the group based SIB(s) and validity information. For alternative I described previously, two bits may be used as the group based SIB indicator to indicate the SIB group transmission: 00 – no transmission of SIB group; 01 – transmission of SIB group 1; 10 – transmission of SIB group 2; 11 – transmission of SIB group 3. Similarly, for alternative II described previously, two bits can be used as the group based SIB indicator to indicate the SIB group transmission: 00 – no transmission of SIB group; 01 – transmission of SIB group 1; 10 – transmission of SIB groups 1+2; 11 – transmission of SIB groups 1+2+3.

[0066] The user terminal can check the group based SIB indicator in the

minimum SI broadcasted by the network node. When the user terminal read such indicator in the minimum SI, it can know which SIB group(s) is now available in the corresponding cell. Then the user terminal can decide if it needs to send a request for a SIB group to the network node. If the group based SIB indicator in the minimum SI indicates that the SIB group is being transmitted/broadcasted or will be transmitted/broadcasted by the network node, which means that the SIB group is available in the cell, the user terminal would not send a corresponding preamble to the network node to request this SIB group.

[0067] In a further embodiment, even if the user terminal transmits a SIB group request for at least one SIB group, the network node can override the SIB group request by indicating the transmission of more SIB groups. For example, the network node may combine multiple SIB group requests from either one or multiple user terminals, and determine the transmission of SIB group(s) and the corresponding indicator settings.

[0068] The proposed methods as illustrated with respect to Figs. 1-2 can classify one or more SIBs into a SIB group, and the SIB group or a combination of several SIB groups may be associated with a unique preamble or a unique timing to request a SIB group. When a user terminal wants to request a SIB group, it can according to its actual needs send a distinct preamble or send a preamble at certain timing to a network node to request the corresponding SIB group. The network node can then know which SIB group the user terminal needs, and broadcast it accordingly. In this way, the network node can avoid to transmit the undesired SI to the user terminal.

[0069] Thus it can be seen that with grouping of one or more SIBs for on-demand transmission, the network node can only send a specified SIB group instead of all SIB groups, in response to a SIB group request from the user terminal. This may be achieved by using different preambles or different preamble transmission timing. In

addition, using a group based SIB indicator to indicate the availability of one or more SIB groups instead of an indicator per SIB, can reduce the number of bits needed in minimum SI quite a lot, thereby making the selective transmission of SI more effective.

[0070] The various blocks or information flows shown in Figs.1-2 may be viewed as method steps, and/or as operations that result from operation of computer program code, and/or as a plurality of coupled logic circuit elements constructed to carry out the associated function(s). The schematic flow chart diagrams described above are generally set forth as logical flow chart diagrams. As such, the depicted order and labeled steps are indicative of specific embodiments of the presented methods. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more steps, or portions thereof, of the illustrated methods. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

[0071] Fig.3 is a block diagram illustrating an apparatus 300 according to some embodiments of the present disclosure. As shown in Fig.3, the apparatus 300 may comprise at least one processor 301 and at least one memory 302 storing computer program code 303. The at least one memory 302 and the computer program code 303 may be configured to, with the at least one processor 301, cause the apparatus 300 at least to perform any step of the method as described in connection with Fig.1 or Fig.2. Alternatively or additionally, the at least one memory 302 and the computer program code 303 may be configured to, with the at least one processor 301, cause the apparatus 300 at least to perform more or less steps to implement the proposed methods.

[0072] Fig.4 is a block diagram illustrating another apparatus 400 according to some embodiments of the present disclosure. As shown in Fig.4, the apparatus 400

may comprise a transmitting module 401 and a receiving module 402. In an exemplary embodiment, the apparatus 400 may be implemented at a user terminal. The transmitting module 401 may be operable to carry out the operation in block 102, and the receiving module 402 may be operable to carry out the operation in block 104. In another exemplary embodiment, the apparatus 400 may be implemented at a network node. The receiving module 402 may be operable to carry out the operation in block 202, and the transmitting module 401 may be operable to carry out the operation in block 204. Optionally, the transmitting module 401 and/or the receiving module 402 may be operable to carry out more or less steps to implement the proposed methods.

[0073] In general, the various exemplary embodiments may be implemented in hardware or special purpose circuits, software, logic or any combination thereof. For example, some aspects may be implemented in hardware, while other aspects may be implemented in firmware or software which may be executed by a controller, microprocessor or other computing device, although the disclosure is not limited thereto. While various aspects of the exemplary embodiments of this disclosure may be illustrated and described as block diagrams, flow charts, or using some other pictorial representation, it is well understood that these blocks, apparatus, systems, techniques or methods described herein may be implemented in, as non-limiting examples, hardware, software, firmware, special purpose circuits or logic, general purpose hardware or controller or other computing devices, or some combination thereof.

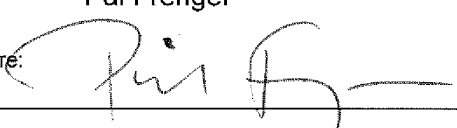
[0074] As such, it should be appreciated that at least some aspects of the exemplary embodiments of the disclosure may be practiced in various components such as integrated circuit chips and modules. It should thus be appreciated that the exemplary embodiments of this disclosure may be realized in an apparatus that is embodied as an integrated circuit, where the integrated circuit may comprise circuitry

(as well as possibly firmware) for embodying at least one or more of a data processor, a digital signal processor, baseband circuitry and radio frequency circuitry that are configurable so as to operate in accordance with the exemplary embodiments of this disclosure.


[0075] It should be appreciated that at least some aspects of the exemplary embodiments of the disclosure may be embodied in computer-executable instructions, such as in one or more program modules, executed by one or more computers or other devices. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types when executed by a processor in a computer or other device. The computer executable instructions may be stored on a computer readable medium such as a hard disk, optical disk, removable storage media, solid state memory, Random Access Memory (RAM), etc. As will be appreciated by one of skill in the art, the function of the program modules may be combined or distributed as desired in various embodiments. In addition, the function may be embodied in whole or partly in firmware or hardware equivalents such as integrated circuits, field programmable gate arrays (FPGA), and the like.

[0076] The present disclosure includes any novel feature or combination of features disclosed herein either explicitly or any generalization thereof. Various modifications and adaptations to the foregoing exemplary embodiments of this disclosure may become apparent to those skilled in the relevant arts in view of the foregoing description, when read in conjunction with the accompanying drawings. However, any and all modifications will still fall within the scope of the non-Limiting and exemplary embodiments of this disclosure.

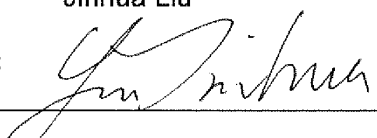
DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)	Attorney Docket Number	P51954 WO2
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Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION	
<p>As the below named inventor, I hereby declare that:</p> <p>This declaration is directed to:</p> <p style="margin-left: 100px;"> <input type="checkbox"/> The attached application, or <input type="checkbox"/> application number PCT/CN2017/101576, filed on September 13, 2017 </p> <p>The above-identified application was made or authorized to be made by me.</p> <p>I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.</p> <p>I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment specifically referred to above.</p> <p>I am aware of 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.</p> <p>I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.</p>		
LEGAL NAME OF INVENTOR		
Inventor:	Pål Frenger	Date (Optional):
Signature:		2017-09-15

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Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
<p>As the below named inventor, I hereby declare that:</p> <p>This declaration is directed to:</p> <p><input type="checkbox"/> The attached application, or</p> <p><input type="checkbox"/> United States application or PCT international application number PCT/CN2017/101576, filed on September 13, 2017</p> <p>The above-identified application was made or authorized to be made by me.</p> <p>I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.</p> <p>I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment specifically referred to above.</p> <p>I am aware of 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.</p> <p>I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.</p>	
LEGAL NAME OF INVENTOR	
Inventor:	Rui Fan
	Date (Optional):
Signature:	

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)	Attorney Docket Number	P51954 WO2
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Title of Invention	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
<p>As the below named inventor, I hereby declare that:</p> <p>This declaration is directed to:</p> <p style="margin-left: 100px;"> <input type="checkbox"/> The attached application, or <input type="checkbox"/> application number PCT/CN2017/101576, filed on September 13, 2017 </p> <p>The above-identified application was made or authorized to be made by me.</p> <p>I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.</p> <p>I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment specifically referred to above.</p> <p>I am aware of 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.</p> <p>I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.</p>	
LEGAL NAME OF INVENTOR	
Inventor:	Jinhua Liu
Signature:	
Date (Optional):	2017.9.20

Electronic Acknowledgement Receipt

EFS ID:	30976661
Application Number:	15568431
International Application Number:	
Confirmation Number:	2730
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
First Named Inventor/Applicant Name:	Rui FAN
Customer Number:	131247
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Application Type:	U.S. National Stage under 35 USC 371

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	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	
	Examiner Name	
	Attorney Docket Number	4906P51954US1

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	3	101542915	CN	A	2009-09-23	SAMSUNG ELECTRONICS CO LTD [KR]		☒

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	Filing Date		2017-10-20	
	First Named Inventor	Rui FAN		
	Art Unit			
	Examiner Name			
	Attorney Docket Number		4906P51954US1	

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	1	3GPP TS 25.331 V13.5.0 (2016-12), "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Radio Resource Control (RRC); Protocol specification (Release 13)," December 2016, 2271 pages.	
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	Examiner Name	
	Attorney Docket Number	4906P51954US1

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	/William W. Kidd; Reg. No. 31,772/	Date (YYYY-MM-DD)	2018-01-10
Name/Print	William W. Kidd	Registration Number	31,772

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A method for acquiring system information by a mobile station in mobile wireless communication system

Inventor(s): VINCENT MUNIERE [FR]; STANISLAS BOURDEAUT [FR] ± (MUNIERE VINCENT, ; BOURDEAUT STANISLAS)

Applicant(s): EVOLIUM SAS [FR] ± (EVOLIUM SAS, ; ALCATEL LUCENT)

Classification: - **international:** H04W48/16
- **cooperative:** H04W48/16

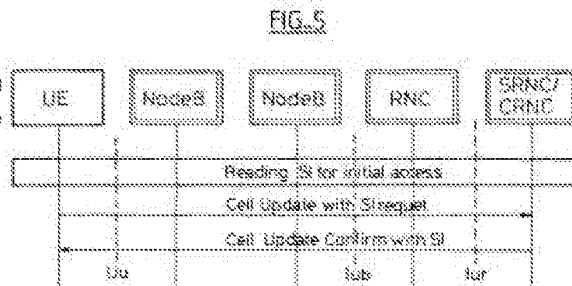
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US2008039083 (A1) US8577342 (B2) more

Abstract of CN101123818 (B)

One of the different objects of the present invention is a method for acquiring system information by a mobile station in a mobile radiocommunication system, comprising a step of: acquiring part of said system information on or after access to the network for establishing or re-establishing a radio connection.



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[71] 申请人 阿尔卡特朗讯公司

地址 法国巴黎

[72] 发明人 V·米尼埃尔 S·布尔德

[74] 专利代理机构 北京市中咨律师事务所

代理人 杨晓光 李 峥

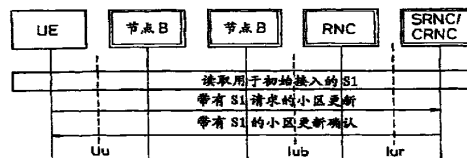
权利要求书 4 页 说明书 10 页 附图 3 页

[54] 发明名称

在移动无线通信系统中通过移动站获取系统信息的方法

[57] 摘要

本发明的目的之一是在移动无线通信系统中通过移动站获取系统信息的方法，该方法包含以下步骤：在接入网络之时或之后获取部分所述系统信息，其中所述接入用于建立或重建无线连接。



1. 一种在移动无线通信系统中通过移动站获取系统信息的方法，包含以下步骤：

-在接入网络之时或之后获取部分所述系统信息，所述接入用于建立或重建无线连接。

2. 根据权利要求 1 的方法，其中，可以在接入之时或之后获取的部分系统信息包含非接入相关的系统信息。

3. 根据权利要求 1 的方法，包含以下步骤：

-在所述接入之前获取部分所述系统信息。

4. 根据权利要求 1 的方法，其中，应该在所述接入之前获取的部分系统信息包含接入相关的系统信息。

5. 根据权利要求 1 的方法，包含以下步骤：

-移动站向网络发送至少一条请求以在接入之时或之后获取系统信息；

-网络在接收到所述请求时发送系统信息。

6. 根据权利要求 1 的方法，其中，所述接入对应于初始接入。

7. 根据权利要求 1 的方法，包含以下步骤：

-网络指示哪些系统信息应该在接入之前被获取，和/或哪些系统信息可以在接入之时或之后被获取。

8. 根据权利要求 1 的方法，其中，所述系统信息包含相邻小区信息，且所述方法包含以下步骤：

-网络指示哪些相邻小区信息应该在接入之前被获取，和/或哪些相邻小区信息可以在接入之时或之后被获取。

9. 根据权利要求 8 的方法，其中，不同类型的相邻小区信息包含频率内小区信息、频率间小区信息和交互无线电接入技术小区信息，且所述方法包含以下步骤：

-网络指示应该在接入之前被获取的相邻小区信息类型，和/或可以在接入之时或之后被获取的相邻小区信息类型。

10. 根据权利要求7的方法, 包含以下步骤:
-网络在广播系统信息中提供所述指示。
11. 根据权利要求10的方法, 包含以下步骤:
-网络在主信息块中提供所述指示。
12. 根据权利要求10的方法, 包含以下步骤:
-在接入之前网络在将由移动站读取的系统信息块中提供所述指示。
13. 根据权利要求5的方法, 包含以下步骤:
-移动站在根据无线资源控制协议发送的至少一个消息中发送所述请求。
14. 根据权利要求5的方法, 包含以下步骤:
-移动站在组内选择的至少一个消息中发送所述请求, 所述组包含:
-小区更新消息,
-小区更新完成消息,
-RRC连接请求消息,
-RRC连接建立完成消息,
-测量报告消息,
-UTRAN移动信息确认消息,
-上行链路直接传送消息,
-物理信道重配置完成消息,
-指示系统信息请求的专用消息。
15. 根据权利要求1的方法, 包含以下步骤:
-网络在专用信道中发送在接入之时或之后可以请求的系统信息。
16. 根据权利要求1的方法, 包含以下步骤:
-网络在根据无线资源控制协议发送的至少一个消息中发送可以在接入之时或之后获取的系统信息。
17. 根据权利要求1的方法, 包含以下步骤:
-网络在组内选择的至少一个消息中发送可以在接入之时或之后获取的系统信息, 所述组包含:

- 小区更新确认消息,
- RRC 连接建立消息,
- UTRAN 移动信息消息,
- 测量控制消息,
- 下行链路直接传送消息。

18. 根据权利要求1的方法, 包含以下步骤:

- 网络根据移动站或用户需求和/或系统需求, 修改可以在接入之时或之后获取的系统信息。

19. 根据权利要求1的方法, 包含以下步骤:

- 网络根据所述移动站的无线接入容量, 修改可以在接入之时或之后获取的系统信息。

20. 根据权利要求1的方法, 包含以下步骤:

- 网络根据正在进行的服务或针对用户的服务质量, 修改可以在接入之时或之后获取的系统信息。

21. 根据权利要求1的方法, 包含以下步骤:

- 网络根据从所述移动站接收到的信息, 修改可以在接入之时或之后获取的系统信息。

22. 根据权利要求1的方法, 包含以下步骤:

- 网络根据在接入之时或之后正在请求获取系统信息的所述移动站接收到的信息, 修改可以在接入之时或之后获取的系统信息。

23. 根据权利要求1的方法, 包含以下步骤:

- 移动站向网络发送信息, 所述信息使得网络能够修改可以在接入之时或之后获取的系统信息。

24. 根据权利要求1的方法, 包含以下步骤:

- 移动站在接入之时或之后在关于获取系统信息的请求中向网络发送信息, 所述信息使得网络能够修改可以在接入之时或之后获取的系统信息。

25. 根据权利要求1的方法, 包含以下步骤:

- 网络根据系统负载, 修改可以在接入之时或之后获取的系统信息。

26. 根据权利要求 18 的方法, 其中, 修改的系统信息包含相邻小区信息。
27. 根据权利要求 1 的方法, 包含以下步骤:
-移动站从所述网络广播的系统信息中获取应该在接入之前获取的系统信息。
28. 根据权利要求 1 的方法, 包含以下步骤:
-移动站从所述网络广播的系统信息中获取可以在接入之时或之后获取的系统信息。
29. 一种移动站, 包含:
用于在接入之时或之后获取部分系统信息的装置, 所述接入用于建立或重建无线连接。
30. 根据权利要求 29 的移动站, 包含:
用于在所述接入之时或之后向网络发送至少一条关于获取系统信息的请求的装置。
31. 根据权利要求 29 的移动站, 包含:
-向网络发送信息的装置, 所述信息使得网络能够修改可以在接入之时或之后获取的系统信息。
32. 一种网络实体, 包含:
用于使得移动站接入之时或之后能够获取部分系统信息的装置, 其中所述接入用于建立或重建无线连接。
33. 根据权利要求 32 的网络实体, 包含:
用于在从所述移动站接收到请求时发送系统信息的装置。
34. 根据权利要求 32 的网络实体, 包含:
用于指示应该在接入之前获取的系统信息和/或可以在接入之时或之后获取的系统信息的装置。
35. 根据权利要求 32 的网络实体, 包含:
用于根据移动站或用户需求和/或系统需求, 修改可以在接入之时或之后获取的系统信息的装置。

在移动无线通信系统中通过移动站获取系统信息的方法

技术领域

本发明一般地涉及移动通信系统。

背景技术

移动通信系统的详细描述可以在文献,尤其是诸如 3GPP(第三代合作伙伴计划)的标准化团体发布的技术规范中找到。

简单回顾一下,如图 1 所示,通信系统的一般结构主要包括:

- 无线接入网 1, 或 RAN;
- 核心网 4, 或 CN。

RAN 包含例如基站 2 和基站控制器 3 等网络单元。RAN 一方面经由接口 6 与移动站 5 联系,而另一方面经由接口 7 与 CN 联系。CN 与外部网络(未明确标出)相联系。在 RAN 内,基站经由接口 8 与基站控制器通信。

在 UMTS 型的系统中,RAN 被称为 UTRAN (UMTS 地面无线接入网),基站被称为节点 B,基站控制器被称为 RNC (无线网络控制器),移动站被称为 UE (用户设备)。接口 6 被称为 Uu 接口,接口 7 被称为 Iu 接口,接口 8 被称为 Iub 接口,还引入了在 RNC 之间的接口 9,被称为 Iur 接口。接口 6 还被称为无线接口,而接口 7、8、9 还被称为地面接口。

现在,RAN (例如 UTRAN) 的结构向所谓的 E-RAN (例如 E-UTRAN) 方向发展。这种发展也被称为长期发展。例如,E-UTRAN 包含诸如基站等网络单元。基站也被称为 e-节点 B, e-节点 B 之间的接口被称为 X2,一个 e-节点 B 与 CN (或接入网关) 之间的接口被称为 S1。

在下文中,将更特别考虑 UTRAN 作为本发明应用到 RAN 的例子;然而,应该理解本发明不限制于这种特定的例子。

UTRAN 执行许多功能,包含特别地在 3GPP TS25.331 中规定的 RRC (无

线资源控制)功能。

在小区中从 UTRAN 到 UE 的系统信息广播被详细描述于 3GPP TS25.331 中。系统信息单元在系统信息块 SIB(SIB 通常被指定称为 SIB1, ..., SIB18) 中广播。SIB 集合了具有相同属性的系统信息单元。不同的 SIB 可以具有不同的特性,所述特性是关于它们的重复率和 UE 上重读所述 SIB 的需求。系统信息组织成树状。主信息块(MIB)向小区中许多 SIB 提供参考和进度信息。SIB 包含真实的系统信息。

系统信息的这种广播的问题是,为移动站获取系统信息花费的时间。这对用户感知的延迟具有显著的影响,所述延迟特别是诸如呼叫建立或小区重选或呼叫重建时的延迟。另外,尤其是由于技术的发展,例如新无线接入技术的当前部署和/或无线接入网络结构的当前发展,系统信息的数量渐增,因此更加重了这种延迟。这负面地影响用户体验。系统信息这种广播的另一个问题是需要显著带宽,这不符合有效的带宽利用。另一个问题是系统信息的这种广播缺乏灵活性,尤其是广播信息不能被优化或适用于每种情况。

发明内容

本发明的目的是部分或全部地解决这样的问题和/或部分或全部地避免这样的缺陷。

在本发明的一个方面中,在移动无线通信系统中通过移动站获取系统信息的方法实现这些或其它目的,该方法包含以下步骤:

在接入网络之时或之后获取部分所述系统信息,所述接入用于建立或重建无线连接。

在另一方面,可以在所述接入之时或之后获取的部分所述系统信息包含非接入相关的系统信息。

在另一方面,所述方法包含以下步骤:

-在所述接入之前获取部分所述系统信息。

在另一方面,应该在所述接入之前获取的部分系统信息包含接入相关

的系统信息。

在另一方面，所述方法包含以下步骤：

-移动站发送至少一条请求到网络，以用于在所述接入之时或之后获取系统信息；

-网络在接收到所述请求时发送系统信息。

在另一方面，所述接入对应于初始接入。

在另一方面，所述方法包含以下步骤：

-网络指示哪些系统信息应该在接入之前被获取，和/或哪些系统信息可以在接入之时或之后被获取。

在另一方面，所述系统信息包含相邻小区信息，且所述方法包含以下步骤：

-网络指示哪些相邻小区信息应该在接入之前被获取，和/或哪些相邻小区信息可以在接入之时或之后被获取。

在另一方面，不同类型的相邻小区信息包含频率内小区信息（intra-frequency cell information）、频率间小区信息（inter-frequency cell information）和交互无线电接入技术小区信息（inter-radio access technology cell information），且所述方法包含以下步骤：

-网络指示应该在接入之前被获取的相邻小区信息类型，和/或可以在接入之时或之后被获取的相邻小区信息类型。

在另一方面，所述方法包含以下步骤：

-网络在广播系统信息中提供所述指示。

在另一方面，所述方法包含以下步骤：

-网络在主信息块中提供所述指示。

在另一方面，所述方法包含以下步骤：

-在接入之前网络在将由移动站读取的系统信息块中提供所述指示。

在另一方面，所述方法包含以下步骤：

-移动站根据无线资源控制协议在至少一个消息中发送所述请求。

在另一方面，所述方法包含以下步骤：

-移动站在组内选择的至少一个消息中发送所述请求，所述组包含：

- 小区更新消息，
- 小区更新完成消息，
- RRC 连接请求消息，
- RRC 连接建立完成消息，
- 测量报告消息，
- UTRAN 移动信息确认信息，
- 上行链路直接传送消息，
- 物理信道重配置完成消息，
- 指示系统信息请求的专用消息。

在另一方面，所述方法包含以下步骤：

- 网络在专用信道中发送可以在接入之时或之后请求的系统信息。

在另一方面，所述方法包含以下步骤：

- 网络根据无线资源控制协议，在至少一个消息中发送可以在接入之时或之后获取的系统信息。

在另一方面，所述方法包含以下步骤：

- 网络在组内选择的至少一个消息中发送可以在接入之时或之后获取的系统信息，所述组包含：

- 小区更新确认消息，
- RRC 连接建立消息，
- UTRAN 移动信息消息，
- 测量控制消息，
- 下行链路直接传送消息。

在另一方面，所述方法包含以下步骤：

- 网络根据移动站或用户需求 and/或系统需求，修改可以在接入之时或之后获取的系统信息。

在另一方面，所述方法包含以下步骤：

- 网络根据所述移动站的无线接入容量，修改可以在接入之时或之后获

取的系统信息。

在另一方面，所述方法包含以下步骤：

-网络根据正在进行的服务或针对用户的服务质量，修改可以在接入之时或之后获取的系统信息。

在另一方面，所述方法包含以下步骤：

-网络根据从所述移动站接收到的信息，修改可以在接入之时或之后获取的系统信息。

在另一方面，所述方法包含以下步骤：

-网络根据在接入之时或之后正在请求获取系统信息的所述移动站接收到的信息，修改可以在接入之时或之后获取的系统信息。

在另一方面，所述方法包含以下步骤：

-移动站向网络发送信息，所述信息使得网络能够修改可以在接入之时或之后获取的系统信息。

在另一方面，所述方法包含以下步骤：

-移动站在关于接入之时或之后获取系统信息的请求中向网络发送信息，所述信息使得网络能够修改可以在接入之时或之后获取的系统信息。

在另一方面，所述方法包含以下步骤：

-网络根据系统负载，修改可以在接入之时或之后获取的系统信息。

在另一方面，修改的系统信息包含相邻小区信息。

在另一方面，所述方法包含以下步骤：

-移动站从所述网络广播的系统信息中获取应该在接入之前获取的系统信息。

在另一方面，所述方法包含以下步骤：

-移动站从所述网络广播的系统信息中获取可以在接入之时或之后获取的系统信息。

在本发明的另一方面，通过移动站实现这些或其它目的，所述移动站包含用于执行根据本发明方法的装置。

在本发明的另一方面，通过网络实体来实现这些或其它目的，所述网

络实体诸如特别地用于 UTRAN 的无线网络控制器 (RNC), 所述网络实体包含用于执行根据本发明方法的装置。

附图说明

本发明的这些或其它目的将在从下文参照附图的描述中变得更加明显, 附图中:

-图 1 旨在回顾例如 UMTS 的移动通信系统以及例如 UTRAN 的无线接入网的结构;

-图 2 到图 6 旨在示意说明根据本发明方法的例子。

具体实施方式

通过举例方式, 在下面的描述中将更加特别考虑 UTRAN 作为本发明应用到 RAN 的例子; 然而, 应该理解本发明不限制于这种特定的例子。

本发明也可以基于例子简化说明如下。特别地, 用于建立(或重建)无线连接的初始接入的例子将在下文更加特别地考虑; 然而, 应该理解本发明不限制于这种例子, 且本发明也可以用于在其它例子中, 例如用于在小区重选择情况下用于建立无线连接的接入。

由于采用了新的无线接入技术, 在一个 UTRAN 小区中, 相邻小区的数目渐增。因此对应于相邻小区信息(特别地, 诸如在 SIB11 中)的系统信息渐增。如果所有的信息在 UE 初始接入之前必须读取, 该初始接入将延迟, 这样影响了呼叫建立延迟并影响了用户体验。

在一个方面, 本发明特别地认识到, 与在接入之前需要获取所有系统信息的现有技术相反, 在接入之时或之后获取部分系统信息是有益的。这将使得能够避免这样的缺陷。

在图 2 中, 移动站接入到网络以建立或重建无线连接的步骤标示为 S1, 且在接入之时或之后获取系统信息的步骤标示为 S2。

在另一方面, 本发明也认识到指定若干系统信息分类是有益的, 一些分类应该读取用于初始接入, 而其它的可以在以后别的步骤中由 UE 读取。

在图3中,移动站接入到网络以建立或重建无线连接的步骤标示为S1,应该在接入前获取系统信息的步骤标示为S3,而在接入之时或之后获取系统信息的步骤标示为S2。

特别地,应该在接入前获取的系统信息可以包含接入相关系统信息,而在接入之时或之后获取的系统信息可以包含非接入相关系统信息。

接入相关系统信息例如可以包含在RRC连接建立之前(也就是在空闲模式下)用于执行无线资源管理和/或控制过程所必需的信息。非接入相关系统信息例如可以包含在RRC连接建立时或之后(也就是在连接模式下)用于执行无线资源管理和/或控制过程所必需的信息。

在另一方面,本发明还认识到,由于在初始接入之后UE可以与无线接入网(UTRAN或E-UTRAN,...)连接,因此第二步和随后的系统信息获取可以“按需”执行,这样允许无线接入网向UE提供所需要的系统信息,因为只有所需要的信息,因此节省了下行链路带宽并降低了相关信息的获取时间。

因此,在呼叫建立或重建时,UE不会浪费时间获取所有的系统信息,但应该仅仅获取那些用于初始接入的信息。而剩余的SIB组更适合后来在UE在连接模式中(例如在Cell-DCH状态中)获取。

例如,在RLC不可校正错误时,UE可能需要重选择别的小区;于是,对于UE来说已经获取发送在SIB11和SIB12中的所有相邻配置是有利的。此外,在本地服务涉及的UE,可能需要包含在SIB15和SIB16中的帮助数据信息。

在这样的例子中,SIB11、12、15和16包含很多信息,且在连接模式下(例如在Cell-DCH状态期间),如果系统信息没有在初始接入之前被获取的话,UE将有益于请求UTRAN传送这些系统信息。

本发明也提出了在UE或无线接入网或两者中定义系统信息的多个类。接入类(或接入相关)系统信息定义应该在初始接入之前通过UE获取的信息。

在另一方面,本发明也提出了若干能使用在描述相邻关系的系统信息

中的类别。相邻关系特别地包含相同技术的不同小区，或不同频率或带宽或不同技术的不同小区。

UE 可以获取在初始接入之前需要的相邻关系（这部分可以为空）。

在另一方面，对于相邻关系的每一部分，本发明也提出了无线接入网络可以指示 UE 是否应该获取它或 UE 可以在以后步骤获取它。

这种指示可以被无线接入网络传输，例如在主信息块或将在初始接入之前被 UE 读取的系统信息块中。

一旦执行了初始接入，UE 可以获取剩余系统信息（在一步或若干步中）。

UE 可以在广播通道或在例如信令无线承载的专用通道上接收剩余系统信息。

本发明还提出了当信息在连接模式下（例如在专用通道上）接收时，UE 可以向无线接入网络请求所需要的系统信息。

在图 4 中，发送获取系统信息的步骤被标示为 S4，按这种请求发送系统信息到移动站的步骤被标示为 S5。

在例子中，为了一旦执行了初始接入就允许 UE 读取部分系统信息且获取剩余 SIB，提出了增加信令以使得 UE 一旦 UE 处于 Cell_DCH 中，UE 可以请求某些将在 DCCH 上传输的 SIB。

这样的系统信息请求将允许加速初始呼叫的建立，和在 RLC 不可校正错误后服务的再进入。它包含 UE 所需要的 SIB 和到目前为止还没有解码的 SIB。

系统信息的 UE 请求可以例如被发送在小区更新消息中、小区更新完成消息中、RRC 连接请求消息中、测量报告消息中，或 UTRAN 移动信息确认消息中、或捎带在上行链路直接传送消息中、或发送在物理信道重配置完成消息中，或在指示系统信息请求的专用消息中。

在小区更新消息中发送请求的例子图示说明在图 5 中，此处它被标示为“带有 S1 请求的小区更新”。

一旦接收到这种请求，无线接入网应该发送相关系统信息到 UE。

这例如可以被传输在小区更新确认消息中、或 RRC 连接建立消息中、或 UTRAN 移动信息消息中、或测量控制消息中、或捎带在下行链路直接传送消息中、或发送在现有系统信息块中：不同类别的相邻小区和参数可以从新的系统信息或者从具有新实例的现有系统信息中分离出来。

在小区更新确认消息中发送系统信息的例子图示在图 5 中，此处它被标示为“带有 S1 请求的小区更新确认”。

在例子中，在接收到请求时，只要 UE 在 Cell-DCH 中，无线接入网络应该在 DCCH 上向 UE 发送相关系统信息。由于 DCCH 可以在 HS-DSCH 上传输，遗漏信息可以非常有效地从 UTRAN 传送到 UE。

换句话说，在所考虑的例子中，尤其是由于系统信息内容的扩展，因此提出了在 3GPP TS 25.331 中增加信令以允许 UE 明确地请求一些系统信息块和允许 UTRAN 在 DCCH 上发送 SIB。

在另一方面，本发明还提出了 UTRAN 可以得益于它已经处理的信息，以便于优化以专用模式发送到 UE 的系统信息。

特别地，UTRAN 可以使用 UE 的无线接入容量，以便于发送关于有关相邻关系的信息，例如支持 E-UTRA 的 UE 应该被提供关于 E-UTRA 相邻小区的信息。

UTRAN 还可以基于系统负载上的信息：例如沉重负载的相邻小区/频率/带宽/技术可以从相邻小区/频率/带宽/技术列表中移出。

UTRAN 也可以基于系统服务上的信息：如果用户激活了某种 QoS，例如某些小区/频率/带宽/技术可以在相邻小区/频率/带宽/技术列表中优先（或禁止）。

在图 6 中，根据移动站或用户设备和/或系统需求，修改或优化可在接入之后获取的系统信息的步骤被标示为 S7，且发送这种被修改或优化系统信息的步骤被标示为 S8。另外，特别地，在关于获取别的系统信息的请求中向网络发送能够启动这种修改或优化的信息的步骤被标示为 S6。

为了实现本发明的目的，本发明还提出移动站，以及网络实体（例如特别地用于 UTRAN 的无线网络控制器（RNC）），包含根据任意上述方面、

单独地或组合地执行根据本发明的方法的装置。

上述装置的详细执行对于本领域内技术人员不会增加任何特定的问题，且因此对于领域内技术人员来说，这种装置不需要通过它们的功能作出比上述更充分的描述。

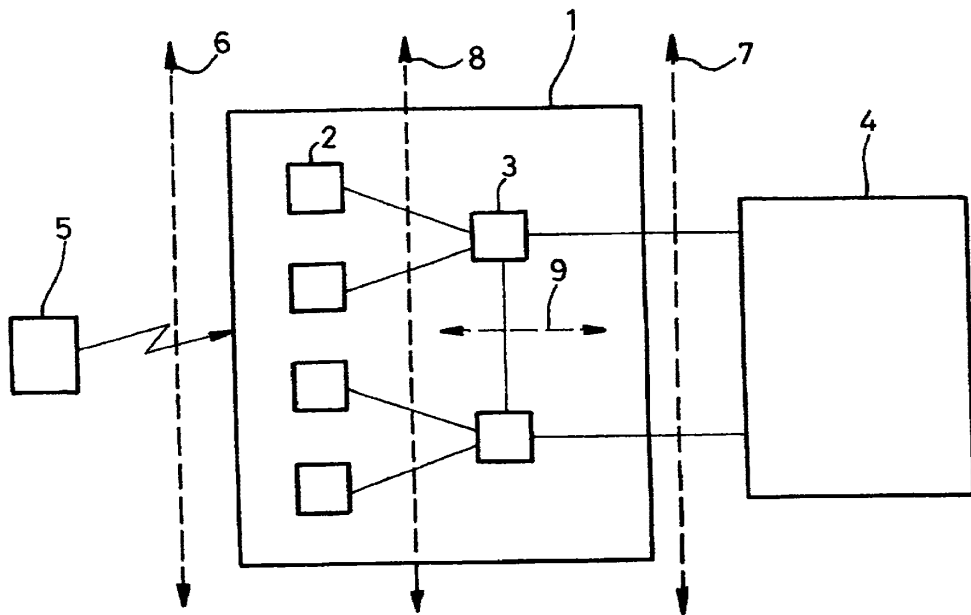


图 1

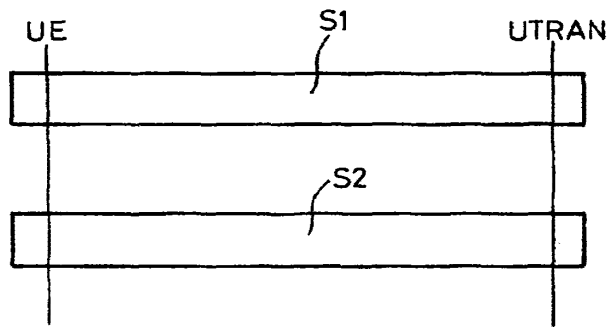


图 2

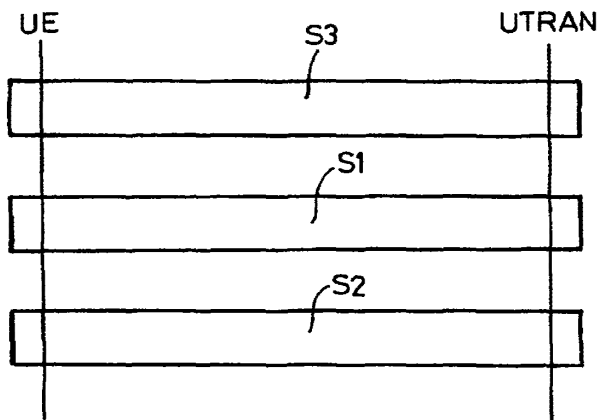


图 3

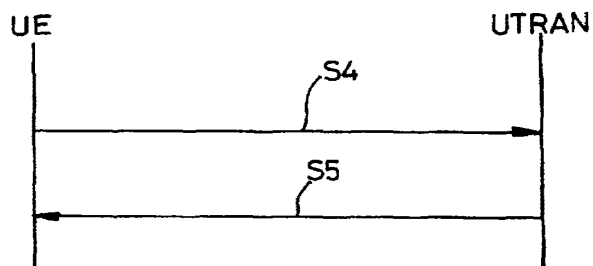


图 4

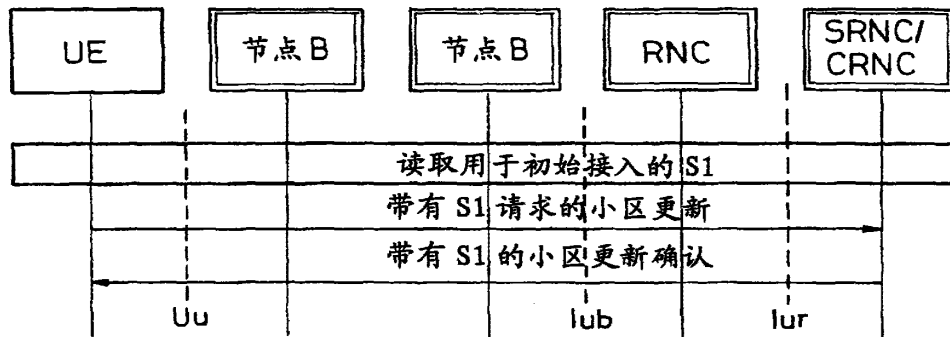


图 5

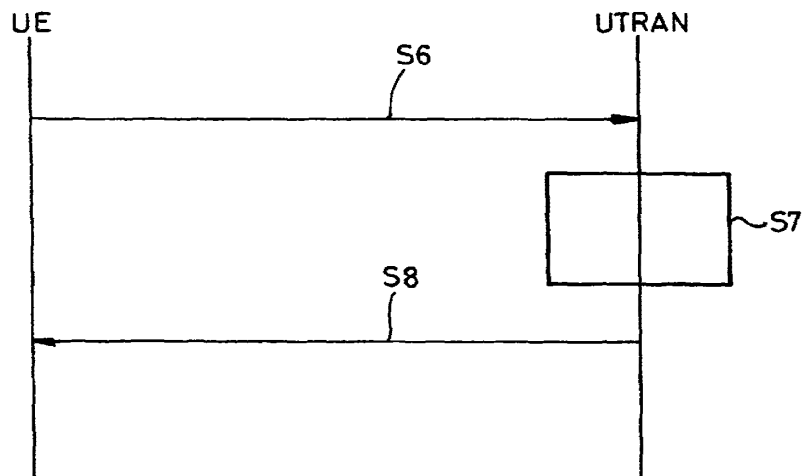


图 6



Espacenet

Bibliographic data: CN101217689 (A) — 2008-07-09

A systematic message transmitting method and its implementation device

Inventor(s): HAILIN JIANG [CN]; HAIZHOU BI [CN] ± (JIANG HAILIN, ; BI HAIZHOU)

Applicant(s): DATANG MOBILE COMM EQUIP CO [CN] ± (DATANG MOBILE COMMUNICATIONS EQUIPMENT CO., LTD)

Classification: - **international:** H04B7/26; H04W72/12
- **cooperative:** H04W72/12

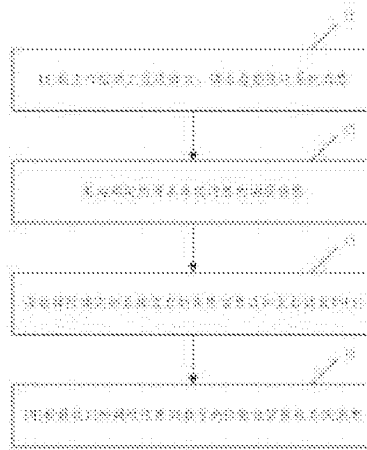
Application number: CN2007163262 20070105

Priority number(s): CN2007163262 20070105

Also published as: CN101217689 (B) WO2008083580 (A1)

Abstract of CN101217689 (A)

The invention discloses a transmission method of system information, which comprises that: the user equipment requests a base station to send system information by sending specific leader sequence; the receiving base station determines and sends scheduling information of the requested system information according to the received leader sequence; the user equipment receives system information that is required by the user equipment from the indicated transmission position according to the received scheduling information of system information. The invention also discloses a user equipment and a base station; by adopting the method of the invention and the device thereof, link self-adapting of sending system information can be realized, thereby saving system resource.



- 11. THE METHOD OF CLAIM 10, WHEREIN THE USER DETERMINES, BASED ON THE TIME SLOTS OF A FIRST SCHEDULE
- 12. THE USER DETERMINES THE SCHEDULE AND THE CONTENT OF THE MESSAGE OF THE FIRST SCHEDULE
- 13. THE USER DETERMINES THE SET OF THE DETERMINED SCHEDULES BASED ON THE CONTENT OF THE FIRST SCHEDULE
- 14. THE METHOD OF CLAIM 10, WHEREIN THE USER DETERMINES THE SCHEDULES OF THE FIRST SCHEDULE

[19] 中华人民共和国国家知识产权局

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H04Q 7/22 (2006.01)

H04Q 7/38 (2006.01)

H04B 7/26 (2006.01)



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[71] 申请人 大唐移动通信设备有限公司

地址 100083 北京市海淀区学院路29号

[72] 发明人 蒋海林 毕海洲

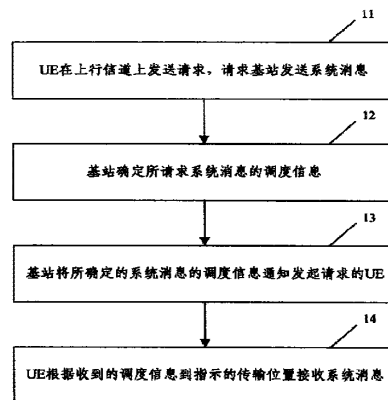
权利要求书3页 说明书9页 附图1页

[54] 发明名称

一种系统消息传送方法及其实现装置

[57] 摘要

本发明公开了一种系统消息传送方法，包括：用户设备通过发送特定前导序列请求基站发送系统消息；接收基站根据所收到前导序列确定并发送的所请求系统消息的调度信息；用户设备根据收到的系统消息调度信息，到指示的传输位置接收自身所需的系统消息。本发明还公开了一种用户设备和一种基站，采用本发明的方法及装置，能够实现系统消息发送的链路自适应，节省系统资源。



- 1、一种系统消息传送方法，其特征在于，该方法包括：
用户设备通过发送特定前导序列请求基站发送系统消息；
用户设备接收基站发送的所请求系统消息的调度信息，该调度信息是由基站根据所收到前导序列确定的；
用户设备根据收到的系统消息调度信息，到指示的传输位置接收自身所需的系统消息。
- 2、根据权利要求1所述的方法，其特征在于，所述前导序列中携带有信道质量指示信息；或者，所述前导序列通过设置与信道质量指示信息之间的对应关系，隐含携带信道质量指示信息。
- 3、根据权利要求1所述的方法，其特征在于，所述系统消息调度信息至少包括系统消息的传输位置和信道质量指示信息；
该方法进一步包括：建立前导序列与系统消息块和信道质量指示信息之间的对应关系；
所述根据前导序列确定系统消息的调度信息为：基站根据收到的前导序列确定用户设备需要发送的系统消息块及其传输位置和信道质量指示信息。
- 4、根据权利要求1至3任一项所述的方法，其特征在于，所述基站将所确定的调度信息发送给用户设备的具体方法为：
基站通过静态部分系统消息主消息块的相应指示域，将用户设备所请求的系统消息的传输位置及传输格式通知给发送请求的用户设备；或者，
基站通过特定寻呼指示分组及其指示域将用户设备所请求的系统消息的传输位置及传输格式通知给发送请求的用户设备；或者，
基站通过特定用户设备标识或特定用户设备标识及其调度控制信道的指示域通知发送请求的用户设备所请求系统消息的传输位置及传输格式。
- 5、根据权利要求2或3所述的方法，其特征在于，所述信道质量指示信息包括但不限于：下行发射功率、下行信噪比、下行到达信号角度。

6、根据权利要求5所述的方法，其特征在于，该方法进一步包括：基站采用链路自适应方式发送用户设备所请求的系统消息；

如果信道质量指示信息携带下行发射功率，则基站根据信道质量指示信息指示的发射功率发送用户设备请求的系统消息；

如果信道质量指示信息携带下行信噪比，则基站根据信道质量指示信息指示的信噪比对应的调制编码方案发送用户设备请求的系统消息；

如果信道质量指示信息携带下行信号到达方向角，则基站采用波束赋形方式发送用户设备请求的系统消息。

7、根据权利要求6所述的方法，其特征在于，所述基站将所确定的调度信息发送给用户设备的具体方法为：

基站通过静态部分系统消息主消息块的相应指示域，将用户设备所请求的系统消息的传输位置及传输格式通知给发送请求的用户设备；或者，

基站通过特定寻呼指示分组及其指示域将用户设备所请求的系统消息的传输位置及传输格式通知给发送请求的用户设备；或者，

基站通过特定用户设备标识或特定用户设备标识及其调度控制信道的指示域通知发送请求的用户设备所请求系统消息的传输位置及传输格式。

8、一种用户设备，至少包括消息收发单元，其特征在于，该设备还包括系统消息请求单元和信息存储单元，

所述系统消息请求单元，用于设置特定前导序列与系统消息块和信道质量指示信息之间的映射关系，并将特定前导序列及所设置的映射关系存储于信息存储单元中；选择特定前导序列发起系统消息请求，通知用户设备的消息收发单元向基站发送特定前导序列，并在收到消息收发单元解调出的系统消息调度信息后，指示消息收发单元到调度信息指示的传输位置按指示的传输格式接收所需的系统消息；

用户设备的消息收发单元进一步用于向基站发送特定前导序列，接收基站发送的系统消息调度信息，并将经过解调的系统消息调度信息发送给系统消息请求单元，根据指示的传输位置按指示的传输格式接收所需的系统消息。

9、根据权利要求 8 所述的用户设备，其特征在于，所述信息存储单元进一步用于存储系统消息块与信道质量指示信息之间的映射关系，和/或存储特定寻呼指示组与系统消息块和信道质量指示信息之间的映射关系，和/或存储特定用户设备标识与系统消息块和信道质量指示信息之间的映射关系。

10、一种基站，至少包括消息收发单元，其特征在于，该基站还包括调度信息确定单元和信息存储单元，

所述调度信息确定单元，用于根据收到的前导序列确定所请求系统消息的调度信息，根据确定的通知方式，指示基站的消息收发单元将所确定的系统消息调度信息按确定的通知方式发送给用户设备；

所述信息存储单元，用于存储系统消息块与信道质量指示信息之间的映射关系，和/或存储特定前导序列与系统消息块和信道质量指示信息之间的映射关系，和/或存储特定寻呼指示组与系统消息块和信道质量指示信息之间的映射关系，和/或存储特定用户设备标识与系统消息块和信道质量指示信息之间的映射关系；

基站的消息收发单元进一步用于：接收前导序列，根据确定的通知方式将确定的系统消息调度信息放置于主消息块的相应指示域中，或通过特定寻呼指示组、或特定用户设备标识或特定用户设备标识及其指示域发送给用户设备。

一种系统消息传送方法及其实现装置

技术领域

本发明涉及移动通信系统中的消息传送技术，特别是涉及一种系统消息传送方法及其实现装置。

背景技术

随着第三代(3G)移动通信技术的不断发展，第三代合作伙伴计划(3GPP)组织在2004年提出了新一代的长期演进(LTE, Long Term Evolution)系统，以实现3G技术向B3G(Beyond 3G)和4G的平滑过渡。在LTE系统中，广播信道(BCH)中传输的系统消息分为静态部分和可变部分，其中，静态部分的系统消息大小固定，并在指定的时频资源位置用固定的调制编码方案发送；可变部分的系统消息映射到下行的共享物理资源上，可以与其它信道进行无线资源共享。

对于可变部分系统消息的发送，目前提出的方式有基于请求(On Demand)机制，即：某些情况下，用户设备(UE)通过随机接入信道(RACH)向基站发起请求，要求发送某些系统消息，基站收到请求后，就将UE所请求的系统消息广播发送。该机制从网络实现的角度来看，就是：某些系统消息不用一直发送，是通过UE的RACH信道控制这些系统消息的发送或停发。

现有技术中，虽然可变部分系统消息可以通过UE发送随机接入信道请求信号来控制系统消息发送的开与关，但系统消息的发送仍然是针对小区中所有UE的，而不是针对发起请求的那些UE，因此，从小区覆盖的角度出发，对所请求系统消息的发送只能采用一种比较保守的方式，即：要使小区覆盖范围内所有UE都能收到发送的系统消息的方式，这样，就可能会选用较低的发送等级、通用的编码方式、较大的发射功率等等，如此，不仅会造成系统资源的浪

费，还会影响发送效果。

发明内容

有鉴于此，本发明的主要目的在于提供一种系统消息传送方法及其实现装置，能够实现系统消息发送的链路自适应，节省系统资源。

为达到上述目的，本发明的技术方案是这样实现的：

本发明提供了一种系统消息传送方法，包括：用户设备通过发送特定前导序列请求基站发送系统消息；接收基站发送的所请求系统消息的调度信息，该调度信息是由基站根据所收到前导序列确定的；用户设备根据收到的系统消息调度信息，到指示的传输位置接收自身所需的系统消息。

其中，所述前导序列中携带有信道质量指示信息；或者，所述前导序列通过设置与信道质量指示信息之间的对应关系，隐含携带信道质量指示信息。所述系统消息调度信息至少包括系统消息的传输位置和信道质量指示信息；该方法进一步包括：建立前导序列与系统消息块和信道质量指示信息之间的对应关系；所述根据前导序列确定系统消息的调度信息为：基站根据收到的前导序列确定用户设备需要发送的系统消息块及其传输位置和信道质量指示信息。

上述方案中，所述信道质量指示信息包括但不限于：下行发射功率、下行信噪比、下行到达信号角度。该方法进一步包括：基站采用链路自适应方式发送用户设备所请求的系统消息；如果信道质量指示信息携带下行发射功率，则基站根据信道质量指示信息指示的发射功率发送用户设备请求的系统消息；如果信道质量指示信息携带下行信噪比，则基站根据信道质量指示信息指示的信噪比对应的调制编码方案发送用户设备请求的系统消息；如果信道质量指示信息携带下行信号到达方向角，则基站采用波束赋形方式发送用户设备请求的系统消息。

上述方案中，所述基站将所确定的调度信息发送给用户设备的具体方法为：基站通过静态部分系统消息主消息块的相应指示域，将用户设备所请求的系统消息的传输位置及传输格式通知给发送请求的用户设备；或者，基站通过特定

寻呼指示分组及其指示域将用户设备所请求的系统消息的传输位置及传输格式通知给发送请求的用户设备；或者，基站通过特定用户设备标识或特定用户设备标识及其调度控制信道的指示域通知发送请求的用户设备所请求系统消息的传输位置及传输格式。

本发明还提供了一种用户设备，至少包括消息收发单元，该设备还包括系统消息请求单元和信息存储单元，所述系统消息请求单元，用于设置特定前导序列与系统消息块和信道质量指示信息之间的映射关系，并将特定前导序列及所设置的映射关系存储于信息存储单元中；选择特定前导序列发起系统消息请求，通知用户设备的消息收发单元向基站发送特定前导序列，并在收到消息收发单元解调出的系统消息调度信息后，指示消息收发单元到调度信息指示的传输位置按指示的传输格式接收所需的系统消息；用户设备的消息收发单元进一步用于向基站发送特定前导序列，接收基站发送的系统消息调度信息，并将经过解调的系统消息调度信息发送给系统消息请求单元，根据指示的传输位置按指示的传输格式接收所需的系统消息。

其中，所述信息存储单元进一步用于存储系统消息块与信道质量指示信息之间的映射关系，和/或存储特定寻呼指示组与系统消息块和信道质量指示信息之间的映射关系，和/或存储特定用户设备标识与系统消息块和信道质量指示信息之间的映射关系。

本发明还提供了一种基站，至少包括消息收发单元，该基站还包括调度信息确定单元和信息存储单元，所述调度信息确定单元，用于根据收到的前导序列确定所请求系统消息的调度信息，根据确定的通知方式，指示基站的消息收发单元将所确定的系统消息调度信息按确定的通知方式发送给用户设备；所述信息存储单元，用于存储系统消息块与信道质量指示信息之间的映射关系，和/或存储特定前导序列与系统消息块和信道质量指示信息之间的映射关系，和/或存储特定寻呼指示组与系统消息块和信道质量指示信息之间的映射关系，和/或存储特定用户设备标识与系统消息块和信道质量指示信息之间的映射关系；

基站的消息收发单元进一步用于：接收前导序列，根据确定的通知方式将

确定的系统消息调度信息放置于主消息块的相应指示域中，或通过特定寻呼指示组、或特定用户设备标识或特定用户设备标识及其指示域发送给用户设备。

本发明所提供的系统消息传送方法及其实现装置，UE 通过发送特定前导序列发起系统消息发送请求，基站根据收到的前导序列确定所请求系统消息的调度信息，并将所确定的调度信息通知给发起请求的 UE，以保证所发送的系统消息能被发起请求的那些 UE 收到，而不一定在整个小区广播，这样就可以在系统消息发送时，对发射功率、调制编码方案等参数进行适当地选择，选用保证发起请求 UE 能收到的、效果最好的发送参数，从而实现系统消息发送的链路自适应。而且，由于选择合适的发射功率进行发送，选择适当的调制编码方案完成调制编码等等，不必再为覆盖全小区的 UE 而加大发射功率，如此，在保证发送效果的同时能大大减少系统资源的占用，节省系统资源。

附图说明

图 1 为本发明系统消息发送的实现流程示意图。

具体实施方式

本发明的基本思想是：UE 通过发送特定前导序列请求基站发送系统消息，基站根据收到的前导序列确定所请求系统消息的调度信息，并将所确定的调度信息通知给发起请求的 UE，发起请求的 UE 再根据收到的系统消息调度信息，到指示的传输位置接收自身所需的系统消息。

这里，所述特定前导序列是系统为 UE 请求系统消息预留的一些前导序列。UE 所请求的系统消息为可变部分系统消息。

本发明中，对于系统消息的发送，静态部分的系统消息一直以固定的传输格式在固定位置广播发送，比如：采用四相频移键控（QPSK）+1/3 编码的传输格式进行发送。可变部分的系统消息可分为多组，每组称为一个系统消息块（SIB），比如：将所有可变部分的系统消息分为 n 组，分别表示为 SIB1, ..., SIBn。一般分组是按系统消息的特点划分的，比如：按完成功能划分，也就是说，每

组系统消息的特点是相似的,这样便于对每组消息进行独立的开关控制及发送。

如图 1 所示,本发明的系统消息发送方法包括以下步骤:

步骤 11: UE 通过发送特定前导序列在上行信道上发起请求,要求基站发送系统消息。

这里,所述发起请求的上行信道可以是随机接入信道,也可以是无竞争的上行控制信道。其中,所谓无竞争是指在上行控制信道中预留信道资源。

本发明中,UE 发送请求采用前导序列的形式,系统为 UE 请求系统消息预留了一些前导序列,作为特定前导序列,所预留的特定前导序列会预先通知 UE 和基站。每个特定前导序列根据自身能携带的信息量可以携带少量的 CQI 信息;或者,建立每个特定前导序列与信道质量指示(CQI)信息之间的对应关系,相当于前导序列隐含携带 CQI 信息。其中,CQI 信息包括但不限于以下参数:下行发射功率,用于系统消息发送时的功率调整;下行信噪比,用于系统消息发送时调制编码方案的调整;下行到达信号角度(DOA),用于系统消息发送时进行波束赋形调整。在实际应用中,CQI 信息可以为上述任意一个参数,或为上述任意两个或三个参数的组合,CQI 信息就代表系统消息的传输格式。

根据 UE 发送的前导序列及其对应的 CQI 信息,基站可以采用相应的链路自适应方式发送 UE 所请求的系统消息。比如说:如果 CQI 信息携带的参数为下行发射功率,则基站根据 CQI 信息指示的发射功率发送 UE 请求的系统消息;如果 CQI 信息携带的参数为下行信噪比,则基站根据 CQI 信息指示的信噪比对应的调制编码方案发送 UE 请求的系统消息;如果 CQI 信息携带的参数为下行信号到达方向角,则基站可采用波束赋形的方式发送 UE 请求的系统消息。

本发明中,每个预留的前导序列与系统消息块之间也存在对应关系,进一步说就是,每个预留的前导序列与 SIB 和 CQI 信息存在一定的映射关系。例如:前导序列 p1 对应系统消息块 SIB2 和下行发射功率 Pa,那么,基站检测到前导序列 p1 时,就会认为有 UE 需要发送系统消息块 SIB2,且下行信道的发射功率为 Pa。如果不同 UE 请求发送相同 SIB,且下行信道的 CQI 信息相同,则发送的前导序列也相同;如果不同 UE 请求发送相同 SIB,但下行信道的 CQI 信

息不同，则选择最保守的 CQI 信息发送，比如有多个不同的发射功率，则选择最低的发射功率进行发送。由于同一个 UE 可能请求多个 SIB，所以一个前导序列也可以对应多个 SIB 和 CQI 信息的组合。

步骤 12：基站检测到 UE 发送的前导序列并确认为特定前导序列后，根据前导序列确定 UE 所需系统消息的调度信息，即：确定该 UE 需要发送的 SIB 及其传输位置和下行信道的 CQI 信息。

一般的随机接入过程中，基站在收到 UE 发送的前导序列后会回复前导序列响应信号，本发明中，基站不对 UE 发送的前导序列回复任何响应信号。

步骤 13：基站将 UE 所请求的系统消息的调度信息通知发送请求的 UE，其中，系统消息的调度信息是指系统消息的传输位置及传输格式。

本发明中，基站可通过以下三种方法之一将所请求系统消息的调度信息通知给发送请求的 UE：

第一种，基站通过静态部分系统消息主消息块（MIB）的相应指示域，将 UE 所请求的系统消息的传输位置及传输格式通知给发送请求的 UE。

由于静态部分系统消息一直以固定传输格式在固定位置发送，所以，本发明在静态部分系统消息的 MIB 中增加新的指示域，用来携带指示哪些 SIB 将在哪些时频资源位置被发送的信息，以及发送 SIB 的传输格式。当然，如果 MIB 中存在未使用的域，也可以直接使用 MIB 中已有的未使用的域。每个发送请求的 UE 收到 MIB 后，就可以从 MIB 的相应指示域中获取传输位置和传输格式信息，然后到指定位置接收自身所需的系统消息。

这里，所述传输格式就是指链路自适应参数，比如：调制编码方案、波束赋形参数、发射功率等等，也就是 CQI 信息。

比如：在 MIB 中增加 SIB 域、SIB 传输位置域和传输格式域，如果当前 UE 请求发送 SIB2，则基站在发送 MIB 时，将 SIB2 放入 SIB 域，将传输 SIB2 的时频资源位置放入 SIB 传输位置域，将 SIB2 对应的 CQI 信息放入传输格式域就可以了。其中，SIB2 对应的 CQI 信息是根据预先设置的 SIB 与 CQI 信息之间的对应关系得到的。

第二种，基站通过特定寻呼指示分组将 UE 所请求的系统消息的传输位置及传输格式通知给发送请求的 UE。

为实现这种方案，可预先从系统存在的寻呼指示分组中选择一些预留，作为特定寻呼指示分组，并在特定寻呼指示分组与 SIB 及 CQI 信息之间建立一一对应关系，所建立的映射关系基站会预先通知所有 UE。那么，UE 通过解调出寻呼指示分组，就可以获得该寻呼指示分组所对应的发送系统消息的 SIB 及 CQI 信息。其中，CQI 信息就代表传输格式，传送每个 SIB 的时频资源位置在寻呼指示相对应的资源指示域给出。

所述预留寻呼指示分组可以采用以下方式：由于 UE 属于哪个寻呼指示分组是根据其自身 IMSI 号按一定原则计算得到的，所以，假设系统中存在 144 个寻呼指示分组，要预留其中的 4 个，则令 UE 分组号 = IMSI mod 140，这样，普通 UE 的寻呼指示分组就从 0 到 139，而其余的四个寻呼指示分组 140~143 就可以预留出来，用于通知 UE 所请求系统消息的传输位置和传输格式。

本发明中，所述系统消息的调度信息由基站在携带寻呼指示的 L1/L2 调度控制信道上发送，同时，为发送系统消息专门设置有 SIB 发送周期，该 SIB 发送周期不同于 UE 的寻呼指示周期。UE 在发送完上行请求后，会在 SIB 发送周期内监视 L1/L2 调度控制信道，获取系统消息的调度信息。

第三种，基站通过特定 UE ID 或特定 UE ID 及其调度控制信道的指示域通知发送请求的 UE 所请求系统消息的传输位置及传输格式。

为实现这种方案，可预留一些特定的 UE ID，用于区分发送系统信息的调度控制信道和普通的调度控制信道。并且，建立特定 UE ID 与 SIB 及 CQI 信息之间的映射关系，所建立的映射关系基站会预先通知所有 UE，或者在调度控制信道中设定用于指示 SIB 的域。所述在调度控制信道中设定的域可以是新增的，也可以是普通调度控制信道中不使用的域。UE 解调出特定 UE ID，就可以获得与其相对应的 SIB，由于调度控制信道上一般包含资源指示域和传输格式域，所以，SIB 的传输位置通过调度控制信道的资源指示域给出；同时，下行调度控制信道中的传输格式域可以传送系统消息的传输格式。

步骤 14: 发起请求的 UE 收到系统消息的调度信息后, 到调度信息指示的传输位置上按给定的传输格式接收自身所需的系统消息。其中, 所述系统消息可以直接在寻呼信道中发送。

对于不同的 UE, 根据所收到的系统消息调度信息确定哪些是自身所请求的系统消息, 再到相应的传输位置接收所需的系统消息。

至于 UE 如何收到系统消息的调度信息与步骤 13 中基站所选用的通知方式相关, 在实际应用中, 基站只会选用三种中的一种, 并预先通知 UE 会以何种方式进行通知。如果选择第一种, UE 就从接收的静态部分系统消息的 MIB 相应指示域中读取系统消息的调度信息; 如果选择第二种, UE 在发送完前导序列后, 会在 L1/L2 调度控制信道上监视寻呼指示, 判断检测到的寻呼指示中是否有与自身所请求 SIB 相对应的寻呼指示分组号, 如果有, 则通过解调寻呼指示分组即可获得系统消息的调度信息; 如果选择第三种, UE 在发送完前导序列后, 会在调度控制信道上监视 UE ID, 判断收到的 UE ID 是否为特定的 UE ID, 如果是, 则根据特定 UE ID 获得 SIB, 并通过解调调度控制信道获取系统消息的调度信息, 即传输位置和传输格式。

本发明中, 由于基站根据前导序列获得了 UE 下行链路的 CQI 信息, 所以, 在发送系统消息时可进行链路自适应发送。所述链路自适应的方式可以包括: 自适应调整系统消息的发射功率、自适应调整系统消息发送的调制编码方式以及系统消息的发送进行下行波束赋形等等, 而系统消息的发送格式或方式应在系统消息的调度信息中包含。

为实现上述方法, 本发明在用户设备中增加系统消息请求单元和信息存储单元, 所述系统消息请求单元, 用于设置特定前导序列与 SIB 和 CQI 信息之间的映射关系, 并将特定前导序列以及与其对应的 SIB、CQI 信息一起存储于信息存储单元中; 所述系统消息请求单元还用于发起系统消息请求, 选择特定前导序列, 通知用户设备已有的消息收发单元向基站发送特定前导序列, 并在收到消息收发单元解调出的系统消息调度信息后, 指示消息收发单元到调度信息指示的传输位置按照指示的传输格式接收所需的系统消息。

所述信息存储单元进一步用于存储 SIB 与 CQI 信息之间的映射关系、和/或存储特定寻呼指示组与 SIB 和 CQI 信息之间的映射关系，和/或存储特定 UE ID 与 SIB 和 CQI 信息之间的映射关系。

用户设备的消息收发单元进一步用于向基站发送特定前导序列，接收基站发送的系统消息调度信息，并将经过解调的系统消息调度信息发送给系统消息请求单元，根据指示的传输位置按指示的传输格式接收所需的系统消息。

相应的，基站中需要增加调度信息确定单元和信息存储单元，所述调度信息确定单元，用于根据收到的前导序列确定所请求系统消息的调度信息，所收到的前导序列来自基站已有的消息收发单元；根据确定的通知方式，指示基站的消息收发单元将所确定的系统消息调度信息按确定的通知方式发送给用户设备。所述信息存储单元，用于存储 SIB 与 CQI 信息之间的映射关系、和/或存储特定前导序列与 SIB 和 CQI 信息之间的映射关系，存储特定寻呼指示组与 SIB 和 CQI 信息之间的映射关系，和/或存储特定 UE ID 与 SIB 和 CQI 信息之间的映射关系。

基站的消息收发单元进一步用于：接收前导序列，根据确定的通知方式将确定的系统消息调度信息放置在 MIB 相应指示域中，或通过特定寻呼指示组、或特定 UE ID、或特定 UE ID 及其指示域发送给用户设备。

以上所述，仅为本发明的较佳实施例而已，并非用于限定本发明的保护范围。

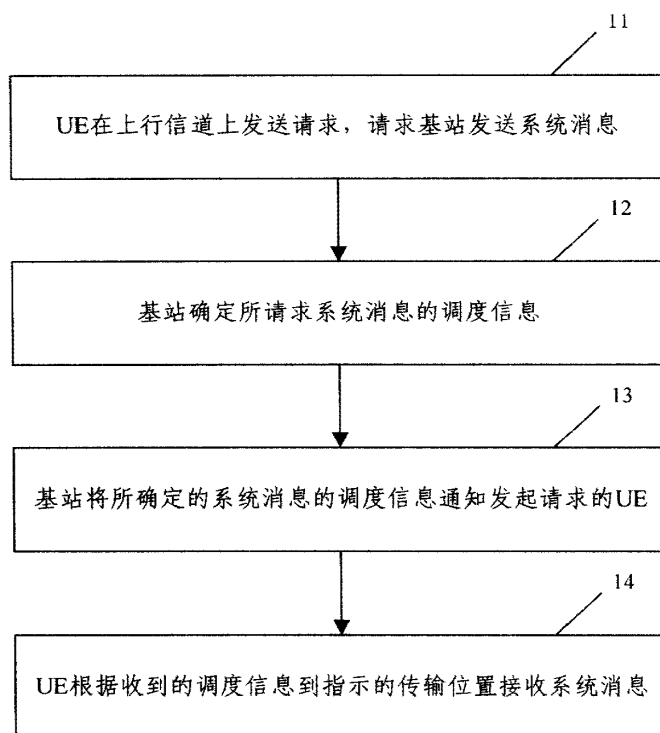


图 1



Espacenet

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Method and apparatus for receiving system information from base station in a mobile communication system

Inventor(s): KO MIN-SUK, ; JEONG KYEONG-IN

Applicant(s): SAMSUNG ELECTRONICS CO LTD [KR] ± (SAMSUNG ELECTRONICS CO., LTD)

Classification: - **international:** H04B1/06; H04W48/12
- **cooperative:** H04W48/12

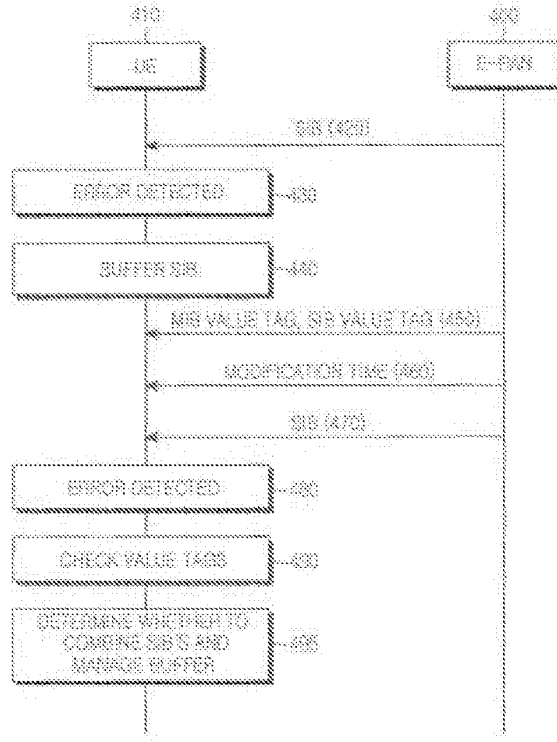
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Abstract of CN101542915 (A)

A method and apparatus for receiving system information from a Base Station (BS) in a Mobile Station (MS) in a mobile communication system are provided, in which it is determined whether there is buffered system information in a buffer, if current system information has an error, it is determined whether a combining condition is satisfied, in the presence of the buffered system information, the combining condition being defined by at least one of a Master Information Block (MIB) value tag, a System Information Block (SIB) value tag, and modification time information that are associated with the current system information, and the current system information is combined with the buffered system information, if the combining condition is satisfied.



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 [71] 申请人 三星电子株式会社
 地址 韩国京畿道
 [72] 发明人 高敏硕 郑景仁

[74] 专利代理机构 北京市柳沈律师事务所
 代理人 钱大勇

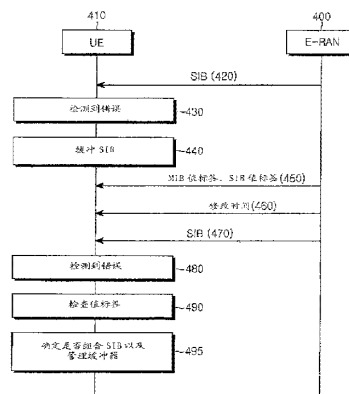
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[54] 发明名称

移动通信系统中从基站接收系统信息的方法和装置

[57] 摘要

提供了一种在移动通信系统中用于在移动站 (MS) 中从基站 (BS) 接收系统信息的方法和装置, 其中: 如果当前系统信息存在错误, 则确定缓冲器中是否存在缓冲的系统信息; 在存在缓冲的系统信息时, 确定是否满足组合条件, 该组合条件由与该当前系统信息有关的主信息块 (MIB) 值标签、系统信息块 (SIB) 值标签和修改时间信息中的至少一个定义; 以及如果满足该组合条件, 则组合该当前系统信息与该缓冲的系统信息。



1、一种在移动通信系统中用于在移动站（MS）中从基站（BS）接收系统信息的方法，包括：

如果当前系统信息具有错误，则确定缓冲器中是否存在缓冲的系统信息；

在存在缓冲的系统信息时，确定是否满足组合条件，该组合条件由与该当前系统信息有关的主信息块（MIB）值标签、系统信息块（SIB）值标签和修改时间信息中的至少一个定义；以及

如果满足该组合条件，则组合该当前系统信息与该缓冲的系统信息。

2、如权利要求1所述的方法，其中，该组合条件为，MIB值标签具有未改变的值。

3、如权利要求1所述的方法，其中，该组合条件为，如果MS未接收到该修改时间信息，则MIB值标签具有改变的值，并且SIB值标签具有未改变的值。

4、如权利要求1所述的方法，其中，该组合条件为，如果MS接收到该修改时间信息，则MIB值标签具有改变的值，所缓冲的系统信息在修改时间之后被接收到，并且SIB值标签具有未改变的值。

5、如权利要求1所述的方法，其中，该组合条件为，如果MS接收到修改时间信息并且未接收到SIB值标签，则MIB值标签具有改变的值，并且所缓冲的系统信息在修改时间之后被接收到。

6、如权利要求1所述的方法，还包括：如果该组合的系统信息具有错误，则从该缓冲器中清除所缓冲的系统信息，并且将所组合的系统信息缓冲在缓冲器中。

7、如权利要求1所述的方法，其中，该组合条件为，如果MS未接收到修改时间信息并且未接收到SIB值标签，则MIB值标签具有改变的值。

8、如权利要求7所述的方法，还包括：如果该组合的系统信息具有错误，则从该缓冲器中清除所缓冲的系统信息，并且将当前系统信息缓冲在缓冲器中。

9、一种在移动通信系统中用于在移动站（MS）中从基站（BS）接收系统信息的装置，包括：

接收器，接收系统信息，以及与该系统信息有关的主信息块（MIB）值标签、系统信息块（SIB）值标签和修改时间信息中的至少一个；

检错器，检查接收到的系统信息中的错误并输出检错结果；

控制器，基于检错结果，根据是否满足组合条件或缓冲条件来将系统信息提供给缓冲器和组合器中的一个，该组合条件和缓冲条件由 MIB 值标签、SIB 值标签和修改时间信息中的至少一个定义；

该缓冲器，如果满足缓冲条件，则缓冲从控制器接收到的系统信息；以及

该组合器，如果满足组合条件，则将缓冲器中缓冲的系统信息与从控制器接收到的系统信息组合。

10、如权利要求 9 所述的装置，其中，该组合条件为，MIB 值标签具有未改变的值。

11、如权利要求 9 所述的装置，其中，该组合条件为，如果该接收器未接收到该修改时间信息，则 MIB 值标签具有改变的值，并且 SIB 值标签具有未改变的值。

12、如权利要求 9 所述的装置，其中，该组合条件为，如果该接收器接收到该修改时间信息，则 MIB 值标签具有改变的值，所缓冲的系统信息在修改时间之后被接收到，并且 SIB 值标签具有未改变的值。

13、如权利要求 9 所述的装置，其中，该组合条件为，如果 MS 接收到修改时间信息并且未接收到 SIB 值标签，则 MIB 值标签具有改变的值，并且所缓冲的系统信息在修改时间之后被接收到。

14、如权利要求 9 所述的装置，其中：如果该组合的系统信息具有错误，则该控制器从该缓冲器中清除所缓冲的系统信息，并且将所组合的系统信息缓冲在缓冲器中。

15、如权利要求 9 所述的装置，其中，该组合条件为，如果该接收器未接收到修改时间信息并且未接收到 SIB 值标签，则 MIB 值标签具有改变的值。

16、如权利要求 15 所述的装置，其中：如果该组合的系统信息具有错误，则该控制器从该缓冲器中清除所缓冲的系统信息，并且将当前系统信息缓冲在缓冲器中。

移动通信系统中从基站接收系统信息的方法和装置

技术领域

本发明一般涉及移动通信系统，更具体地，涉及在移动通信系统中用于在移动站（MS）中从基站（BS）接收系统信息的方法和装置。

背景技术

在移动通信系统中，BS向MS发送系统信息，系统信息是指BS和MS之间通信所需的多条信息，包括用于信道建立的信息和邻近小区的列表。系统信息在系统信息块（SIB）中携带，一般为18个SIB。

BS可以使用两种方法中的一种来向MS通知系统信息的变化，即，SIB的变化。在这两种方法中的一种中，BS周期性地发送主信息块（MIB），并且MS监视MIB。MIB发送周期等于监视周期。提供发送SIB所需的信息的MIB包括被称为MIB值标签和SIB值标签的信息比特。MIB值标签指示系统信息是否已被改变，并且SIB值标签指示已被改变的SIB。

MIB或SIB可以在广播控制信道（BCCH）上被广播。

在该方法中，MS以与BS的系统信息发送周期相同的周期来监视系统信息。因此，当系统信息改变时，不需要修改时间信息。修改时间信息指示应用改变的系统信息的时间。

另一种方法是，当发生改变时，BS向MS通知系统信息的变化，而不是周期性地通知。该方法需要修改时间信息。

现在将简要说明怎样通过利用值标签来确定系统信息是否已被改变。以下描述适用于这两种方法。

如果第一MIB值标签是0并且第二MIB值标签是0，则这指示系统信息没有发生变化。如果SIB被改变，则MIB值标签被设置为1，从而向MS通知系统信息的变化。每当系统信息改变时，MIB值标签依次增加。MIB值标签仅仅向MS通知系统信息是否已被改变，而不指示改变的SIB值。因此，当接收到与前一个相比为不同的MIB值标签时，MS通过检查SIB值标签来识别改变的SIB值。

在上述例子中，如果 MIB 值标签被改变为 1，则 MS 确定系统信息已被改变。为了找出改变的系统信息，MS 然后读取 18 个 SIB 值标签的每一个，并且从对应于改变的 SIB 值标签的 SIB 中获得改变的系统信息。

图 1 示出了在移动通信系统中用于在用户设备 (UE) 中从演变无线接入网络 (E-RAN) 接收系统信息的传统操作的信号流。

参考图 1，在移动通信系统中，E-RAN 100 在步骤 120 中向 UE 110 发送具有 MIB 值标签的 MIB，并且在步骤 130 中向 UE 110 发送 SIB。假定 MIB 值标签是无错误的并且具有增加的值，因而 UE 110 已经读取 SIB 值标签。为了使用改变的 SIB 值标签确定改变的 SIB，UE 110 在步骤 140 检查接收到的 SIB 中的错误。如果 SIB 具有错误，则 UE 110 在步骤 150 忽略 SIB 并且在步骤 160 接收新的 SIB。为了方便，这里不提供 MIB 发送的描述。

在步骤 170，UE 110 检查 SIB 中的错误。如果未检测到错误，则 UE 110 在步骤 180 中将 SIB 缓冲在缓冲器中。如果在接收到的 SIB 中检测到错误，则 UE 110 忽略 SIB，并且重复 SIB 接收直到在图 1 的过程中未检测到错误。该重复使得 UE 接收正常的 SIB 并且确定改变的系统信息的时间延迟很长。结果，E-RAN 和 UE 之间的通信被延迟。

发明内容

本发明的一方面目的是至少解决该问题和/或缺点以及至少提供如下优点。因此，本发明的一方面将提供在 UE 中无误地接收系统信息的方法和装置。

本发明的另一个方面将提供在 UE 中增加系统信息的接收比率的方法和装置。

本发明的另一个方面将提供在 UE 中降低接收系统信息的时间延迟的方法和装置。

根据本发明，提供了一种在移动通信系统中用于在 MS 中从 BS 接收系统信息的方法，其中：如果当前系统信息存在错误，则确定缓冲器中是否存在缓冲的系统信息；在存在缓冲的系统信息时，确定是否满足组合条件，该组合条件由与该当前系统信息有关的 MIB 值标签、SIB 值标签和修改时间信息中的至少一个定义；以及如果满足该组合条件，则组合该当前系统信息与该缓冲的系统信息。

根据本发明，提供了一种在移动通信系统中用于在 MS 中从 BS 接收系统信息的装置，其中接收器接收系统信息以及与该系统信息有关的 MIB 值标签、SIB 值标签和修改时间信息中的至少一个，检错器检查接收到的系统信息中的错误并输出检错结果，控制器基于检错结果根据是否满足组合条件或缓冲条件来将系统信息提供给缓冲器和组合器中的一个，该组合条件和缓冲条件由 MIB 值标签、SIB 值标签和修改时间信息中的至少一个定义，如果满足缓冲条件，则该缓冲器缓冲从控制器接收到的系统信息，如果满足组合条件，则该组合器将缓冲器中缓冲的系统信息与从控制器接收到的系统信息组合。

附图说明

通过以下接合附图的详细说明，本发明的上述及其他目的、特征和优点将更清楚，其中：

图 1 示出了在移动通信系统中用于在 UE 中从 E-RAN 接收系统信息的传统操作的信号流；

图 2 示出了根据本发明的移动通信系统的配置；

图 3 示出了根据本发明的用于接收 SIB 的 UE；

图 4 示出了根据本发明的用于在 UE 中接收 SIB 的操作的信号流；

图 5 示出了根据本发明的第一实施例的用于在 UE 中接收 SIB 的操作；

图 6 示出了根据本发明的第二实施例的用于在 UE 中接收 SIB 的操作；

图 7 示出了根据本发明的第三实施例的用于在 UE 中接收 SIB 的操作；

图 8 示出了根据本发明的用于在 UE 中比接收到 SIB 值标签早地接收 SIB 的操作的信号流；

图 9 示出了根据本发明的第四实施例的用于在 UE 中接收 SIB 的操作；
以及

图 10 示出了根据本发明的第五实施例的用于在 UE 中接收 SIB 的操作。

贯穿附图中，相同的附图参考数字将被理解为指代相同的元件、特征和结构。

具体实施方式

说明书中定义的事项，例如详细结构和元件，是为了帮助全面地理解本

发明的优选实施例。因此，本领域普通技术人员将理解，在不脱离本发明的范围和精神的条件下，可以对这里描述的实施例的进行多种改变和修改。此外，为了清楚和简明，省略对公知的功能和结构的描述。

本发明通过根据组合条件将先前存储的 SIB 与接收到的 SIB 组合来增加 SIB 的接收成功率，该组合条件是由 MIB 值标签、修改时间和 SIB 值标签定义的。与传统技术相比，在本发明中，SIB 值标签可以和 MIB 值标签一起被发送，或者可以与 MIB 值标签分开发送。如前所述，在 UE 中接收系统信息的这两种方法中的一种需要修改时间信息，而另一种方法则不需要修改时间信息。本发明可适用于这两种情况。

图 2 示出了根据本发明的移动通信系统。

参考图 2，E-RAN 215 被配置为简单结构，具有演变节点 B (ENB) 225、230、235、240 和 245 以及锚节点 205 和 210。UE 250 经由 E-RAN 215 接入网际协议 (IP) 网络。ENB 225 到 245 无线连接到 UE 250。因为在共享信道上服务包括例如 IP 上语音 (VoIP) 的实时服务在内的所有用户业务，因此 ENB 225 到 245 收集 UE 的状态信息并且调度他们，用于可靠的信息发送/接收。

典型地，一个 ENB 控制多个小区。ENB 执行自适应调制和编码 (AMC)，其根据 UE 的信道状态来自适应地确定用于 UE 的调制方案和信道编码速率。在 ENB 225 到 245 之间执行混合自动重发请求 (HARQ)。因为单独的 HARQ 在满足不同的服务质量 (QoS) 需求方面具有限制，因此在 UE 250 和 ENB 225 到 245 之间在上层执行外部 ARQ。

HARQ 通过软组合先前接收到的数据与重发的数据而不丢弃先前接收到的数据来增加接收成功率。HARQ 被适配为在高速分组通信 (例如高速下行链路分组接入 (HSDPA) 和增强的专用信道 (EDCH) 中实现高传输效率。

图 3 示出了根据本发明的用于接收 SIB 的 UE。

参考图 3，接收器 300 从 ENB 230 接收 SIB。检错器 310 通过例如循环冗余校验 (CRC) 来检查接收到的 SIB 中的错误。控制器 320 根据由与 SIB 相关的 MIB 值标签、SIB 值标签和修改时间定义的条件来将 SIB 提供到缓冲器 330 或组合器 340。该条件将在稍后进行描述。

缓冲器 330 缓冲接收到的 SIB 或组合的 SIB，并且根据从控制器 320 接收到的命令，将缓冲的 SIB 提供到组合器 340，以及将接收到的 SIB 或组合

的 SIB 提供到解码器 350。组合器 340 组合接收到的 SIB 与缓冲的 SIB，并且将组合的 SIB 提供到缓冲器 330。解码器 350 解码无错误的接收到的 SIB 或组合的 SIB，并且将解码后的 SIB 提供到控制器 320。

图 4 示出了根据本发明的用于在 UE 中接收 SIB 的操作的信号流。

参考图 4，假设 UE 410 已经接收到改变的 MIB 值标签和因而校验后的 SIB 值标签，则在步骤 420 中 UE 410 从 E-RAN 400 接收 SIB。由于 MIB 值标签具有增加的值，因此 UE 410 应该由对应于改变的 SIB 值标签的 SIB 获得改变的系統信息。因此，UE 410 在步骤 430 中检查接收到的 SIB 中的错误。如果 SIB 具有错误，则 UE 在步骤 440 中将 SIB 缓冲在缓冲器 330 中。该 SIB 被称为缓冲的 SIB。UE 410 也将 MIB 值标签和 SIB 值标签存储在缓冲器 330 或任何其他存储器（未示出）中。在步骤 450，UE 410 在下一调度时间接收 MIB 值标签和 SIB 值标签。假定 UE 410 在步骤 460 接收修改时间信息。

在步骤 470，UE 410 接收 SIB。虽然 MIB 值标签、SIB 值标签和修改时间信息是在分开的步骤中接收到的，但是它们可以被一起接收到。UE 410 在步骤 480 对接收到的 SIB 执行错误检查。如果 SIB 具有错误，则 UE 410 将存储的 MIB 值标签和 SIB 值标签中的至少一个与接收到的 MIB 值标签、SIB 值标签和修改时间信息进行比较。在步骤 495 的比较之后，UE 410 根据组合条件确定是组合还是缓冲接收到的 SIB。组合条件是根据接收到的 MIB 值标签是否已被改变、接收到的 SIB 值标签是否已被改变、以及 UE 是否接收到修改时间信息来定义的。

为了更好地理解本发明，根据以下两个标准来对本发明的优选实施例进行分类。

(1) 根据 UE 是否接收到修改时间信息来划分本发明的优选实施例。将参照图 5、6 和 9 来描述 UE 未接收到修改时间信息的情况。将参照图 7 和 10 来描述 UE 接收到修改时间信息的情况。

(2) 根据 UE 是否比接收到 SIB 值标签早地接收到 SIB 来划分本发明的优选实施例。将参照图 5、6 和 7 来描述 UE 比接收到 SIB 值标签早地接收到 SIB 的情况。将参照图 9 和 10 来描述 UE 比接收到 SIB 值标签早地接收到 SIB 的情况。

与传统技术不同，在本发明中，UE 可以比接收到 SIB 值标签早地接收

到 SIB。本发明不局限于 SIB 值标签和 MIB 值标签一起在 MIB 中发送的情况。也即，根据系统配置，SIB 值标签可以与 MIB 值标签分开发送。

图 5、6 和 7 示出了本发明的优选实施例，其中 UE 根据组合条件接收 SIB。

图 5 示出了根据本发明的第一实施例的用于在 UE 中接收 SIB 的操作。

用于图 5 的过程的组合条件 1 是，当 UE 未接收到修改时间信息时，最新接收到的 MIB 值标签（即，当前 MIB 值标签）与存储的 MIB 值标签（即，缓冲的 MIB 值标签）具有相同的值。由于 MIB 值标签没有被改变，因此当前 SIB 值标签与缓冲的 SIB 值标签相同。因此，组合条件不涉及 SIB 值标签。

参考图 5，UE 在步骤 500 接收当前 SIB，并且在步骤 510 检查当前 SIB 中的错误。当当前 SIB 具有错误时，UE 进行到步骤 520，以及如果当前 SIB 没有错误，则 UE 跳到步骤 570。

由于当前 SIB 是无错误的，因此它可以在步骤 570 中被立即用于 UE。因此，当前 SIB 被直接输出，而不被缓冲在缓冲器中。

在步骤 520，UE 确定在缓冲器中是否存在缓冲的 SIB。在不存在缓冲的 SIB 时，UE 在步骤 560 将当前 SIB 缓冲在缓冲器中，因为当前 SIB 是最新的 SIB。

在存在缓冲的 SIB 时，UE 在步骤 530 组合缓冲的 SIB 与当前 SIB，并且在步骤 540 检查组合的 SIB 中的错误。如果组合的 SIB 没有错误，则 UE 在步骤 570 输出组合的 SIB 而不缓冲。如果组合的 SIB 具有错误，则 UE 在步骤 550 清除缓冲器，并且在步骤 580 将组合的 SIB 缓冲在缓冲器中。

图 6 示出了根据本发明的第二实施例的用于在 UE 中接收 SIB 的操作。

用于图 6 的过程的组合条件 2 是，当 UE 未接收到修改时间信息时，当前 MIB 值标签具有与缓冲的 MIB 值标签的值不同的值，并且当前 SIB 值标签具有与缓冲的 SIB 值标签相同的值。

参考图 6，UE 在步骤 600 接收当前 SIB，并且在步骤 605 检查当前 SIB 中的错误。当当前 SIB 具有错误时，UE 进行到步骤 610，以及如果当前 SIB 没有错误，则 UE 跳到步骤 650。

由于当前 SIB 是无错误的，因此它可以在步骤 650 中被立即用于 UE。因此，当前 SIB 被直接输出，而不被缓冲在缓冲器中。

在步骤 610，UE 确定在缓冲器中是否存在缓冲的 SIB。在不存在缓冲的

SIB 时, UE 在步骤 655 将当前 SIB 缓冲在缓冲器中, 因为当前 SIB 是最新的 SIB。

在存在缓冲的 SIB 时, UE 在步骤 615 比较当前 SIB 值标签与缓冲的 SIB 值标签。如果这两个 SIB 值标签不同, 则 UE 在步骤 620 中从缓冲器清除缓冲的 SIB, 并且在步骤 625 将当前 SIB 缓冲在缓冲器中, 因为当前 SIB 是最新的 SIB。

如果这两个 SIB 值标签相同, 则 UE 在步骤 630 组合当前 SIB 与缓冲的 SIB, 并且在步骤 635 检查组合的 SIB 中的错误。如果从组合的 SIB 没有检测到错误, 则 UE 在步骤 650 输出组合的 SIB 而不缓冲。如果在组合的 SIB 中检测到错误, 则 UE 在步骤 640 从缓冲器中清除缓冲的 SIB, 并且在步骤 645 缓冲组合的 SIB。

图 7 示出了根据本发明的第三示范性实施例的用于在 UE 中接收 SIB 的操作。

用于图 7 的过程的组合条件 3 是, 当 UE 接收到修改时间信息时, 当前 MIB 值标签具有与缓冲的 MIB 值标签的值不同的值, 在修改时间之后接收到缓冲的 SIB, 并且当前 SIB 值标签具有与缓冲的 SIB 值标签相同的值。

参考图 7, UE 在步骤 700 接收当前 SIB, 并且在步骤 705 检查当前 SIB 中的错误。当当前 SIB 具有错误时, UE 进行到步骤 710, 以及如果当前 SIB 没有错误, 则 UE 跳到步骤 755。

由于当前 SIB 是无错误的, 因此它可以立即被应用于 UE。因此, 在步骤 755, 当前 SIB 被直接输出, 而不被缓冲在缓冲器中。

在步骤 710, UE 确定在缓冲器中是否存在缓冲的 SIB。在存在缓冲的 SIB 的情况下, UE 进行到步骤 715, 以及在不存在缓冲的 SIB 的情况下, UE 进行到步骤 760。在步骤 760, 由于缓冲的 SIB 不存在于缓冲器中或者在修改时间之前被接收到, 则 UE 将作为最新的 SIB 的当前 SIB 缓冲在缓冲器中。如果当前 SIB 在修改时间信息之前已被接收到, 则这指示当前 SIB 不是最新的 SIB。

在步骤 715, UE 确定在修改时间之后是否接收到缓冲的 SIB。如果在修改时间之前接收到缓冲的 SIB, 则 UE 进行到步骤 760。如果在修改时间之后接收到缓冲的 SIB, 则 UE 在步骤 720 比较当前 SIB 值标签与缓冲的 SIB 值标签。如果这两个 SIB 值标签不同, 则 UE 在步骤 725 从缓冲器清除缓冲

的 SIB，并且在步骤 730 将接收到的 SIB 缓冲在缓冲器中，因为当前 SIB 是最新的 SIB。

如果这两个 SIB 值标签相同，则 UE 在步骤 735 组合当前 SIB 与缓冲的 SIB，并且在步骤 740 检查组合的 SIB 中的错误。如果从组合的 SIB 没有检测到错误，则 UE 在步骤 755 输出组合的 SIB 而不缓冲。如果在组合的 SIB 中检测到错误，则 UE 在步骤 745 从缓冲器中清除缓冲的 SIB，并且在步骤 750 缓冲组合的 SIB。

图 5、6 和 7 所述的实施例涉及 UE 在接收 SIB 之前接收 MIB 值标签和 SIB 值标签时的情况。如前所述，UE 可以分开接收 SIB 值标签和 MIB 值标签。因此，可能发生这样的情况，UE 在接收 SIB 值标签之前接收 SIB，如图 8 所示。

图 8 示出了根据本发明的用于在 UE 中比接收到 SIB 值标签早地接收 SIB 的操作的信号流。

参考图 8，UE 810 从 E-RAN 800 接收改变的 MIB 值标签，因而在步骤 820 知道 SIB 的变化。因而，UE 810 在步骤 830 接收新的 SIB，并且在步骤 840 在 SIB 接收之后接收 SIB 值标签。

当 SIB 值标签与 MIB 被分开发送时，尽管接收到 MIB 值标签，但是例如由于传输损失，UE 可能未能接收 SIB 值标签。图 9 和 10 描述 UE 未能接收 SIB 值标签的情况。

图 9 示出了根据本发明的第四实施例的用于在 UE 中接收 SIB 的操作。

用于图 9 的过程的组合条件 4 是，当 UE 未接收到修改时间信息时，当前 MIB 值标签具有与缓冲的 MIB 值标签的值不同的值，并且当前 SIB 值标签未被接收到。

参考图 9，UE 在步骤 900 接收当前 SIB，并且在步骤 910 检查当前 SIB 中的错误。当当前 SIB 具有错误时，UE 进行到步骤 920，以及如果当前 SIB 没有错误，则 UE 跳到步骤 960。

由于当前 SIB 是无错误的，因此它可以立即被应用于 UE。因此，在步骤 960，当前 SIB 被直接输出，而不被缓冲在缓冲器中。

在步骤 920，UE 确定在缓冲器中是否存在缓冲的 SIB。在存在缓冲的 SIB 的情况下，UE 进行到步骤 930，以及在不存在缓冲的 SIB 的情况下，UE 进行到步骤 960。在步骤 960，由于缓冲的 SIB 不存在于缓冲器中，因此

UE 将作为最新的 SIB 的当前 SIB 缓冲在缓冲器中。

与步骤 930，UE 组合当前 SIB 与缓冲的 SIB。UE 在步骤 940 检查组合的 SIB 中的错误。如果从组合的 SIB 没有检测到错误，则 UE 在步骤 970 输出组合的 SIB 而不缓冲。如果在组合的 SIB 中检测到错误，则 UE 在步骤 950 从缓冲器中清除缓冲的 SIB，并且在步骤 960 缓冲当前的 SIB。UE 在步骤 960 不缓冲组合的 SIB，因为如果 UE 未接收到 SIB 值标签，则 UE 不能从多个 SIB 中识别出具有改变的系统信息的 SIB。因而，当组合的 SIB 具有错误时，这暗示着当前 SIB 可能不同于缓冲的 SIB。因而，错误的组合的 SIB 被丢弃并且被取代，将具有最新的系统信息的当前 SIB 缓冲在缓冲器中。

图 10 示出了根据本发明的第五实施例的用于在 UE 中接收 SIB 的操作。

用于图 10 的过程的组合条件 5 是，当 UE 接收到修改时间信息时，当前 MIB 值标签具有与缓冲的 MIB 值标签的值不同的值，并且缓冲的 SIB 在修改时间之后被接收到。

在图 10 中，UE 接收改变的 MIB 值标签并且在接收 SIB 之后接收 SIB 值标签。如前所述，UE 接收修改时间信息。

参考图 10，UE 在步骤 1000 接收当前 SIB，并且在步骤 1010 检查当前 SIB 中的错误。当当前 SIB 具有错误时，UE 进行到步骤 1020，以及如果当前 SIB 没有错误，则 UE 跳到步骤 1080。

由于当前 SIB 是无错误的，因此它可以立即被应用于 UE。因此，在步骤 1080，当前 SIB 被直接输出，而不被缓冲在缓冲器中。

在步骤 1020，UE 确定在缓冲器中是否存在缓冲的 SIB。在存在缓冲的 SIB 的情况下，UE 进行到步骤 1030，以及在不存在缓冲的 SIB 的情况下，UE 进行到步骤 1090。

在步骤 1090，由于缓冲的 SIB 不存在于缓冲器中，或者如果有的话，缓冲的 SIB 在修改时间之前被接收到，则 UE 将作为最新的 SIB 的当前 SIB 缓冲在缓冲器中。

在步骤 1040，UE 组合当前 SIB 与缓冲的 SIB。UE 在步骤 1050 检查组合的 SIB 中的错误。如果从组合的 SIB 没有检测到错误，则 UE 在步骤 1080 输出组合的 SIB 而不将其缓冲。如果在组合的 SIB 中检测到错误，则 UE 在步骤 1060 从缓冲器中清除缓冲的 SIB，并且在步骤 1070 缓冲组合的 SIB。

从上面的描述可知，在移动通信系统中，本发明通过在 UE 中的组合有

利地增加 SIB 的接收成功率，即使从 ENB 接收到的 SIB 具有错误也是如此。此外，当 UE 从 ENB 接收到 SIB 时，对于操作，本发明减小了接收时间延迟。

虽然已经参考本发明的特定示范性实施例对本发明进行了图示和描述，但是，本领域技术人员将要理解，在不脱离由所附权利要求书及其等价物所限定的本发明的精神和范围的情况下，可以在形式和细节上进行各种变化。

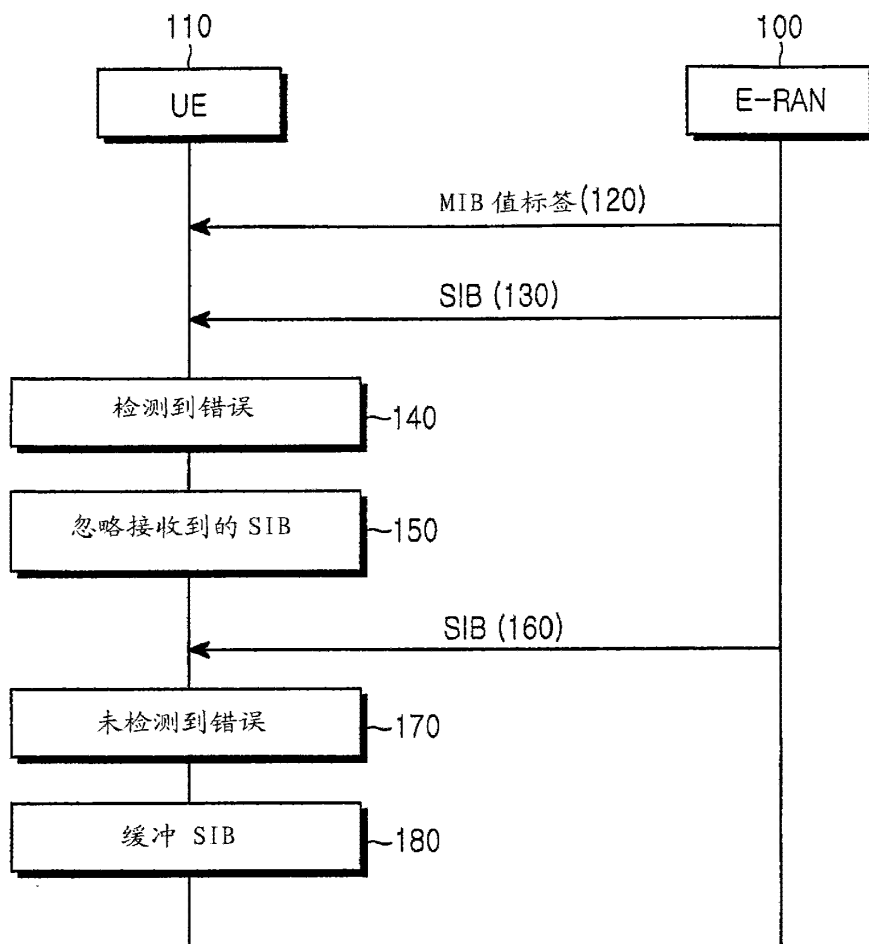


图 1

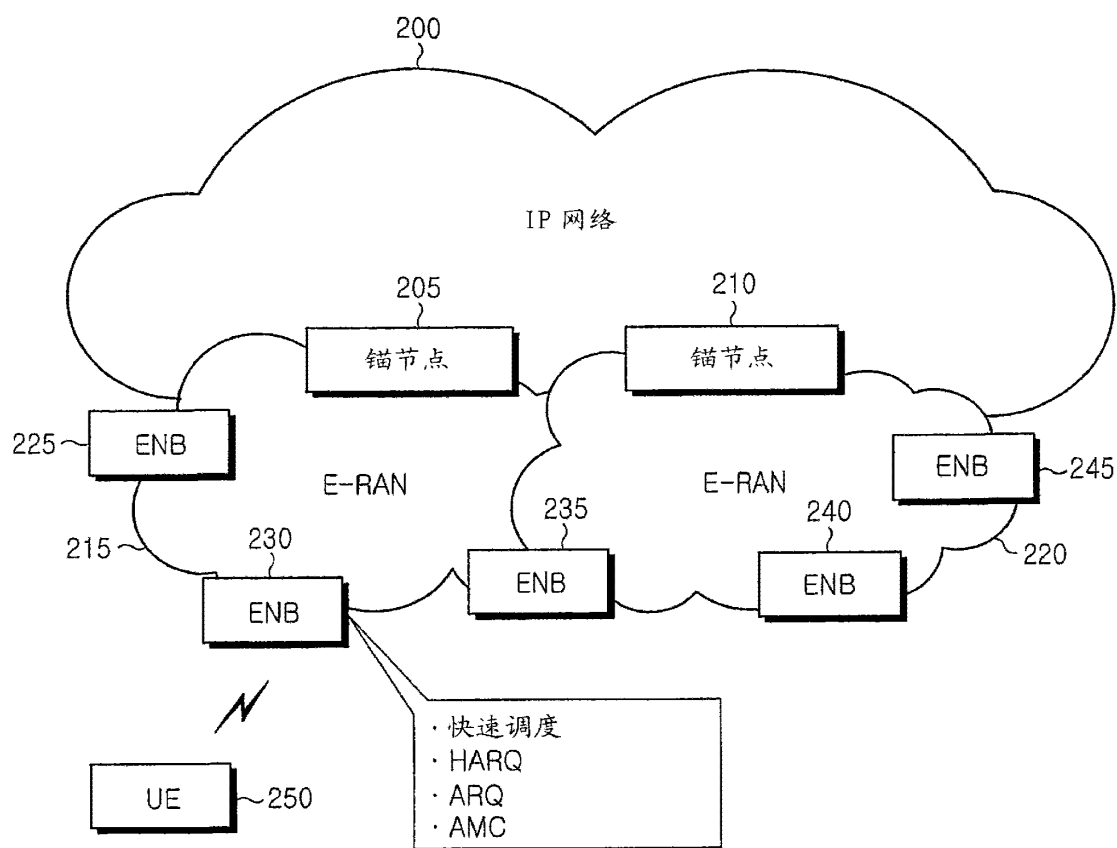


图 2

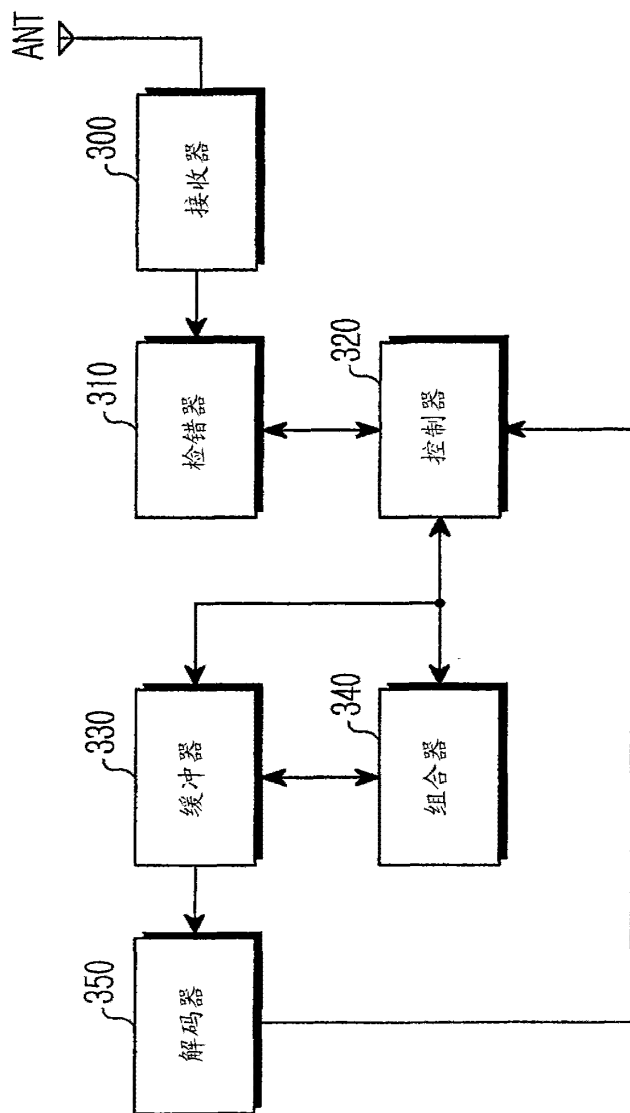


图 3

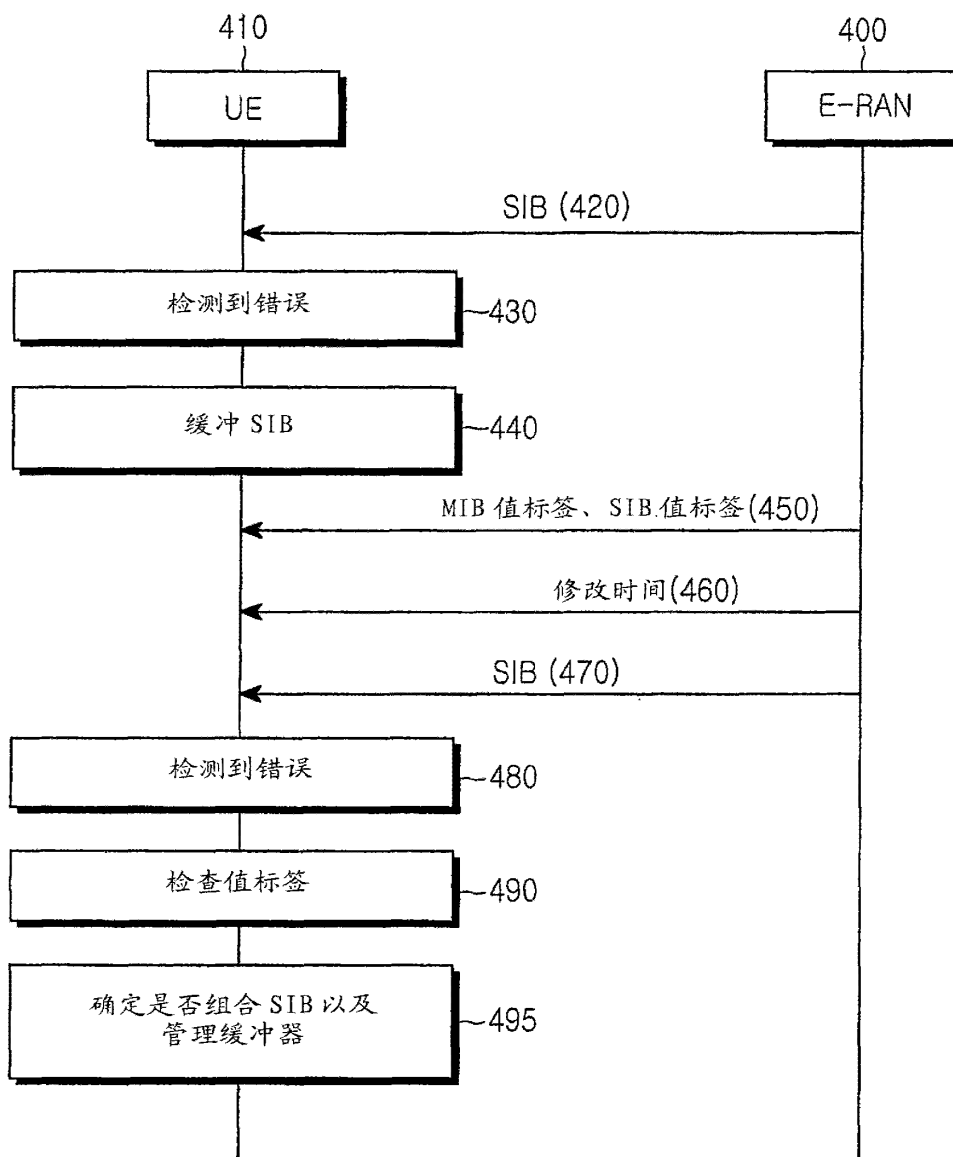


图 4

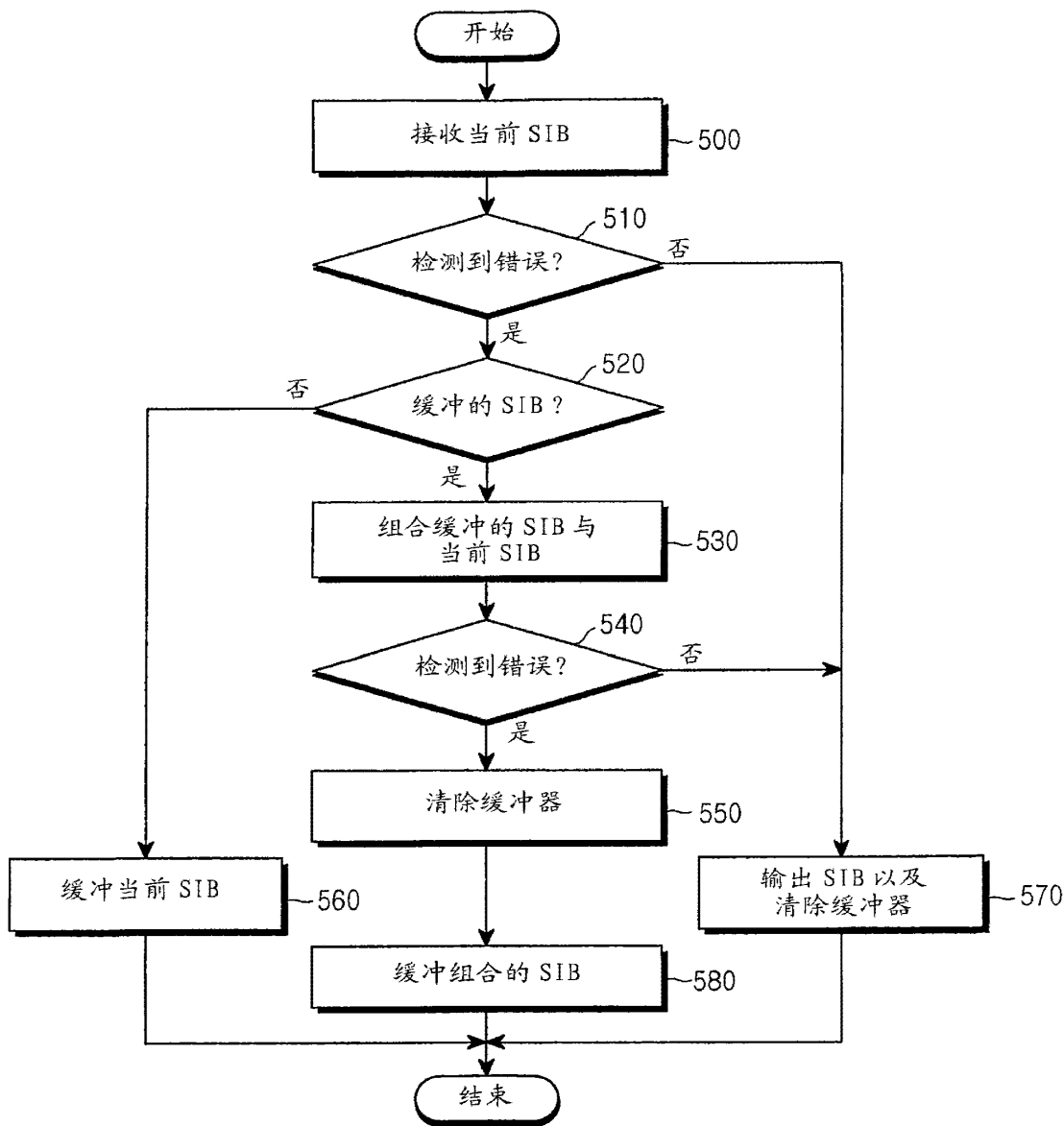


图 5

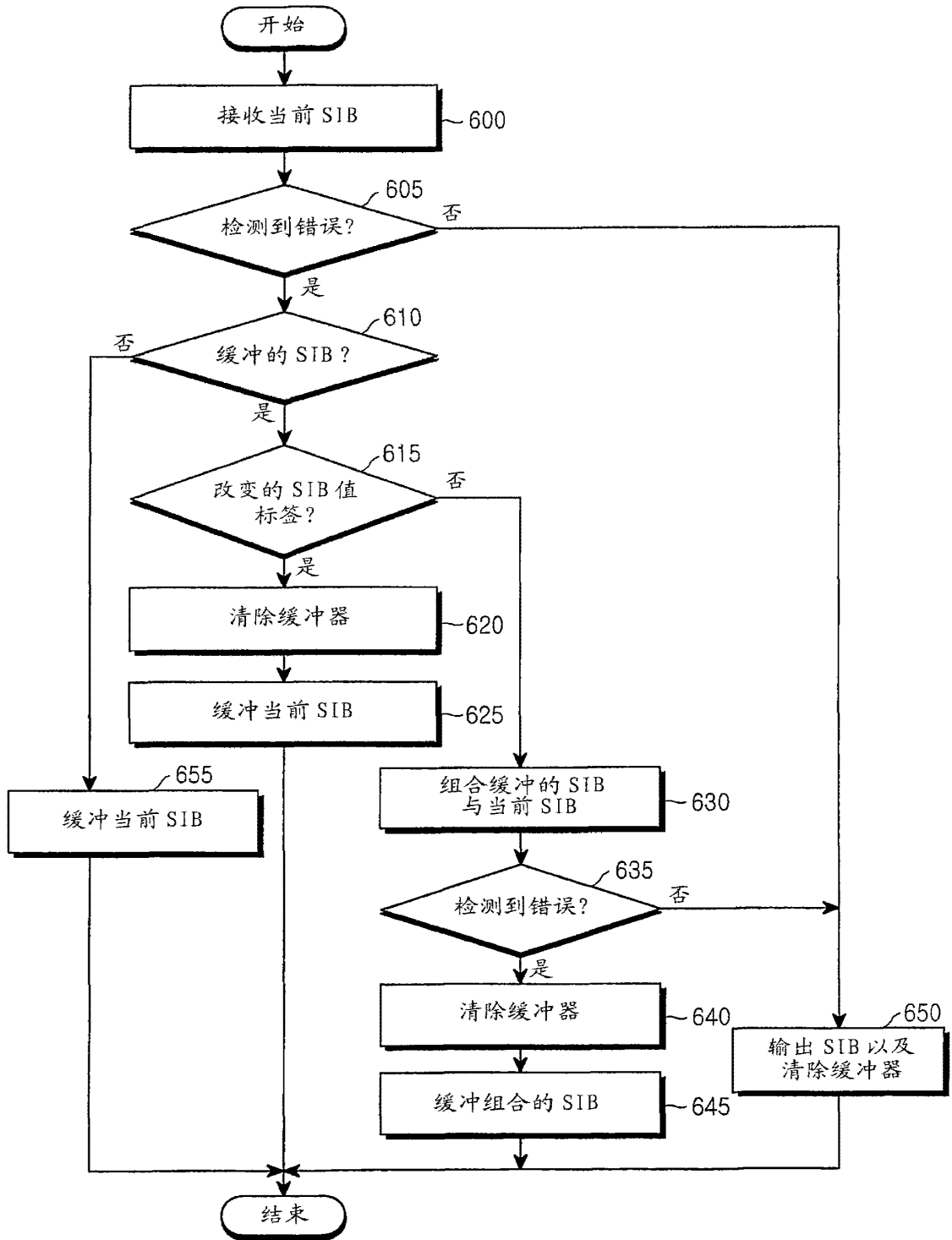


图 6

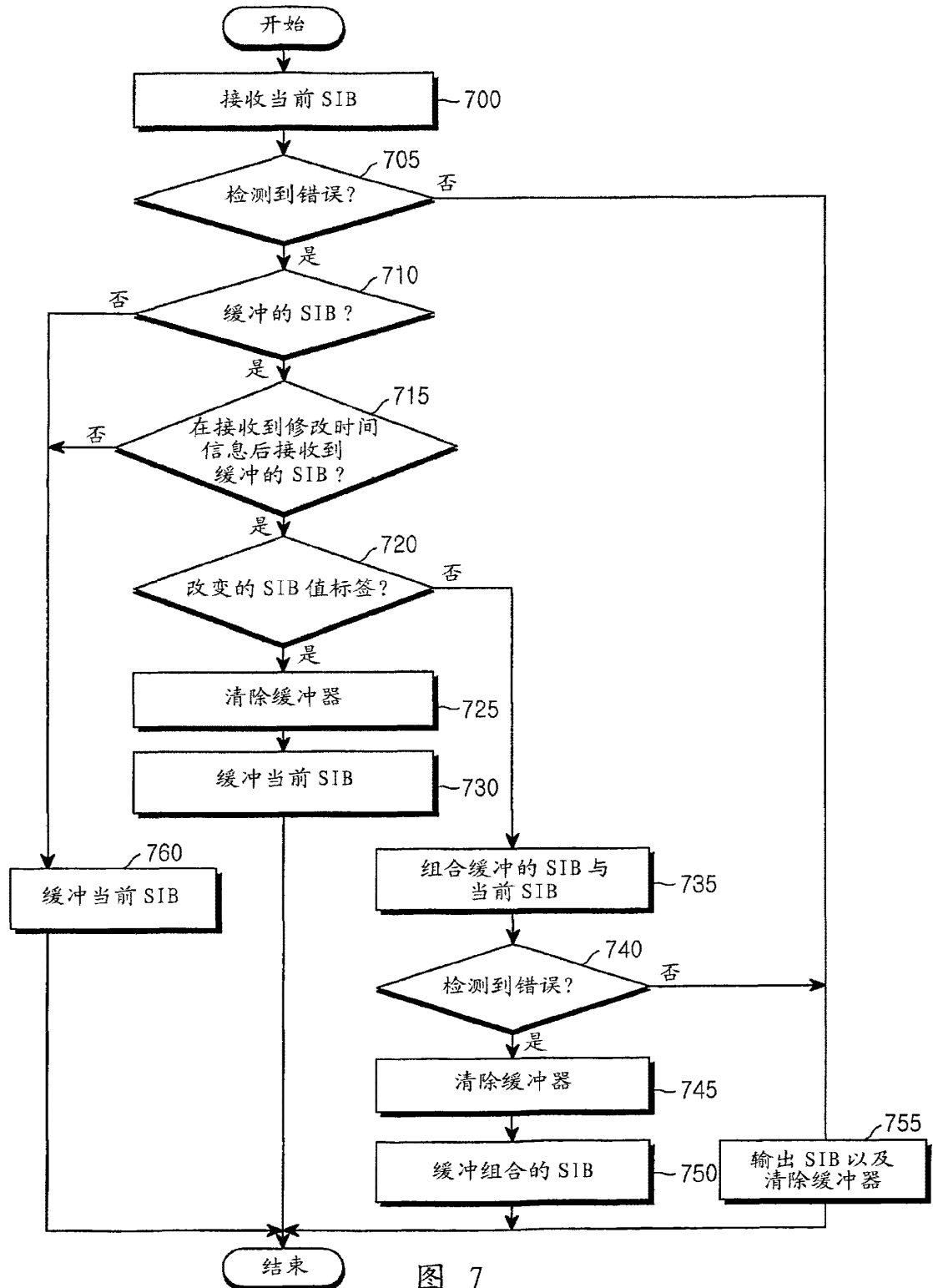


图 7

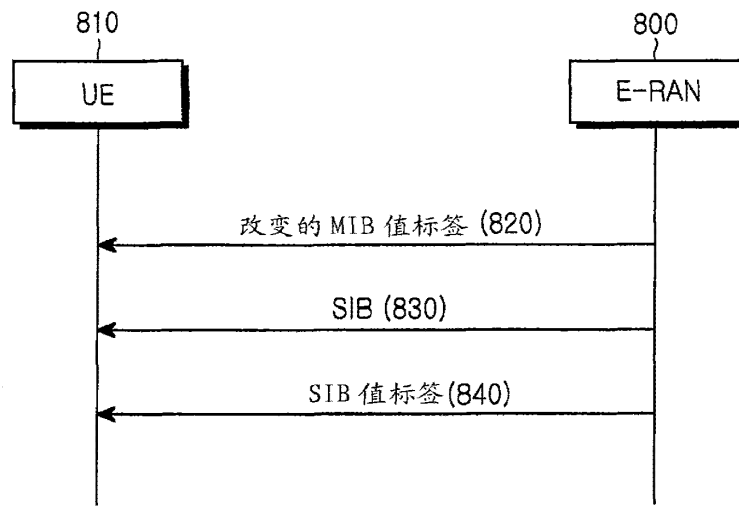


图 8

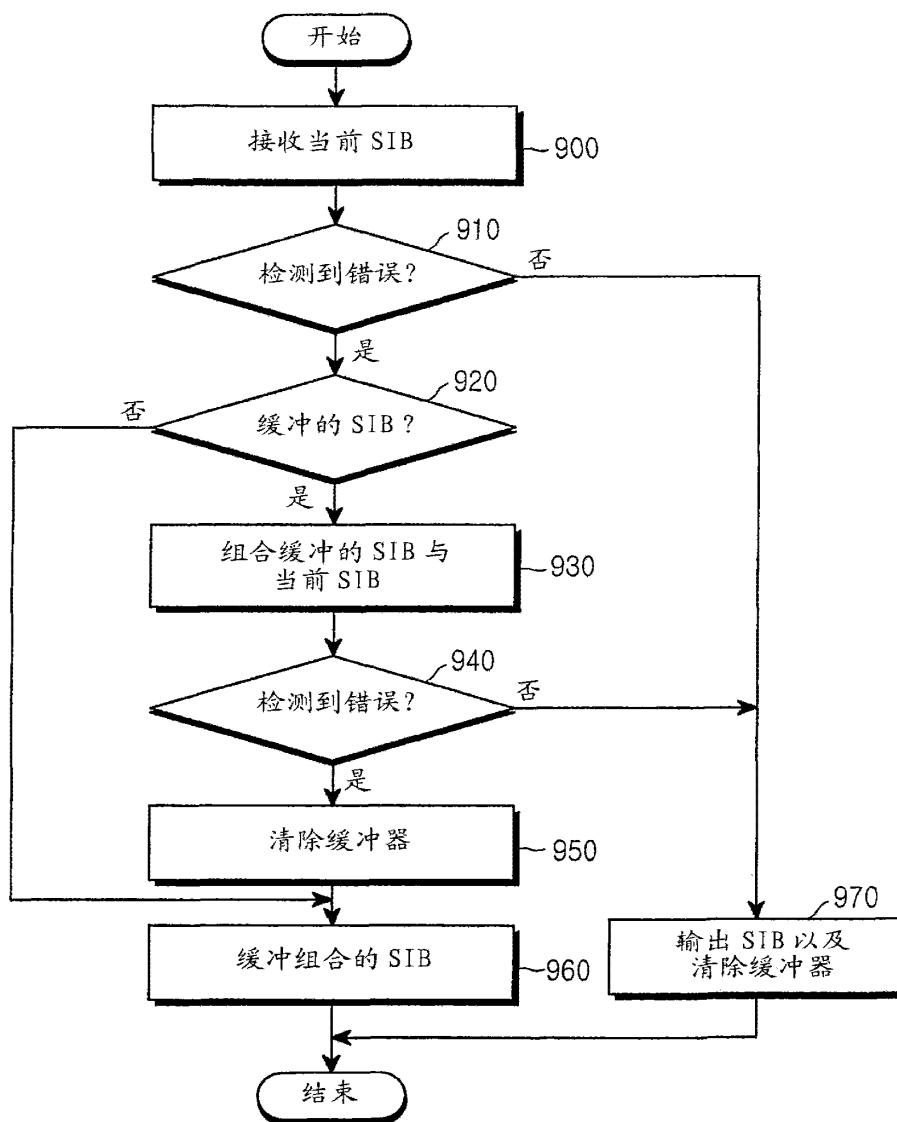


图 9

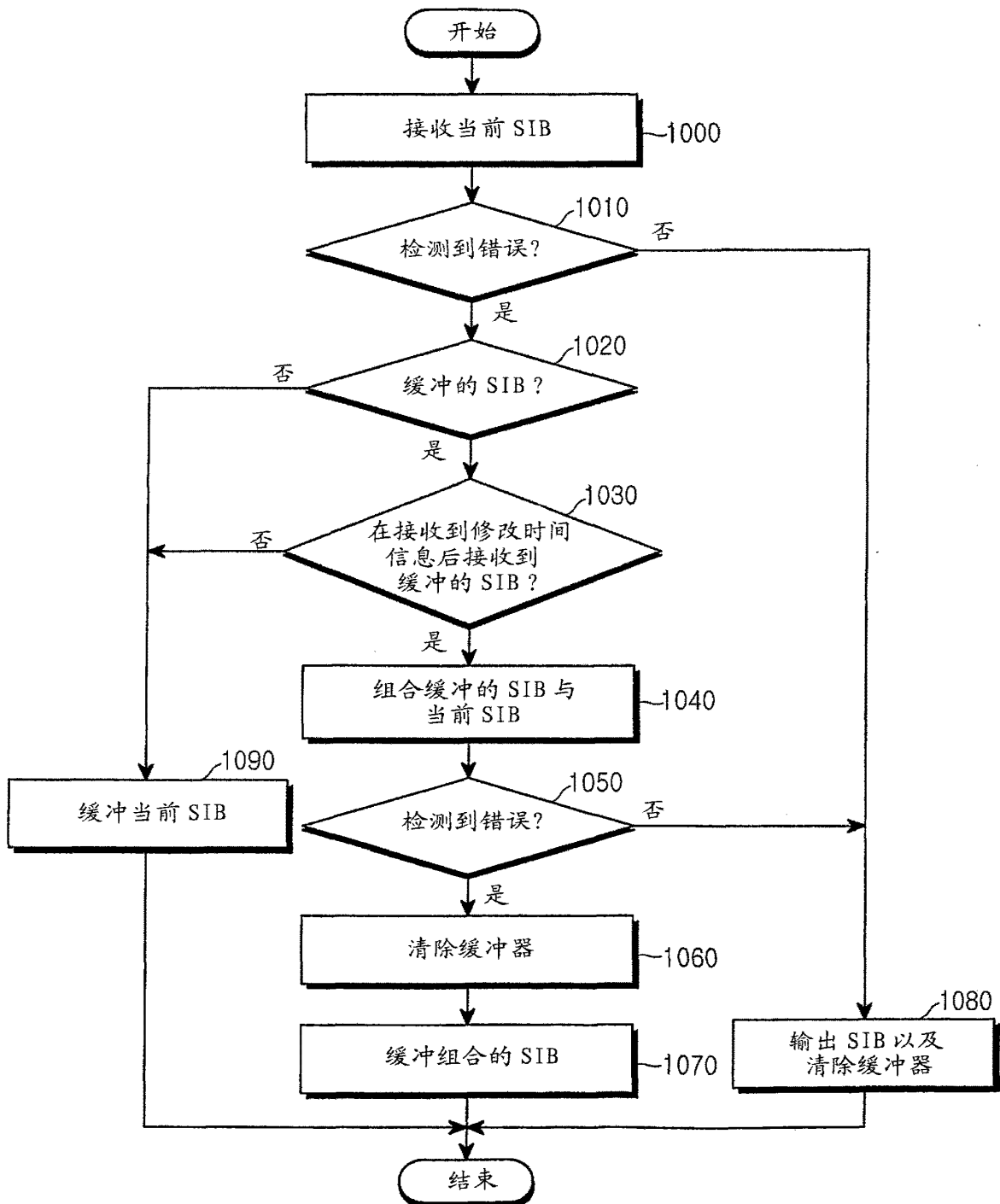


图 10

PATENT COOPERATION TREATY

2HM



From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:
 100034
 7F, New Era Building, 26 Pinganli Xidajie,
 Xicheng District, Beijing, China
 ZHONGZI LAW OFFICE

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

(PCT Rule 44.1)

Date of mailing(*day/month/year*)
 30. Nov. 2017 (30. 11. 2017)

Applicant's or agent's file reference PF170510PCT	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/CN2017/101576	International filing date (<i>day/month/year</i>) 13. Sep. 2017 (13. 09. 2017)
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (PUBL) et al	

1. The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.
Filing of amendments and statement under Article 19:
 The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):
When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.
Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70
For more detailed instructions, see PCT Applicant's Guide, International Phase, paragraphs 9.004 – 9.011.

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

3. **With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:**
 the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
 no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

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

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

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

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

For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide, National Chapters*.

STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA(ISA/CN) 6,Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088 Facsimile No. (86-10) 62019451	Authorized officer PENG, Liang Telephone No.: (86-10) 62019450
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NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under Article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the *PCT Applicant's Guide*.

In these Notes, "Article," "Rule" and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report and the written opinion of the International Searching Authority, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only (see *PCT Applicant's Guide*).

The attention of the applicant is drawn to the fact that amendments to the claims under Article 19 are not allowed where the International Searching Authority has declared, under Article 17(2), that no international search report would be established (see *PCT Applicant's Guide*, paragraph 296).

What parts of the international application may be amended ?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Preliminary Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When ? Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments ?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How ? Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet or sheets containing a complete set of claims in replacement of all the claims previously filed must be submitted.

Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively in Arabic numerals (Section 205(a)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments ?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.



NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under Article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments and any accompanying statement, under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the time of filing the amendments (and any statement) with the International Bureau, also file with the International Preliminary Examining Authority a copy of such amendments (and of any statement) and, where required, a translation of such amendments for the procedure before that Authority (see Rules 55.3(a) and 62.2, first sentence). For further information, see the Notes to the demand form (PCT/IPEA/401).

If a demand for international preliminary examination is made, the written opinion of the International Searching Authority will, except in certain cases where the International Preliminary Examining Authority did not act as International Searching Authority and where it has notified the International Bureau under Rule 66.1bis(b), be considered to be a written opinion of the International Preliminary Examining Authority. If a demand is made, the applicant may submit to the International Preliminary Examining Authority a reply to the written opinion together, where appropriate, with amendments before the expiration of 3 months from the date of mailing of FormPCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later (Rule 43bis.1(c)).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see the *PCT Applicant's Guide*, National Chapters



PATENT COOPERATION TREATY
PCT

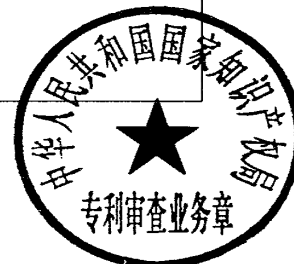
INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

2KN



Applicant's or agent's file reference PF170510PCT	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/CN2017/101576	International filing date <i>(day/month/year)</i> 13 Sep. 2017 (13. 09. 2017)	(Earliest)Priority date <i>(day/month/year)</i> 04 Jan. 2017 (04. 01. 2017)
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (PUBL) 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 4 sheets. <input type="checkbox"/> It is also accompanied by a copy of each prior art document cited in this report.		
<p>1. Basis of the report</p> <p>a. With regard to the language, the international search was carried out on the basis of:</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> the international application in the language in which it was filed</p> <p style="margin-left: 20px;"><input type="checkbox"/> 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))</p> <p>b. <input type="checkbox"/> This international search report has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).</p> <p>c. <input type="checkbox"/> With regard to any nucleotide and /or amino acid sequence disclosed in the international application, see Box No. I.</p> <p>2. <input type="checkbox"/> Certain claims were found unsearchable (see Box No. II)</p> <p>3. <input type="checkbox"/> Unity of invention is lacking (see Box No. III)</p> <p>4. With regard to the title,</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> the text is approved as submitted by the applicant.</p> <p style="margin-left: 20px;"><input type="checkbox"/> the text has been established by this Authority to read as follows:</p> <p>5. With regard to the abstract,</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> the text is approved as submitted by the applicant.</p> <p style="margin-left: 20px;"><input type="checkbox"/> the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box IV.</p> <p>The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.</p> <p>6. With regard to the drawings,</p> <p style="margin-left: 20px;">a. The figure of the drawings to be published with the abstract is Figure No. Fig. 1</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> as suggested by the applicant</p> <p style="margin-left: 40px;"><input type="checkbox"/> as selected by this Authority, because the applicant failed to suggest a figure</p> <p style="margin-left: 40px;"><input type="checkbox"/> as selected by this Authority, because this figure better characterizes the invention</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> none of the figures is to be published with the abstract</p>		



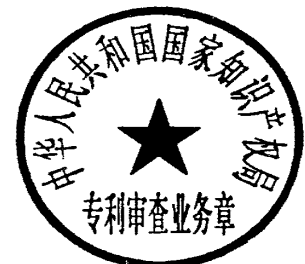
Form PCT/ISA/210(first sheet)(July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/101576

A. CLASSIFICATION OF SUBJECT MATTER		
H04L 29/06 (2006.01) i; H04W 72/12 (2009.01) 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) IPC: H04L H04W H04Q		
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) CNPAT, CNKI, WPI, EPDOC, 3GPP: system, information, block, group, feature, SIB, preamble, on demand, schedule, LTE, new radio, NodeB, UE		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 101217689A (DA TANG MOBILE COMMUNICATIONS EQUIPMENT CO., LTD.) 09 Jul.2008(09.07.2008) description, page 1 lines 13 -17, page 5 line 2- page 6 line 10	1-47
A	CN 101123818A (ALCATEL LUCENT) 13 Feb.2008(13.02.2008) the whole document	1-47
A	CN 101542915A (SAMSUNG ELECTRONICS CO., LTD.) 23 Sep.2009(23.09.2009) the whole document	1-47
A	3GPP "Technical Specification Group Radio Access Network; Radio Resource Control (RRC); Protocol specification (Release 13)" "3GPP TS 25.331 V13.5.0" 31 Dec.2016(31.12.2016) the whole document	1-47
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		

NTD



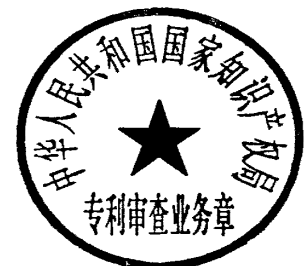
INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/101576

OMN



<p>* 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</p>	<p>"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</p>
<p>Date of the actual completion of the international search 17 Nov. 2017 (17. 11. 2017)</p>	<p>Date of mailing of the international search report 30 Nov. 2017 (30. 11. 2017)</p>
<p>Name and mailing address of the ISA/CN STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451</p>	<p>Authorized officer PENG, Liang Telephone No.: (86-10) 62413350</p>

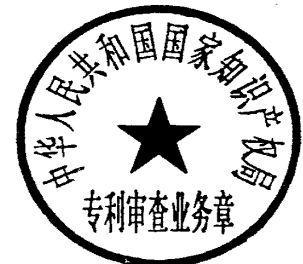
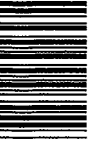


INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/101576

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN101217689A	09.07.2008	WO2008083580A1	17.07.2008
CN101123818A	13.02.2008	US2008039083A1	14.02.2008
		EP1887822A1	13.02.2008
		WO2008017584A2	14.02.2008
CN101542915A	23.09.2009	KR20080046100A	26.05.2008
		EP2844004A1	04.03.2015
		CA2669679A1	29.05.2008
		AU2007322589A1	29.05.2008
		WO2008062971A1	29.05.2008
		US2008212522A1	04.09.2008
		EP2087599A1	12.08.2009
		JP2010510747A	02.04.2010
		RU2009119175A	27.11.2010

INN



PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:

100034

7F, New Era Building, 26 Pinganli Xidajie,
Xicheng District, Beijing, China
ZHONGZI LAW OFFICE

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43 bis.1)

Date of mailing(day/month/year)
30. Nov. 2017 (30. 11. 2017)

Applicant's or agent's file reference
PF170510PCT

FOR FURTHER ACTION
See paragraph 2 below

International application No. PCT/CN2017/101576	International filing date(day/month/year) 13. Sep. 2017 (13. 09. 2017)	Priority date (day/month/year) 04. Jan. 2017 (04. 01. 2017)
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International Patent Classification (IPC) or both national classification and IPC
H04L 29/06 (2006. 01) i; H04W 72/12 (2009. 01) i

Applicant
TELEFONAKTIEBLAGET LM ERICSSON (PUBL) et al

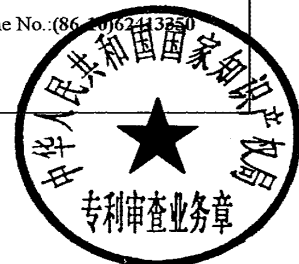
1. This opinion contains indications relating to the following items:
- Box No. I Basis of the opinion
 - Box No. II Priority
 - Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - Box No. IV Lack of unity of invention
 - Box No. V Reasoned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

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

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

- For further options, see Form PCT/ISA/220.
3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/CN STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China Facsimile No. (86—10) 62019451	Date of completion of this opinion 24. Nov. 2017 (24. 11. 2017)	Authorized officer PENG,Liang Telephone No. (86—10) 62013250
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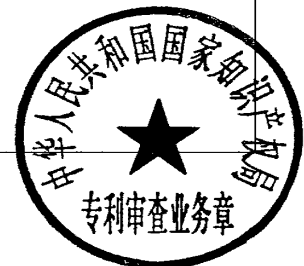
WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/CN2017/101576

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
- the international application in the language in which it was filed.
 - a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rule 43bis.1(b))
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:

OEL



WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/CN2017/101576

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

1. Statement:

Novelty (N)	Claims <u>1-47</u>	YES
	Claims <u>None</u>	NO
Inventive step (IS)	Claims <u>1-47</u>	YES
	Claims <u>None</u>	NO
Industrial applicability (IA)	Claims <u>1-47</u>	YES
	Claims <u>None</u>	NO

2. Citations and explanations

Reference is made to the following document:

D1: CN 101217689 A, 09.07.2008

Novelty and Inventive Step:

D1 discloses (see description, page 1 lines 13 -17, page 5 line 2- page 6 line 10) a method for requesting system information, comprising: transmitting a request for at least one system information block group, each of which comprises one or more system information blocks from a user terminal to a network node, and receiving one or more system information block groups from the network node based on schedule information of the system information.

The technical features "the one or more system information blocks are grouped according to a feature of the one or more system information blocks" and "the one or more system information block groups comprise the at least one system information block group" as defined in claims 1, 24 are not explicitly or implicitly disclosed in D1. Therefore claims 1, 24 are novel in the sense of PCT Article 33(2). Meanwhile, claims 1, 24 are neither indicated nor obviously rendered from the prior art, so claims 1, 24 are not obvious to a person skilled in the art on the basis of the prior art. Therefore claims 1, 24 involve an inventive step under PCT Article 33(3).

Claims 2-11 are dependent on claim 1 directly or indirectly, claims 25-34 are dependent on claim 24 directly or indirectly, therefore they also meet the requirements of PCT with respect to novelty (PCT Article 33(2)) and an inventive step (PCT Article 33(3)).

Claim 12 claims an apparatus which comprises the processor and memory, wherein the processor is configured to implement corresponding steps in claim 1. Hence, based on the analysis of claim 1, claim 12 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).

Claim 23 claims an apparatus, each component in the product of claim 23 completely corresponds to each step in the process of claim 1. Hence, based on the analysis of claim 1, claim 23 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).



WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/CN2017/101576

Article 33 (3)).

Claim 35 claims an apparatus which comprises the processor and memory, wherein the processor is configured to implement corresponding steps in claim 24. Hence, based on the analysis of claim 24, claim 35 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).

Claim 46 claims an apparatus, each component in the product of claim 46 completely corresponds to each step in the process of claim 24. Hence, based on the analysis of claim 24, claim 46 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).

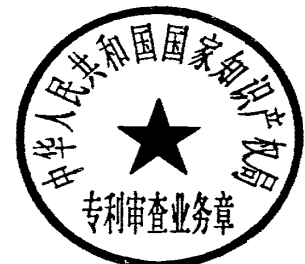
Claims 13-22 are dependent on claim 12 directly or indirectly, claims 36-45 are dependent on claim 35 directly or indirectly, therefore they also meet the requirements of PCT with respect to novelty (PCT Article 33(2)) and an inventive step (PCT Article 33(3)).

Claim 47 claims a computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer, wherein the computer program codes comprise codes for performing the method according to any one of claims 1-11 and claims 24-34. Hence, based on the analysis of claims 1-11 and claims 24-34, claim 47 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).

Industrial Applicability:

Claims 1 - 47 can find industrial applicability in the technical field of wireless communication, and thus meet the requirements of PCT Article 33(4).

IGL



Electronic Acknowledgement Receipt

EFS ID:	31467041
Application Number:	15568431
International Application Number:	
Confirmation Number:	2730
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
First Named Inventor/Applicant Name:	Rui FAN
Customer Number:	131247
Filer:	William W. Kidd/Julie Farrar
Filer Authorized By:	William W. Kidd
Attorney Docket Number:	4906P51954US1
Receipt Date:	10-JAN-2018
Filing Date:	
Time Stamp:	20:15:43
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	P51954_US1_2018-01-10_IDS.pdf	1054230 <small>e31cc552f420bb0ff783f110b9b226d56befd62b</small>	no	4

Warnings:

Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
2	Foreign Reference	P51954_US1_2018-01-10_FR1_CN101123818A.PDF	1208629 9b02380a98eeef3ce39e45dc30629dfe3c24c99d	no	19
Warnings:					
Information:					
3	Foreign Reference	P51954_US1_2018-01-10_FR2_CN101217689A.PDF	1440310 64fa1f51a23a5ac44515ea1905ce429e94cd797d	no	16
Warnings:					
Information:					
4	Foreign Reference	P51954_US1_2018-01-10_FR3_CN101542915A.PDF	1464015 321ee0798e05d932ba09bac7da0de04a9f6ff77	no	25
Warnings:					
Information:					
5	Non Patent Literature	P51954_US1_2018-01-10_NPL1_3GPP_TS_25_331_V13_5_0_2_016_2271PGS.PDF	10300609 0432cb526bdce085a389ad2ef46ff2dca00e0e6	no	2271
Warnings:					
Information:					
6	Non Patent Literature	P51954_US1_2018-01-10_NPL2_ISR_WO_PCTCN2017101576_30NOV2017_11PGS.PDF	568601 e732d09a325d700b8cab16c16b114d7e51a02c52	no	11
Warnings:					
Information:					
Total Files Size (in bytes):				16036394	

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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



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Table with 7 columns: APPLICATION NUMBER, FILING or 371(c) DATE, GRP ART UNIT, FIL FEE REC'D, ATTY. DOCKET NO, TOT CLAIMS, IND CLAIMS. Row 1: 15/568,431, 10/20/2017, 1840, 4906P51954US1, 23, 3

CONFIRMATION NO. 2730

FILING RECEIPT

131247
NDWE LLP/Ericsson
99 Almaden Boulevard, Suite 710
San Jose, CA 95113



Date Mailed: 07/10/2018

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

Inventor(s)

Rui FAN, Beijing, CHINA;
Jinhua LIU, Beijing, CHINA;
Pål FRENGER, Linköping, SWEDEN;

Applicant(s)

Telefonaktiebolaget LM Ericsson (publ), Stockholm, SWEDEN;

Power of Attorney: The patent practitioners associated with Customer Number 131247

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/CN2017/101576 09/13/2017

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.)

CHINA PCT/CN2017/070130 01/04/2017

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 07/07/2018

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is US 15/568,431

Projected Publication Date: 10/18/2018

Non-Publication Request: No

Early Publication Request: No
Title

ON-DEMAND REQUEST FOR SYSTEM INFORMATION

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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

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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.

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NOT GRANTED

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

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Table with 3 columns: U.S. APPLICATION NUMBER NO. (15/568,431), FIRST NAMED INVENTOR (Rui FAN), ATTY. DOCKET NO. (4906P51954US1). Includes sub-tables for INTERNATIONAL APPLICATION NO. (PCT/CN2017/101576) and FILING/PRIORITY DATES (09/13/2017, 01/04/2017).

131247
NDWE LLP/Ericsson
99 Almaden Boulevard, Suite 710
San Jose, CA 95113

CONFIRMATION NO. 2730
371 ACCEPTANCE LETTER



Date Mailed: 07/10/2018

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 ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE or 371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1) and (c)(2) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN BELOW. 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)

10/20/2017
DATE OF RECEIPT OF 35 U.S.C.
371(c)(1) and (c)(2) REQUIREMENTS

The following items have been received:

- Copy of the International Application filed on 10/20/2017
• Preliminary Amendments filed on 10/20/2017
• Information Disclosure Statements filed on 01/10/2018
• Inventor's Oath or Declaration filed on 11/16/2017
• Request for Immediate Examination filed on 10/20/2017
• U.S. Basic National Fees filed on 10/20/2017
• Authorize Access to Search Results filed on 10/20/2017
• Power of Attorney filed on 10/20/2017
• Authorization to Permit Access filed on 10/20/2017
• Application Data Sheet (37 CFR 1.76) filed on 10/20/2017

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)

JACQUELINE A WHITFIELD

Telephone: (703) 756-1132

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number
15/568,431

APPLICATION AS FILED - PART I

		(Column 1)	(Column 2)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
FOR		NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (j), or (m))		N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))		23	minus 20 = *			OR	x 100 =	300
INDEPENDENT CLAIMS (37 CFR 1.16(h))		3	minus 3 = *			OR	x 460 =	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	2020

APPLICATION AS AMENDED - PART II

		(Column 1)	(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
				TOTAL ADD'L FEE			OR	TOTAL ADD'L FEE		
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	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 15568431	Filing Date
Applicant(s) Rui FAN		

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT		*		*		*	
	Indep	Depend	Indep	Depend	Indep	Depend	Indep	Depend	Indep	Depend	Indep	Depend

1	1		1			
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Total Indep	6		3		0	
Total Depend	45	←	20	←	0	←
Total Claims	51		23		0	

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Table with 4 columns: APPLICATION NUMBER (15/568,431), FILING OR 371(C) DATE (10/20/2017), FIRST NAMED APPLICANT (Rui FAN), ATTY. DOCKET NO./TITLE (4906P51954US1)

CONFIRMATION NO. 2730

PUBLICATION NOTICE

131247
NDWE LLP/Ericsson
99 Almaden Boulevard, Suite 710
San Jose, CA 95113



Title: ON-DEMAND REQUEST FOR SYSTEM INFORMATION

Publication No. US-2018-0302841-A1

Publication Date: 10/18/2018

NOTICE OF PUBLICATION OF APPLICATION

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

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

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

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

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15568431	
	Filing Date		2017-10-20	
	First Named Inventor	Rui FAN		
	Art Unit	2463		
	Examiner Name	Melvin C MARCELO		
	Attorney Docket Number	4906P51954US1		

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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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NON-PATENT LITERATURE DOCUMENTS							Remove	
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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15568431
	Filing Date		2017-10-20
	First Named Inventor	Rui FAN	
	Art Unit	2463	
	Examiner Name	Melvin C MARCELO	
	Attorney Docket Number	4906P51954US1	

1	Examination Report from foreign counterpart Bangladesh Patent Application No. 256/2017/4370 (Atty. Docket No. P51954BD1), mailed December 24, 2018, 1 page.
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If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

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

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	15568431
	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	2463
	Examiner Name	Melvin C MARCELO
	Attorney Docket Number	4906P51954US1

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	/William W. Kidd; Reg. No. 31,772/	Date (YYYY-MM-DD)	2019-01-16
Name/Print	William W. Kidd	Registration Number	31,772

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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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:	34878946
Application Number:	15568431
International Application Number:	
Confirmation Number:	2730
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
First Named Inventor/Applicant Name:	Rui FAN
Customer Number:	131247
Filer:	William W. Kidd/Julie Farrar
Filer Authorized By:	William W. Kidd
Attorney Docket Number:	4906P51954US1
Receipt Date:	16-JAN-2019
Filing Date:	20-OCT-2017
Time Stamp:	20:31:56
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	P51954_US1_2019-01-16_IDS.pdf	1053215 <small>e647ef223c2ab621c2decc479105589dce10e47c</small>	no	4

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2	Non Patent Literature	P51954_US1_2019-01-16_NPL1_OA_25620174370_24Dec2018_1pg.pdf	1211301	no	1
			10c6e045b824c74083762e217712a04c05a290b		

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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.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/568,431	10/20/2017	Rui FAN	4906P51954US1	2730
131247	7590	04/04/2019	EXAMINER	
NDWE LLP/Ericsson 99 Almaden Boulevard, Suite 710 San Jose, CA 95113			MARCELO, MELVIN C	
			ART UNIT	PAPER NUMBER
			2463	
			NOTIFICATION DATE	DELIVERY MODE
			04/04/2019	ELECTRONIC

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

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

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

ndwe_docketing@cardinal-ip.com
patent@ndwe.com

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Rejections - 35 USC § 103

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

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

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

nonobviousness.

4. Claims 1, 6-10, 12, 17-22 and 24 is/are rejected under 35 U.S.C. 103 as being unpatentable over Ishii (US 2018/0167918 A1 with effective filing date of 12/13/2016) in view of Shukla et al. (US 2015/0351011 A1).

Ishii teaches a method for requesting system information blocks where the system information blocks are grouped (e.g. Figure 6). Ishii does not teach the system information blocks are grouped according to a feature of the one or more system information blocks. However, Shukla explicitly teaches

that the system information blocks are grouped according to a feature of the system information blocks (see Figure 1). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to group the system information blocks in Ishii according to a feature of the system information block as explicitly taught by Shukla.

With respect to the claims, references to the prior art appear in parenthesis.

Claims

1. *(Currently Amended)* A method for requesting system information **(Ishii's requesting of SIB in Figure 6)**, comprising:

*transmitting a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node **(Non-Essential System Information Request (SIB#n) 6-4 in Figure 6)**, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks **(Shukla teaches to group the SIBs according to a feature of the one or more system information blocks in Figure 1)**; and*

*receiving one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group **(Ishii's Non-Essential System Information Response (SIB#n content) 6-5 in Figure 6)**.*

6. *(Currently Amended)* The method according to claims 1, further comprising:

*receiving notification information from the network node, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information **(Ishii teaches the notification information indicates change of content of system information block in paragraph 0082)**.*

7. (Original) The method according to claim 6, wherein the notification information is included in minimum system information (**Essential system information message in paragraph 0277, where the essential system information corresponds to the minimum system information in paragraph 0111**).

8. (Currently Amended) The method according to claim 1, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks (**Shukla's Figure 1 identifies the functionality of each of the group of SIBs**).

9. (Currently Amended) The method according to claims 1, further comprising:
receiving an indicator from the network node, wherein the indicator indicates at least one of:
which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node (**Ishii teaches the indicator of the system information blocks in paragraph 0338**).

10. (Currently Amended) The method according to claim 1, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the user terminal (**Ishii teaches that the Access Node can transmit the Non-Essential System Information Response 20-5 and also Essential System Information Broadcast 20-6a and Non-Essential System Information Broadcast 20-7a in Figure 20**).

12. (Currently Amended) An apparatus for requesting system information (**Ishii's requesting of SIB in Figure 6**), comprising:
at least one processor; and

at least one memory comprising computer program code which, when executed by the at least one processor, cause the apparatus to:

*transmit a request for at least one system information block group, each of which comprises one or more system information blocks, to a network node (**Non-Essential System Information Request (SIB#n) 6-4 in Figure 6**), wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks (**Shukla teaches to group the SIBs according to a feature of the one or more system information blocks in Figure 1**); and*

*receive one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group (**Ishii's Non-Essential System Information Response (SIB#n content) 6-5 in Figure 6**).*

17. (Currently Amended) The apparatus according to claim 12, wherein the at least one memory and the computer program code which, when executed by the at least one processor the cause the apparatus to:

*receive notification information from the network node, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information (**Ishii teaches the notification information indicates change of content of system information block in paragraph 0082**).*

*18. (Original) The apparatus according to claim 17, wherein the notification information is included in minimum system information (**Essential system information message in paragraph 0277, where the essential system information corresponds to the minimum system information in paragraph 0111**).*

19. (Currently Amended) *The apparatus according to claims 12, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks* **(Shukla's Figure 1 identifies the functionality of each of the group of SIBs).**

20. (Currently Amended) *The apparatus according to claim 12, wherein the at least one memory and the computer program code which, when executed by the at least one processor, further cause the apparatus to:*

receive an indicator from the network node, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node **(Ishii teaches the indicator of the system information blocks in paragraph 0338).**

21. (Currently Amended) *The apparatus according to claims 12, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the apparatus* **(Ishii teaches that the Access Node can transmit the Non-Essential System Information Response 20-5 and also Essential System Information Broadcast 20-6a and Non-Essential System Information Broadcast 20-7a in Figure 20).**

24. (Currently Amended) *A method for transmission of system information* **(Ishii's requesting of SIB in Figure 6), comprising:**

receiving a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node **(Non-Essential System Information Request (SIB#n) 6-4 in Figure 6), wherein the one or more system information blocks are**

grouped according to a feature of the one or more system information blocks (Shukla teaches to group the SIBs according to a feature of the one or more system information blocks in Figure 1); and transmitting one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group (Ishii's Non-Essential System Information Response (SIB#n content) 6-5 in Figure 6).

Allowable Subject Matter

5. Claims 2-5, 11, 13-16 and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
6. The following is a statement of reasons for the indication of allowable subject matter: Ishii and Shukla et al. do not teach the preambles indicating the system information block groups.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MELVIN C MARCELO whose telephone number is (571)272-3125. The examiner can normally be reached on M-F 9:30-6:00.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Rinehart can be reached on 571-272-3632. 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.

MELVIN C. MARCELO
Primary Examiner
Art Unit 2463

/MELVIN C MARCELO/
Primary Examiner, Art Unit 2463
April 1, 2019

Notice of References Cited	Application/Control No. 15/568,431	Applicant(s)/Patent Under Reexamination FAN et al.	
	Examiner MELVIN C MARCELO	Art Unit 2463	Page 1 of 1

U.S. PATENT DOCUMENTS

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A US-20150351011-A1	12-2015	Shukla; Umesh K.	H04W48/16	455/434
*	B US-20180167918-A1	06-2018	ISHII; Atsushi	H04W72/042	1/1
C					
D					
E					
F					
G					
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K					
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FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

*	Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
U	Samsung, R2-167563, 'On Demand SI Delivery: Signaling Aspects', 3GPP TSG-RAN WG2 #96, November 14-18, 2016, pages 1-3. (Year: 2016)
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. 15/568,431	Applicant(s)/Patent Under Reexamination FAN et al.
	Examiner MELVIN C MARCELO	Art Unit 2463

CPC - Searched*		
Symbol	Date	Examiner
H04W48/08; H04W48/14; H04W72/0446	04/01/2019	MMarcelo

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
PE2E-checked inventor name and continuity data.	04/01/2019	MMarcelo
EAST-see search history printout.	04/01/2019	MMarcelo

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	23131	system adj1 information adj1 block\$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/03/31 23:22
L2	743	group\$3 near3 (1 or sib or sibs)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/03/31 23:23
L3	28	2 with request\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/03/31 23:23
L4	76818	h04w48/08.cpc. or h04w48/14.cpc. or h04w72/0446.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/04/01 00:49
L5	76	4 and 2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/04/01 00:49

EAST Search History (Interference)

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Bibliographic Data

Application No: 15/568,431

Foreign Priority claimed: Yes No

35 USC 119 (a-d) conditions met: Yes No

Met After Allowance

Verified and Acknowledged:

/MELVIN C MARCELO/

Examiner's Signature

Initials

Title:

ON-DEMAND REQUEST FOR SYSTEM INFORMATION

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/20/2017	370	2463	4906P51954US1
RULE			

APPLICANTS

Telefonaktiebolaget LM Ericsson (publ), Stockholm, SWEDEN

INVENTORS

Rui FAN Beijing, CHINA

Jinhua LIU Beijing, CHINA

Pål FRENGER Linköping, SWEDEN

CONTINUING DATA

This application is a 371 of PCT/CN2017/101576 09/13/2017

FOREIGN APPLICATIONS

PCT/CN2017/070130 01/04/2017

IF REQUIRED, FOREIGN LICENSE GRANTED**

07/07/2018

STATE OR COUNTRY

CHINA

ADDRESS

NDWE LLP/Ericsson

99 Almaden Boulevard, Suite 710

San Jose, CA 95113

UNITED STATES

FILING FEE RECEIVED

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Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15568431
	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	2463
	Examiner Name	Melvin C MARCELO
	Attorney Docket Number	4906P51954US1

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15568431
	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	2463
	Examiner Name	Melvin C MARCELO
	Attorney Docket Number	4906P51954US1

1	Examination Report from foreign counterpart Bangladesh Patent Application No. 256/2017/4370 (Atty. Docket No. P51954BD1), mailed December 24, 2018, 1 page.
If you wish to add additional non-patent literature document citation information please click the Add button <input type="button" value="Add"/>	
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Date Considered	03/29/2019
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	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	2463
	Examiner Name	Melvin C MARCELO
	Attorney Docket Number	4906P51954US1

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	/William W. Kidd; Reg. No. 31,772/	Date (YYYY-MM-DD)	2019-01-16
Name/Print	William W. Kidd	Registration Number	31,772

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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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~~ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.C.M/~~

Doc code: IDS

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15568431
	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	
	Examiner Name	
	Attorney Docket Number	4906P51954US1

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	1	3GPP TS 25.331 V13.5.0 (2016-12), "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Radio Resource Control (RRC); Protocol specification (Release 13)," December 2016, 2271 pages.	
	2	International Search Report and Written Opinion for Application No. PCT/CN2017/101576 (Atty. Docket No. P51954WO2), mailed November 30, 2017, 11 pages.	

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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).

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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	/William W. Kidd; Reg. No. 31,772/	Date (YYYY-MM-DD)	2018-01-10
Name/Print	William W. Kidd	Registration Number	31,772

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 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.

~~ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.C.M/~~

Attorney Docket No.: 4906P51954US1

Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application:

Examiner: Melvin C MARCELO

First Named Inventor:

Art Unit: 2463

Rui FAN

Confirmation No: 2730

Application No. 15/568,431

Filed: 10/20/2017

Title: ON-DEMAND REQUEST FOR
SYSTEM INFORMATION

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P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE

In response to the Office Action dated April 4, 2019, please amend the above-identified application as follows and consider the following remarks.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions of the claims in the application.

1. (Currently Amended) A method for requesting system information, comprising:
transmitting a request using a preamble for indicating at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and
receiving one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.
2. (Cancelled)
3. (Currently Amended) The method according to claim ~~2~~ 1, wherein the transmitting of the request comprises:
selecting, from a plurality of preambles, a preamble associated with the at least one system information block group; and
~~transmitting the request to the network node, wherein the request includes the~~ selected preamble.
4. (Currently Amended) The method according to claim ~~2~~ 1, wherein the at least one system information block group is indicated by transmission timing of the preamble.
5. (Original) The method according to claim 4, wherein the transmission of the request comprises transmitting the request to the network node in accordance with a selected transmission timing associated with the at least one system information block group.
6. (Previously Presented) The method according to claim 1, further comprising:
receiving notification information from the network node, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information.

7. (Original) The method according to claim 6, wherein the notification information is included in minimum system information.
8. (Previously Presented) The method according to claim 1, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.
9. (Previously Presented) The method according to claim 1, further comprising:
receiving an indicator from the network node, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node.
10. (Previously Presented) The method according to claim 1, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the user terminal.
11. (Currently Amended) The method according to claim 6, wherein the notification information indicates a correspondence between ~~all of~~ preambles and system information block groups.
12. (Currently Amended) An apparatus for requesting system information, comprising:
at least one processor; and
at least one memory comprising computer program code which, when executed by the at least one processor, cause the apparatus to:
transmit a request using a preamble for indicating at least one system information block group, each of which comprises one or more system information blocks, to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and
receive one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.

13. (Cancelled)
14. (Currently Amended) The apparatus according to claim ~~13~~ 12, wherein the ~~at least one memory and the~~ computer program code ~~which, when executed by the at least one processor,~~ cause the apparatus to:
 - select, from a plurality of preambles, a preamble associated with the at least one system information block group; and
 - transmit the ~~request to the network node, wherein the request includes the~~ selected preamble.
15. (Currently Amended) The apparatus according to claim ~~13~~ 12, wherein the at least one system information block group is indicated by transmission timing of the preamble.
16. (Currently Amended) The apparatus according to claim 15, wherein the ~~at least one memory and the~~ computer program code ~~which, when executed by the at least one processor,~~ cause the apparatus to transmit the request to the network node in accordance with a selected transmission timing associated with the at least one system information block group.
17. (Currently Amended) The apparatus according to claim 12, wherein the ~~at least one memory and the~~ computer program code ~~which, when executed by the at least one processor,~~ further cause the apparatus to:
 - receive notification information from the network node, wherein transmission of the at least one system information block group is predefined or derived based at least partly on the notification information.
18. (Original) The apparatus according to claim 17, wherein the notification information is included in minimum system information.
19. (Previously Presented) The apparatus according to claim 12, wherein the feature of the one or more system information blocks comprises at least one of functionality and periodicity of the one or more system information blocks.

20. (Currently Amended) The apparatus according to claim 12, wherein the ~~at least one memory and the computer program code which, when executed by the at least one processor,~~ further cause the apparatus to:

receive an indicator from the network node, wherein the indicator indicates at least one of: which system information block group is being transmitted from the network node, and which system information block group is scheduled to be transmitted from the network node.

21. (Previously Presented) The apparatus according to claim 12, wherein the one or more system information block groups further comprise at least another system information block group which is not requested by the apparatus.

22. (Currently Amended) The apparatus according to claim 17, wherein the notification information indicates a correspondence between ~~all of~~ preambles and system information block groups.

23. (Cancelled)

24. (Currently Amended) A method for transmission of system information, comprising:
receiving a request using a preamble for indicating at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node, wherein the one or more system information blocks are grouped according to a feature of the one or more system information blocks; and
transmitting one or more system information block groups from the network node, wherein the one or more system information block groups comprise the at least one system information block group.

25-47. (Cancelled)

REMARKS

At the time of the Office Action, claims 1-22 and 24 were pending. Applicant requests reconsideration of this application in view of this response. Applicant amends claims 1, 3, 4, 11, 12, 14-17, 20, 22 and 24. Applicant further cancels 2 and 13. Accordingly, claims 1, 3-12, 14-22 and 24 are still pending.

Claim Rejections – 35 U.S.C. § 103

Claims 1, 6-10, 12, 17-22 and 24 stand rejected under 35 U.S.C. § 103 as being unpatentable over Ishii (U.S. Publication No. 2018/0167918), in view of Shukla et al. (U.S. Publication No. 2015/0351011; hereinafter, “Shukla”).

Regarding independent claim 1, the Office Action stated a rejection based on the combination of Ishii and Shukla. However, the Office Action noted allowable subject matter in claim 2. Amended claim 1 now incorporates the preamble limitation of claim 2. Accordingly, claim 1 is now allowable.

Regarding dependent claims 3-11, these claims directly or indirectly depend from claim 1 and, therefore, contain allowable subject matter.

Regarding independent claim 12, the Office Action stated a rejection based on the combination of Ishii and Shukla. However, the Office Action noted allowable subject matter in claim 13. Amended claim 12 now incorporates the preamble limitation of claim 13. Accordingly, claim 12 is now allowable.

Regarding dependent claims 14-22, these claims directly or indirectly depend from claim 12 and, therefore, contain allowable subject matter.

Regarding independent claim 24, the Office Action stated a rejection based on the combination of Ishii and Shukla. Amended claim 24 now incorporates the preamble limitation recited in amended claim 1. Accordingly, claim 24 is now allowable.

Allowable Subject Matter

The Office Action indicated that claims 2-5, 11, 13-16 and 22 contain allowable subject matter and would be allowable if rewritten in independent form. Applicant has amended independent claims 1, 12 and 24 to include the noted allowable subject matter. Therefore, Applicant submits that all pending claims are in condition for allowance.

Request for Interview

If the Examiner believes that this application is not in condition for allowance in view of this response, Applicant requests a conference with the Examiner in an interview.

Conclusion

Applicant respectfully submits that in view of this response, the rejections have been overcome and requests withdrawal of the 35 U.S.C. § 103 rejections. Applicant reserves all rights under the doctrine of equivalents.

Per 37 C.F.R. 1.136(a)(3), Applicant hereby requests and authorizes the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 506674.

Respectfully,

NICHOLSON DE VOS WEBSTER & ELLIOTT LLP
(Customer No. 131247)

Dated: 06/27/2019

/William W. Kidd; Reg. No. 31,772/

Name: William W. Kidd

Reg. No. 31,772

Direct: (512) 809-7001

Email: bill.kidd@ndwe.com

99 Almaden Boulevard, Suite 710

San Jose, CA 95113

Main: (408) 675-0441

Fax: (408) 675-0442

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	Examiner Name	Melvin C MARCELO
	Attorney Docket Number	4906P51954US1

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	1	Extended European Search Report for Application No. 17784155.8 (Atty. Docket No. 4906P51954EP1), mailed April 11, 2019, 7 pages.	

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Name/Print	William W. Kidd	Registration Number	31,772

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
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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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(11) EP 2 903 349 A1

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- Viorel, Dorin
Sunnyvale, CA California (US)
- Mousley, Timothy
Caterham, Surrey CR3 5EE (GB)

(71) Applicant: FUJITSU LIMITED
Kawasaki-shi,
Kanagawa 211-8588 (JP)

(74) Representative: Stebbing, Timothy Charles
Haseltine Lake LLP
Lincoln House, 5th Floor
300 High Holborn
London WC1V 7JH (GB)

- (72) Inventors:
- Bucknell, Paul
Brighton, BN2 1SP (GB)
 - Fang, Yiwei
High Wycombe, HP11 1GD (GB)

Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) Access method of wireless communication network

(57) An access method of a device (10) such as an MTC device to a network (20, 30, 40) which allows the transmission of small data packets without the need to read all the System Information normally required to make an initial network access. The device (10) may notify the network that an access request is occurring from a device that was either specifically allowed to use a stored access configuration or is accessing the cell using modified system information being broadcast by the cell. Such notification may be implicit in the characteristics (choice of preamble, timing, frequency and/or repetition) of the access request. The network, preferably having knowledge of the method being used by the device to access the network, can either reject this access or accept it depending on whether the access was from a stored configuration or read from System Information.

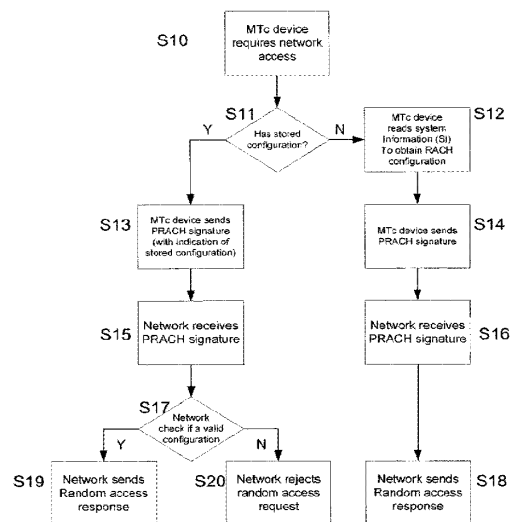


FIGURE 8

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Description

Field of the invention

[0001] The present invention relates to a method of accessing a wireless communication system comprising a base station and subscriber stations for transmitting transmission data to the base station. The present invention further relates to a subscriber station, to a base station and a computer program for use in said method.

[0002] Particularly, but not exclusively, the present invention relates to network access procedures in accordance with the LTE (Long Term Evolution) and LTE-Advanced radio technology standards as, for example, described in the 3GPP TS36 series specifications, Release 9, 10 and subsequent of the 3GPP specification series. However, the present invention is also applicable to UMTS, WiMAX and other communication systems in which a subscriber station (also referred to as "user terminal", "user equipment" or UE, "mobile terminal" etc.) attempts access using a random access method.

Background of the Invention

[0003] Wireless communication systems are widely known in which base stations (BSs) provide "cells" and communicate with subscriber stations within range of the BSs. In LTE for example, the base stations are generally called eNBs or eNBs and the subscriber stations are called user equipments or UEs.

[0004] As an embodiment of the present invention will be described later with respect to LTE, it may be worth briefly outlining some relevant aspects of LTE network topology.

[0005] The network topology in LTE is illustrated in Figure 1. As can be seen, each UE 10 connects over a wireless link via a Uu interface to an eNB 20. It should be noted that various types of eNB are possible having differing transmit powers and therefore providing coverage areas (cells) of differing sizes. Multiple eNBs deployed in a given geographical area constitute a wireless network called the E-UTRAN (and henceforth generally referred to simply as "the network").

[0006] Each eNB 20 in turn is connected by a (usually) wired link using an interface called S1 to higher-level or "core network" entities, including a Serving Gateway (S-GW) 40, and a Mobility Management Entity (MME) 30 for managing the system and sending control signalling to other nodes, particularly eNBs, in the network. In addition (not shown), a Packet Data Network (PDN) Gateway (P-GW) 50 is present, separately or combined with the S-GW, to exchange data packets with any packet data network including the Internet. As shown in Fig. 1, the eNBs 20 communicate among themselves by a (usually) wireless link, using an X2 interface for mutual coordination, for example when handing over a UE 10 from one eNB to another.

[0007] In such a system, each BS divides its available

frequency and time resources in a given cell, into individual resource allocations for the user equipments which it serves, in other words those UEs which have a connection with the BS. The user equipments are generally mobile and therefore may move among the cells, prompting a need for handovers of radio communication links between the base stations of adjacent cells. RRC, or Radio Resource Control, is responsible among other things for signalling related to connection management and handovers to other base stations. A user equipment may be in range of (i.e. able to detect signals from) several cells at the same time, but in the simplest case it communicates with one "serving" cell or "primary" cell. A wireless communication system, and the cells within it, may be operated in FDD (Frequency Division Duplex) or TDD (Time Division Duplex) mode.

[0008] Figure 2 shows the basic units used for resource allocation in the LTE system. Resources in the system have both a time dimension and a frequency dimension. Time in the system is divided in units of a symbol time or "slot" (where a "slot" has typically a duration of seven symbol times), as indicated in Figure 2A. Two successive slots form a "subframe" and (in this example) ten subframes form a "frame". The frequency bandwidth available in the system is divided into a number of sub-carriers.

[0009] The resources available for use by specific UEs are allocated by a scheduling function at the eNB. Such scheduling is usually determined separately for each subframe; in other words the resource allocation of a UE may vary from one subframe to the next. Resources are allocated to UEs both for downlink (DL) and uplink (UL) transmission. UEs which have established a connection with the eNB are synchronized with the eNB and configured with a suitable timing advance (if necessary), so that their allocated downlink and uplink resources can be fully "orthogonal" (non-interfering) with those of other UEs.

[0010] In LTE, several channels for data and control signalling are defined at various levels of abstraction within the system.

[0011] Figure 3 shows some of the channels defined in LTE at each of a logical level, transport layer level and physical layer level, and the mappings between them.

[0012] At the physical layer level, on the downlink, each eNB broadcasts a number of channels and signals to all UEs within range, whether or not the UE is currently being served by that cell. Of particular interest for present purposes, these include a Physical Broadcast Channel (PBCH) as shown in Fig. 3. PBCH carries a so-called Master Information Block (MIB), which gives, to any UEs within range of the signal, basic information as described below. Primary and Secondary Synchronization Signals (PSS/SSS) are also broadcast to all devices within range; these carry a physical layer identity and physical layer cell identity group for identifying the cell.

[0013] User data as well as System Information Blocks (SIBs) are contained in a transport channel DL-SCH, car-

ried on the Physical Downlink Shared Channel (PDSCH). There are various control channels on the downlink, which carry signalling for various purposes; in particular the Physical Downlink Control Channel, PDCCH, is used to carry, for example, scheduling information from a base station (called eNB in LTE) to individual UEs being served by that base station. The PDCCH is located in the first OFDM symbols of a slot.

[0014] Meanwhile, on the uplink, there is a Physical Random Access Channel PRACH which is used to gain initial access to the network, as explained in more detail below. User data and also some signalling data is carried on the Physical Uplink Shared Channel (PUSCH), and control channels include a Physical Uplink Control Channel, PUCCH, used to carry signalling from UEs including channel quality indication (CQI) reports and scheduling requests.

[0015] Since the above mentioned MIB and SIBs are important for the invention to be described, some further details will be given here.

[0016] The MIB includes some of the basic information which the UE needs to join the network, including system bandwidth, number of transmit antenna ports, and system frame number. Reading the MIB enables the UE to receive and decode the SIBs referred to earlier. With respect to SIBs, the term "receive" henceforth also implies "decode".

[0017] The SIBs differ in their information content and are numbered SIB1, SIB2, and so forth. SIB1 contains cell-access related parameters and information on the scheduling of other SIBs. Thus, SIB1 has to be received by a device before it can decode other SIBs such as SIB2. SIB2 contains information including random access channel RACH parameters, referred to below. Currently, SIBs are defined up to SIB14, although not all SIBs need to be received in order for a UE to access the network. For example, SIB10 and SIB11 relate to an Earthquake and Tsunami Warning System. SIB14 is intended for use with so-called Enhanced Access Barring, EAB, which has application particularly to MTC devices (see below).

[0018] For network access, generally SIB1 and SIB2 are the most important, in other words, at a minimum, a UE must normally decode SIB1 and SIB2, in that order, in order to communicate with the eNB. Recently, the present applicant proposed a reduced version of SIB2 called SIB2M, intended for MTC devices (see below), such that reception of SIB1 and SIB2M may suffice for MTC devices to join the network, although SIB2 will still be transmitted for other devices. In the special case of MTC devices subject to EAB, SIB14 is also important.

[0019] Figure 4 illustrates the timings of MIB and SIBs in LTE. As can be seen from Figure 4, the MIB is broadcast relatively frequently, being transmitted four times in each frame. The SIBs, which unlike MIB are transmitted on PDSCH, occur less frequently. The most essential SIB1 is repeated four times in every other frame, whilst SIB2 and further SIBs typically occur less frequently still. The SIBs are repeated to increase the chance of their

being correctly received by a UE, since otherwise, the UE may have to wait an appreciable length of time for the next transmission. This can be a problem particularly for devices at a cell edge or in a coverage hole where reception is poor.

[0020] The Physical Random Access Channel PRACH, referred to in connection with Figure 3, will now be explained since it is also important for the invention to be described. As already mentioned, UEs which have obtained timing synchronization with the network will be scheduled with uplink resources which are orthogonal to those assigned to other UEs. PRACH is used to carry the Random Access Channel (RACH) for accessing the network if the UE does not have any allocated uplink transmission resource. Thus, initiation by the UE of the transport channel RACH implies use of the corresponding physical channel PRACH, and henceforth the two terms RACH and PRACH will be used interchangeably to some extent.

[0021] Thus, RACH is provided to enable UEs to transmit signals in the uplink without having any dedicated resources available, such that more than one terminal can transmit in the same PRACH resources simultaneously. The term "Random Access" is used because (except in the case of contention-free RACH, described below) the identity of the UE (or UEs) using the resources at any given time is not known in advance by the network (incidentally, in this specification the terms "system" and "network" are used interchangeably). So-called "signatures" (see below) are employed by the UEs to allow the eNB to distinguish between different sources of transmission. Unlike the RACH in WCDMA for example, the LTE RACH is not designed to carry any user data, although the choice of signature can indicate other information such as the intended size of a subsequent message (see below).

[0022] Situations where the RACH process is used include:

- Initial access from RRC_IDLE
- RRC connection re-establishment
- Handover
- DL data arrival in RRC_CONNECTED (when non-synchronised)
- UL data arrival in RRC_CONNECTED (when non-synchronised, or no SR resources are available)
- Positioning (based on Timing Advance)

[0023] RACH can be used by the UEs in either of contention-based and contention-free modes. In contention-based access, UEs select any signature at random, at the risk of "collision" at the eNB if two or more UEs accidentally select the same signature. Contention-free access avoids collision, by the eNB informing each UE which signature it may use (and thus implying that the UE is already connected to the network). Contention free RACH is only applicable for handover, DL data arrival and positioning.

[0024] Referring to Figures 5 and 6, the Physical Random Access Channel PRACH typically operates as follows:-

(i) The network, represented in Figures 5 and 6 by an eNB 20, informs each UE of the signature to be used for contention-free access, as indicated by "Message 0" in Figure 5. Periodically, the eNB transmits the broadcast channel PBCH mentioned above, which can be received by all UEs within range (whether or not they are connected to the eNB). The PBCH (not shown in Figures 5 and 6) is transmitted once per frame, and is repeated four times (i.e. a complete set of repetitions spans four frames). The PBCH includes the MIB as already mentioned.

[0025] The UE 10 receives PBCH for the cell of interest. The information in the PBCH allows the UE to receive further SIBs, in particular SIB1 and SIB2 which are contained in PDSCH.

(ii) As already mentioned, PRACH related parameters are contained in SIB2, including:

- time/frequency resources available for PRACH
- signatures available for contention-based RACH (up to 64)
- signatures corresponding to small and large message sizes.

[0026] The signatures each have a numerical index and the available signatures are indicated by use of a number, with all signatures identified by indices up to this number being available for contention-based access.

(iii) The next step differs depending on whether contention-based access or contention-free access is being attempted.

[0027] For contention-based access the UE selects, at random, a PRACH preamble signature according to those available for contention based access and the intended message size. The term "signature" is generally used to refer to characteristics of the particular PRACH preamble transmission. In LTE this corresponds to the preamble sequence. More generally, the signature may include the time domain resources and/or the frequency domain resources, which can include not only the location of such resources in time (symbol no.) and frequency (subcarrier) but also their extent in time and frequency (e.g., number of symbols, number of subcarriers). Henceforth the terms "preamble", "preamble sequence", "preamble signature" and "signature" will be used interchangeably, unless the context demands otherwise.

[0028] In the case of contention-free access, the UE employs the PRACH preamble signature which has previously been assigned to it via Message 0.

(iv) The UE 10 transmits the PRACH preamble (labelled "Message 1" in Figures 5 and 6, also labelled (1) in Figure 6) on the uplink of the serving cell. The eNB 20 receives Message 1 and estimates the transmission timing of the UE. The PRACH preamble transmitted by a UE, having a certain signature, results in a distinctive waveform being received by the eNB, and the eNB makes a decision about which signature(s) the waveform corresponds to, by correlating it with all the possible transmitted signatures.

(v) The UE 10 monitors a specified downlink channel for a response from the network (in other words from the eNB). In response to the UE's transmission of Message 1, the UE 10 receives a Random Access Response or RAR ("Message 2" in Figures 5 and 6, also labelled (2) in Figure 6) from the network. This contains an UL grant for transmission on PUSCH and a Timing Advance (TA) command for the UE to adjust its transmission timing. Figure 6 shows the details of the RAR, showing the Timing Advance and UL Grant fields as well as (in the case of contention-based access) a Temporary Cell Radio Network Temporary Identifier (T-CRNTI) field, by which the RAR informs the UE of an identifier which it should use in its uplink communications following RACH. In contention-free access, the UE can be assumed already to have a C-RNTI.

(vi) For contention-based access, in response to receiving Message 2 from the network, the UE 10 transmits on PUSCH ("Message 3" in Figures 5 and 6, labelled (3) in Figure 6) using the UL grant and TA information contained in Message 2. Message 3 includes a RRC Connection Request as shown in Figure 6, and is the "subsequent message" whose intended size can be indicated by the choice of preamble signature as mentioned above.

[0029] In the case of contention-based access, there is the chance that the same preamble sequence may coincidentally be chosen by another UE also initiating random access. A contention resolution message (not shown) may be sent from eNB 20 in the event that the eNB 20 received the same preamble signature simultaneously from more than one UE, and more than one of these UEs transmitted Message 3. If the UE does not receive any response from the eNB, the UE selects a new signature and sends a new transmission in a RACH sub-frame after a random back-off time.

(vii) Further steps, shown in Figure 6, include a RRC Connection Setup (labelled (4) in Figure 6) by which the eNB responds to the RRC Connection Request, and a reply from the UE in the form of a RRC Connection Setup Complete message as labelled (5) in Figure 6.

[0030] Figures 5 and 6 show the signalling sequence in a simplified form. There is also signalling between the eNB and MME 30 and the S-GW of Figure 1. Figure 7 is a more comprehensive signalling diagram for the case of contention-free access, including this higher-level signalling. As is apparent from Figures 5-7, the network access procedure in LTE is considerably involved and may occupy a significant amount of time, particularly if the initial steps are delayed by difficulty in receiving the SIBs referred to earlier, and/or if there is a need for contention resolution in contention-based access. Although it is possible to repeat transmission of SIBs to assist reception, this only extends the time taken to complete network access. Moreover, the power consumption involved may be significant for low-power devices.

[0031] Meanwhile, the advent of machine-to-machine communications (M2M) between e.g. smart meters in homes and an LTE network creates a large number of deployed devices (so-called Machine Type Communication or MTC devices) which must be low cost, low power, are generally deployed statically and have low-rate, possibly periodic data transmissions with potentially long gaps. This scenario is also referred to as Small Data Transmission.

[0032] It is therefore desirable to design signalling which is more efficient than existing LTE signalling by being targeted at the Small Data Transmission scenario, particularly but not exclusively with respect to MTC devices. In particular there is a need to support frequent transmission of small amounts of data efficiently with minimal network impact (e.g. signalling overhead, network and radio resources, and delay for resource reallocation). It would also be desirable to facilitate access to the network for devices (such as MTC devices) at a cell edge or coverage hole.

Summary of the Invention

[0033] According to a first aspect of the present invention, there is provided a method of accessing a wireless communication network, comprising:

the network broadcasting system information specifying access parameters for gaining access to the network;

a device which needs access to the network deciding whether to use a stored configuration of the access parameters, and if so, transmitting an access request to the network on the basis of the stored configuration; and

the network deciding whether or not to accept the access request.

[0034] Here, "the network" may include one or more base stations which provide wireless access to a device within range. The device may be a terminal or subscriber station (also called UE in LTE), but more particularly, may be a Machine Type Communication, MTC device.

[0035] The system information (SI) may be in a plurality of parts. For example in LTE as mentioned earlier, SI comprises a MIB and a plurality of SIBs, the SIBs being transmitted in a different way from the MIB.

[0036] A "stored configuration of access parameters" means one or more parameter values held in a memory of the device, which would normally be acquired as part of SI prior to sending an access request. Preferably, the device will attempt to receive the currently-broadcast system information prior to deciding whether to use the stored configuration. Being acquired and stored at some earlier time, there is a risk that the stored configuration of access parameters will be out of date and thus invalid for use in the network. Thus, if the broadcast system information can be received, the device will use it, but if not, the device may attempt to access the network using the stored configuration.

[0037] The "access request" means a message transmitted by the device to the network in order to gain network access or more particularly to obtain a grant of UL resources for a data transmission. In the case of LTE, the access request includes a random access preamble, "Message 1" referred to in the introduction.

[0038] Generally, an access request based on the broadcast information may be expected to be more likely to be accepted. Here "receive the broadcast system information" includes receiving part of the SI. In LTE, for example, the device may be able to receive the MIB and SIB1, even if it cannot receive subsequent SIBs. However, to generate an access request based on the broadcast SI would normally require receiving all of MIB, SIB1 and SIB 2 (or SIB2M).

[0039] Thus, in embodiments of the present invention the device is able to transmit an access request without necessarily having read all the SI normally required to make such a request. This may be a particular advantage in the context of so-called Small Data Transmission, where devices may have a need to access the network (perhaps urgently) but only a small amount of data to send. As one example applied to LTE, the access request might follow reception by the device of MIB and SIB1, but not necessarily SIB2 (or SIB2M).

[0040] As an alternative to use of the stored configuration, the device may use the access parameters contained in the broadcast SI, which may be either conventional SI (for example MIB, SIB1 and SIB2 in the case of LTE) or modified SI suitable for MTC devices (MIB, SIB1 and SIB2M for example).

[0041] The network receives the access request and decides whether or not to accept the access request on the basis of information available to it. The network may be more likely to accept the access request if it is aware of the use of the stored configuration. Thus, preferably, the device indicates use of the stored configuration. In other words, the device notifies the network that the access request is based on the stored configuration, preferably as part of the access request itself. Such a notification need not be explicit but may for example be implicit

in the manner in which the access request is transmitted. The indication may be made in various ways, including a flag to denote use of a stored configuration by one value, or use of read SI by another value; or by positive indication of use of read SI implying, in the absence of the positive indication, that a stored configuration used has been used. This indication may alternatively be made by separate signalling, including possibly signalling outside the wireless communication network.

[0042] Moreover, preferably, the device further indicates a failure to receive at least part of the system information, again preferably by means of the access request itself. That is, the access request may contain or imply a combination of indications. The indication of failure to receive SI may imply to the network that the device is located in a coverage hole.

[0043] In the event that the device holds a plurality of stored configurations of the access parameters, the method may further comprise the device selecting from among the plurality of stored configurations, and indicating the selected stored configuration. Again the indication may be implicit in the characteristics of the access request. Here, the selecting may be guided or instructed by the network (for example by signalling during wireless communication prior to the access attempt).

[0044] In one embodiment, the access request is a random access request including, selected by the device, any one or more of:

- a preamble from among a set of random access preambles; and/or
- a transmission timing from among a plurality of possible timings; and/or
- a transmission frequency from among a plurality of possible frequencies; and/or
- a duration in time from a plurality of possible durations; and/or
- an extent in frequency from among a plurality of possible frequency ranges; and/or
- a repetition sequence of signals such as preambles in the time and/or frequency domain from among a plurality of repetition sequences;
- the device indicating use of the stored configuration and/or a failure to read at least part of the system information by its selection(s).

[0045] Normally, selection of a preamble from among a set of preambles would imply contention-based access as understood in LTE for example. However, this is not necessarily the case; it would be possible for a device to be configured with a plurality of preambles for contention-free access.

[0046] Although the number of available preambles is limited in a wireless communication system such as LTE, it will be apparent that by selecting from among of the above variables, a potentially large number of combinations is available for indicating further information (such as the stored configuration or failure to read SI).

[0047] The network may respond to a random access request with a random access response, and may repeat transmission of the random access response if the device indicates a failure to read system information.

[0048] Preferably, the system information includes an indication of whether an access request based on a stored configuration will, or will not, be accepted by the network. As already mentioned the SI may be broadcast in a plurality of parts, in which case it is preferable to include such an indication in an earlier part of SI (such as SIB1 in LTE), increasing the probability that the device can receive it.

[0049] If some system information received by a device indicates that an access request based on a stored configuration will not be accepted by the network, the device attempts to receive a transmission of further system information. Thus, in LTE for example, a device informed from reading SIB1 that a stored configuration is not acceptable, must wait until it has correctly read SIB2 (or SIB2M) before sending the access request.

[0050] Preferably the network repeatedly transmits the further system information and the device repeats attempts to receive the further system information until it is successfully received (decoded and read).

[0051] For a wireless communication network in which wireless communication takes place in time units of frames, each frame divided into a plurality of subframes, the network decides whether or not to accept the access request based on one or more of:

- whether or not an indication of use of a stored configuration has been received;
- whether the access parameters used for the access request are valid;
- the subframe in which the access request was received; and
- whether or not the access request contains a specific signature assigned to the device.

[0052] In any method as defined above, the device may obtain the stored configuration from any of:

- factory setting of the device;
- an application layer setting;
- system information received during an earlier access to the network; or network specifications.

[0053] In one embodiment, a method as defined above is applied to an LTE-based wireless communication system, the access request including a RA preamble transmission of the device (corresponding to "Message 1" in Figure 5).

[0054] In one embodiment, the device is a Machine Type Communication, MTC device. However, the present invention is also applicable to other classes of UEs particularly those at a cell edge or in a coverage hole.

[0055] Embodiments of the present invention may be applied both to a network broadcasting conventional SI

(MIB, SIB1, SIB2 etc), and to networks which broadcast modified SI (such as SIB2M intended for MTC devices).

[0056] According to a second aspect of the present invention, there is provided a wireless communication system, comprising:

a base station arranged to broadcast system information specifying access parameters for gaining access to the system; and

a device arranged to determine a need for access to the system, to decide whether to use a stored configuration of the access parameters for an access request, and if so, to transmit the access request to the base station on the basis of the stored configuration; wherein

the base station is arranged to decide whether or not to accept the access request.

[0057] According to a third aspect of the present invention, there is provided a base station for use in a wireless communication network, the base station arranged to:

broadcast system information specifying access parameters for gaining access to the network;

receive an access request from a device wishing to access the network; and

decide whether or not to accept the access request taking into account whether or not a stored configuration of the access parameters has been used for the access request.

[0058] According to a fourth aspect of the present invention, there is provided a device for use as a terminal in a wireless communication network, the device arranged to:

receive at least part of broadcast system information specifying access parameters for gaining access to the network;

determine a need for access to the system, decide whether to use a stored configuration of the access parameters for an access request, and if so, to transmit the access request to the network on the basis of the stored configuration.

[0059] The above second to fourth aspects may share any of the optional features recited above with respect to the method of the invention. In particular, the base station may receive from the device an indication of the use of the stored configuration for the access request, and the device may be further arranged to provide such an indication either as part of its access request, or separately. Thus, by sending an access request based on a stored configuration the device may also (implicitly, by characteristics of the access request) provide an indication that a stored configuration of access parameters has been employed.

[0060] According to a further aspect of the present in-

vention there are provided computer-readable instructions which, when executed by a processor of a transceiver device in a wireless communication system, cause the device to provide the base station or the terminal as defined above.

[0061] Thus, embodiments of the present invention involve a new access method of devices to a network which allows the transmission of small data packets without the need to read all the System Information normally required to make an initial network access. This access method may be particularly beneficial for M2M communication with MTC devices. The behaviour goes beyond existing methods specifically including the ability to notify the network that initial access is occurring from a device that was either specifically allowed to use a stored access configuration or is accessing the cell using SI (or modified SI) being broadcast by the cell.

[0062] Embodiments of the present invention enable the configuration of RACH for initial access without the normal broadcast signalling required for pre-configuration of a modified method for initial access of a device to a network, and target low-cost M2M applications that usually require transmission of infrequent small amounts of data. In particular, embodiments of the present invention are suitable for use in the case of infrequent machine small packet transmissions from a higher layer perspective and the configuration of infrequent small data packet UL transmissions.

[0063] In embodiments, the network is informed of the method being used by the device to access the network and can either reject this access or accept it depending on whether the access was from a stored configuration or read from System Information reading (e.g. SIB2M).

[0064] In general, and unless there is a clear intention to the contrary, features described with respect to one aspect of the invention may be applied equally and in any combination to any other aspect, even if such a combination is not explicitly mentioned or described herein.

[0065] As is evident from the foregoing, the present invention involves signal transmissions between a terminal and a base station in a wireless communication system. The "terminal" referred to here, also referred to as a subscriber station or UE, may take any form suitable for transmitting and receiving such signals. For the purpose of visualising the invention, it may be convenient to imagine the terminal as a mobile handset but no limitation whatsoever is to be implied from this. In preferred embodiments of the present invention, the base station will typically take the form proposed for implementation in the 3GPP LTE and 3GPP LTE-A groups of standards, and may therefore be described as an eNB (eNB) (which term also embraces Home eNB or HeNB) as appropriate in different situations. However, subject to the functional requirements of the invention, the base station may take any other form suitable for transmitting and receiving signals from terminals.

Brief Description of the Drawings

[0066] Reference is made, by way of example only, to the accompanying drawings in which:

Figure 1 shows the basic system architecture in a LTE-based wireless communication system;

Figure 2 shows the relationship between frames, subframes and slots in LTE;

Figure 3 shows relationships between various uplink channels defined in LTE;

Figure 4 shows timings of transmission of system information (SI) in LTE;

Figure 5 shows in simplified form a random access (RACH) procedure in LTE;

Figure 6 shows the RACH procedure in more detail, including the contents of a random access response (RAR);

Figure 7 is a detailed signalling diagram showing network entry and subsequent procedures in LTE;

Figure 8 is a first flowchart of steps in embodiments of the present invention;

Figure 9 is a second flowchart of steps in embodiments of the present invention;

Figure 10 is a schematic diagram of a UE to which the present invention may be applied; and

Figure 11 is a schematic diagram of an eNB to which the present invention may be applied.

Detailed Description

[0067] The following description will refer to "UEs" and "MTC devices" interchangeably. For present purposes, MTC devices can be regarded as one class of UEs, to which the present invention is particularly relevant, although the present invention is applicable to other classes of UEs.

[0068] For the transmission of data to and from MTC devices that are located in low signal condition areas, one solution being investigated is the use of repetition of key system information, being broadcast by an eNB to allow a MTC device to receive this information with a lower SNR than normal, potentially going -15dB below cell edge SNR levels. Here, "key system information" means all the SI needed by a set of devices to access the network. For example if devices are not moving, then SIBs related to measurements for coping with mobility are not required for these devices to access the network. As already mentioned, however, this will lead to the situation where initial access by the MTC device can be delayed significantly due to the time taken to read system information from a cell before attempting to access that cell.

[0069] A principle in embodiments of the present invention is to reduce or avoid this delay by allowing the device to use stored access parameters in certain circumstances. The use of previously stored access parameters will result in the UE being allowed to transmit using

parameters which are potentially not currently allowed by a cell. Desirably, some mechanism should exist for the UE to know whether it can use the stored access parameters or not, and to indicate to the network that a stored access parameters are being used.

[0070] Some methods for using RACH for initial data access have been described before, including using Message 1 as an indication of the amount of data that the UE has available for transmission stored in its uplink data buffer. One possible extension of this is that the initial access using a stored PRACH configuration is indicated to the eNB. Thus, the eNB would know that the access to the eNB is being performed by a MTC device that has either been allocated a certain stored RACH access parameters as a result of a previous RRC active mode connection or by having read the valid parameters from system information (typically in SIB14) or from SIB2M.

[0071] As explained in U.S provisional patent application No. 13/02455 assigned to the present applicant, it is possible to indicate changes in SIB1, SIB2 and/or SIB2M (a modified SIB2 for MTC devices) by use of flag bits that are stored either in legacy PBCH or in a newly defined MTC PBCH. This allows a device to know whether the SI has changed (and thus by implication whether stored access parameters corresponding to any of SIB1, SIB2/SIB2M remain valid).

[0072] In embodiments of the present invention, the device is configured to read system information contained either in SIB2M, and/or SIB1 and/or SIB14 and then based on an indicator bit or bits stored in SIB2M, SIB1 or SIB14 can either use a previously stored configuration or re-read SIB2 or SIB2M to obtain a valid configuration.

[0073] The main benefit of this scheme is that the indication of the configuration that the device used is signalled quickly to the network so the network (more particularly the eNB) has full knowledge of the method being used by the device to access the network and can either reject this access or accept it depending on whether the access was from a stored configuration or read from System Information reading (e.g. SIB2M).

[0074] Some embodiments will now be described in more detail. In general, unless otherwise indicated, the embodiments described below are based on LTE, where the network comprises multiple eNBs and MTC devices are allowed to attach to the network.

[0075] The RACH procedure in LTE was explained in the introduction. Whilst suited to UEs of human users (also called H2H for human-to-human, as opposed to M2M), where the UEs tend to be mobile and data traffic may be high, the procedure is less suited for MTC devices and Small Data Transmission. Conceptually MTC traffic is different as devices are generally static in one location and transmit low data volumes. Some use of this can be made to improve the mechanism for an MTC device to connect to the network to either send or receive data.

[0076] The trigger data for an MTC device to start the

connection procedure to a network from IDLE mode (i.e. not connected) are defined as either:

MO: Mobile Orientated data, where the MTC device itself requires to either read data from the network or send data to the network and can start a RACH procedure, or

MT: Mobile Terminated data, where the MTC device is instructed by the network to initiate RACH procedure to receive incoming data.

[0077] In embodiments, a modified RACH procedure can be triggered by either MO or MT data.

[0078] After reading MIB information, conventionally the UE will proceed to read SIB2 information which will contain, amongst other information, the RACH configuration to be used in the RACH procedure.

[0079] RACH configuration usually has to be read every time the device accesses the network due to the likelihood of changes in MTC RACH configuration (considering different RACH resources allocated, dependent on different coverage deficit experienced by the device). This assumption holds even if the device is mainly located in the same physical location, since the propagation channel could vary in time due to different factors.

[0080] The proposed scheme preferably involves reading SIB1 which as already mentioned, includes pointers to other SIBs so that they may be read. Then, preferably using a flag (or other indicator) stored in SIB1, to either use a previously stored configuration or re-read SIB2 to obtain a valid configuration.

[0081] The process involves storing the RACH configuration from radio resource configuration (radioResourceConfigCommon) from previous reception of SIB2 or SIB14, and re-using this if allowed by signalling in eNB or in the absence of any alternative.

[0082] The scheme then preferably indicates the use of a previously stored configuration using data that can be sent together with the initial RACH access ("Message 1"). This can be information indicating that the stored configuration was obtained from either a previous configuration which was made during an active RRC connection or obtained from modified System Information broadcast by the cell, e.g. a new SIB such as SIB2M (a SIB specifically for machine type communications access).

First Embodiment

[0083] For a first embodiment, Figure 8 indicates a possible flow sequence of events where the indicator for the stored configuration can be sent as part of Message 1 (PRACH signature transmission).

[0084] To begin with, it is assumed that a MTC device has no current access to the network, but may have gained access at some time(s) in the past, and may have stored in its memory some access parameters applicable at that time. For example the most recent access param-

eters may be held in memory, over-writing any previous stored configuration.

[0085] In step S10, the MTC device determines a need for gaining network access, typically due to having some data ready to transmit to the network.

[0086] In step S11, the device checks whether it has a stored configuration which might be used for an access request. This step might be conditional on receiving sufficient SI (such as MIB and SIB1) to inform the device that a stored configuration is allowed by the network.

[0087] If there is no stored configuration (S11, N) (or if use of a stored configuration is not allowed), the flow proceeds to S12 where the device is required to read (further) SI in order to obtain the RACH configuration. For example, even if the device has already received MIB and SIB1, it must now receive SIB2 to obtain this information. SIB2M, if it is being transmitted for use of MTC devices, may be received instead.

[0088] Proceeding further with this case (which corresponds to the conventional procedure), the device then sends a PRACH signature in accordance with the received RACH configuration (S14). Assuming the device has no existing connection with the network, this would be by way of contention-based access.

[0089] The network receives the PRACH signature (S16) and sends a RAR (S18), followed by contention resolution if necessary. This would be followed by the remaining steps of the conventional signalling sequence shown in Figure 7, including the RRC Connection Request, RRC Connection Setup and so forth.

[0090] Meanwhile, if in step S11 the device does have a stored configuration (and preferably, knows that use of a stored configuration is allowed), the flow follows the branch indicated by S11, Y according to which the device sends a PRACH signature based on the stored configuration or in other words, using values of access parameters contained in the stored configuration. There may be more than one stored configuration as explained later. In doing so, preferably, the device indicates use of the stored configuration in some way; usually this will be achieved by implicit signalling as described below.

[0091] Then, in S15 the network receives the PRACH signature and checks whether it has a valid configuration. The configuration may include for example the choice of signature, time and/or frequency used to transmit it, and so forth.

[0092] If the configuration is valid (S17, Y) the network sends the RAR. If not (S17, N) it rejects the access request. That is, the eNB which receives the request may simply ignore it, or may send a signal to notify the device of rejection of the request. If its request is ignored (or positively rejected) the device may try again, preferably after a renewed attempt to read SI. One feature of this embodiment is the use of an UL indication in Message 1 that a stored configuration for PRACH has been used for the 1st PRACH attempt by the MTC device.

[0093] This indication can be by the choice of a pre-defined specific preamble for Message 1 (signature

and/or duration) or frequency/time domain sequence of preambles (as preambles are repeated). Another possibility is that the RACH preamble is transmitted by the device so as to be received at a pre-defined point in time (with known pre-defined timing point that allows the network to distinguish between different types of access (either with the stored configuration or without).

[0094] The number of preamble signatures used for this method can be one or any number of preamble signatures.

[0095] Another way that can be used for the indication of the choice of either SIB2/SIB2M parameters or a stored radio resource configuration can be additional signaling bits in the UL message sent by a device to the network.

[0096] As indicated by the right-hand branch of Figure 8 (S12, S14, S16, S18), an MTC UE could also have to read SIB2 if there is no other option available for it.

Second Embodiment

[0097] The principle of the first embodiment can be extended to the case where the device is located in a coverage hole, making it difficult to read SI even after repetition. The second embodiment allows the device to indicate this fact to the network.

[0098] In Figure 9, a more detailed procedure is shown in comparison with Figure 8, where the UE can either indicate that it has used a stored configuration and/or that the SI was read using the repeated broadcasts of the SI. It is assumed that the device has a need to access the network.

[0099] As would also be present in the first embodiment, an initial step S30 is shown of the MTC device receiving a broadcast of PSS/SSS identifying the cell. In S31 the device reads PBCH, which as already mentioned includes the MIB.

[0100] The device then attempts to read SIB1 and SIB2. In S32, it is determined whether or not SIB2 can be read without repetition, in other words without having to receive more than one transmission of SIB2.

[0101] If SIB2 can be read without repetition, the device can proceed with the conventional RACH procedure as indicated in S35, S38 S41 and S46, that is, by using the broadcast SI without having to resort to a stored configuration. Here, the broadcast SI could include SIB2M in place of SIB2, if available.

[0102] If SIB2 cannot be read without repetition (or cannot be read at all) (S32, N) the flow process to S33 where the device checks whether it has a stored configuration to use for an access request. If it does (S33, Y) it proceeds to send a PRACH signature based on the stored configuration in S36. However, in this case the characteristics of the PRACH signature transmission (preamble, timing, frequency, etc) indicates not only the use of a stored configuration, but also the fact that the device was unable to read SIB2 without repetition. As indicated in the Figure, this may be equivalent to indicating that the device is in a coverage hole.

[0103] The flow in this case proceeds to the network receiving the PRACH signature (S39) and deciding whether the stored configuration is valid or not. For example if the PRACH signature transmission reflects an out-of-date configuration, the network may reject the access request, in which case (S42, N) the network ignores the access request (S44). Conversely if the stored configuration is valid, this will lead to an acceptable access request to which the network responds with a RAR. Unlike the conventional procedure, this may be a repeated RAR as indicated in S43, to deal with the indication that the device is in a coverage hole and will therefore find it difficult to receive the RAR.

[0104] On the other hand, if the device has either no stored configuration at all, or if it knows from SI read so far that the stored configuration would not be allowed (S33, N) this means that the device has to wait for one or more repetitions in order to successfully read the required SI (in particular SIB2). The flow thus proceeds to S34 where the device reads SI a sufficient number of times to obtain the RACH configuration, and then (S37) sends a PRACH signature. In this choice, the characteristics of the PRACH signature transmission indicate to the network that the device is in a coverage hole, similarly as in S36, but there is no need to indicate use of a stored configuration. If desired, a positive indication could be made to the effect that a RACH configuration based on read SI was being employed. In step S40, the network receives the PRACH signature and responds with a RAR. As in the case of S43, this may be a repeated RAR to assist reception by the device in a coverage hole.

[0105] To summarise the above, in this embodiment the device will try and read normal SI but if this fails then it will use the stored configuration and signal the use of the stored configuration to the network, which can decide, on the basis that the stored configuration is no longer valid and should be renewed, that it can ignore this access attempt. Again, a signal rejecting the access request could be transmitted if desired.

[0106] If the network knows that the access attempt comes from a stored configuration, the response may be different than (or interpreted differently to) a normal RACH response, since the random access response may already include a confirmation of UE RNTI and immediate access to UL radio resources for the sending of a small data packet in the first UL transmission from the device. Thus for example the device may be assumed by the device to be for immediate data transmission. This could reduce the amount of messaging that is sent after initial access by removing the need for the RRC configuration setup messages shown in Figure 7 (e.g. RRC Connection Reconfiguration (measurement configuration) and RRC Connection Reconfiguration (Radio Bearer Setup)).

[0107] If a valid stored configuration is not present, then the device will read the SI that is being (typically being repeated) broadcast for a device in a coverage hole. This can also be indicated in the UL message, as the response may have to be sent with higher power/and

or repetitions to reach the device in the coverage hole.

Third Embodiment

[0108] A third embodiment is similar to the first and second embodiments, except that an MTC UE may also use the same random access configuration as non-MTC devices. In other words the MTC devices may be required to employ the conventional procedure for reading SI, in place of the modified procedure provided by the present invention. It could be determined on the basis of a flag (e.g. in MIB or SIB1) whether the UE must receive SIB2 or not. In the case that the UE uses the PRACH resources indicated in SIB2, following the conventional procedure, no additional bit(s) or special signature is needed to be used.

[0109] Such a flag would of course be received by all devices in the cell, not only MTC devices. This flag might not be needed for UEs located in regular coverage areas; it may be used by any device that requires fast access to the radio resources, i.e. to send one or a small number of packets with reduced control signalling overhead.

[0110] In variations of these embodiments the PRACH resources for MTC UEs may be restricted in the time domain (e.g. only available in certain subframes). In a further variation, an MTC UE is configured with a dedicated preamble/signature and uses the contention free RACH procedure (in the designated subframes). Use of designated subframes in this way would allow re-assignment of the limited number of available preambles, such that use of the present invention would be available only in certain subframes with the conventional procedure in force during other subframes.

[0111] For contention-based access a set of preambles would be assigned in common for the MTC devices, some of which preambles could be used to indicate use of a stored configuration, and others possibly indicating a coverage hole. Whilst for contention-free access, each MTC device would be assigned a small number of preambles, such as one for each of a plurality of stored configurations plus a preamble for conventional random access.

[0112] If the network receives indication of stored configuration access but requires that a UE has to re-read broadcast parameters and discard the stored configuration, then another signal can tell the UE to re-read SI (e.g. Message 3 or another message sent by the network to the UE).

[0113] Use of a timer, or counting a number of access attempts, can prevent the UE from accessing the network with a stored configuration so it has to re-read access parameters from the SIB.

[0114] Stored configuration could come from the application layer (OAM, oneM2M configuration):

- Factory setting
- Application layer setting (e.g. from an app)
- Read from SI (at some earlier point in time)

Specifications

[0115] There could be multiple stored configurations available for use in the UE.

[0116] A method needs to be defined where the UE selects which stored configuration to use, perhaps defined as a priority list.

[0117] Stored configuration priority could be controlled by a DL flag (part of PBCH or SIB). For example, if the eNB wishes to notify the UE not to use any default configuration (or a specific default configuration), then the DL indication would control this in the UE.

[0118] Therefore the UL indication could be multi-level, e.g. if a previously read stored configuration expires then the UE could use the default (specification/factory setting) configuration and indicate this with a different UL indicator to the eNB.

[0119] As indicated above with respect to steps S34, S37, S40, S45 of Figure 9, an MTC device may indicate being in a coverage hole with an UL indication, which can be sent as part of the PRACH procedure. This can be used for the basestation to repeat DL transmission to reach the device in the poor coverage area.

[0120] This stored configuration mode of operation could also be an option for handsets intended for operation in coverage deficit areas, not just MTC devices, assuming it is compliant with the new UE category that might be defined for this category of devices.

[0121] Various modifications are possible within the scope of the invention.

[0122] In the above description, an MTC device indicated use of a stored configuration by the characteristics of a PRACH preamble transmission. However, other UL signalling could be used for this purpose, including signalling outside of the LTE network (for example via Wi-Fi or a wired cable connection if available). An indication is used to indicate that the device is in poor coverage area, and therefore needs to receive SI in a dedicated way.

[0123] Notification of use of a stored configuration would allow the network to send a massively repeated Message 2 (RAR) in a way which is specifically designed for operation of devices in coverage deficit areas, by allowing the device to increase the probability of decoding Message 2 successfully. Thus, embodiments of the present invention can involve repetition of RAR in addition to repetition of SIBs.

[0124] The UL indication could be a short "ping" type of message, where the use of a certain preconfigured RACH access (in other words an access request having certain preamble/timing/frequency and/or repetition characteristics) is used by the device to indicate a "can you hear me?" message, to which the networks can acknowledge with a "yes I can" message. This would allow the device to return to sleep. If the device does not hear the response, then it would typically repeat the UL message until it gets a response. If no response was available, the device would raise a user alarm (e.g. if the device

also is connected to the internet by cable or WiFi connection).

[0125] Figure 8 is a block diagram illustrating an example of a UE 10 to which the present invention may be applied. The UE 10 may include any type of device which may be used in a wireless communication system described above and may include cellular (or cell) phones (including smartphones), personal digital assistants (PDAs) with mobile communication capabilities, laptops or computer systems with mobile communication components, and/or any device that is operable to communicate wirelessly. The UE 10 includes transmitter/receiver unit(s) 804 connected to at least one antenna 802 (together defining a communication unit) and a controller 806 having access to memory in the form of a storage medium 808. The controller 806 may be, for example, Microprocessor, digital signal processor (DSP), application-specific integrated circuit (ASIC), field-programmable gate array (FPGA), or other logic circuitry programmed or otherwise configured to perform the various functions described above, such as determining whether or not to employ a stored configuration of access parameters to construct an access request. For example, the various functions described above may be embodied in the form of a computer program stored in the storage medium 808 and executed by the controller 806. The transmission/reception unit 804 is arranged, under control of the controller 806, to transmit an access request, receive signals from an eNB such as SI or RAR, and so forth as discussed previously.

[0126] Figure 9 is a block diagram illustrating an example of an eNB 20 to which the present invention may be applied. The base station 20 includes transmitter/receiver unit(s) 904 connected to at least one antenna 902 (together defining a communication unit) and a controller 906. The controller may be, for example, Microprocessor, DSP, ASIC, FPGA, or other logic circuitry programmed or otherwise configured to perform the various functions described above, such as broadcasting PBCH, transmitting SIBs and receiving an access request from a device. For example, the various functions described above may be embodied in the form of a computer program stored in the storage medium 908 and executed by the controller 906. The transmission/reception unit 904 is responsible for UE-specific signalling and broadcast messages under control of the controller 906.

[0127] To summarise, embodiments of the present invention allow, for devices such as MTC devices, the transmission of small data packets without the need to read all the System Information normally required to make an initial network access. Whilst reception of the MIB and preferably SIB1 would normally be required, this is not necessarily essential. The behaviour goes beyond existing methods specifically including the ability to notify the network that initial access is occurring from a device that was either specifically allowed to use a stored access configuration, or is accessing the cell using modified system information (such as SIB2) being broadcast by the

cell.

[0128] The invention has been described with reference to LTE/LTE-A but could also be applied to other communications systems such as UMTS and WiMAX.

[0129] Any of the embodiments and variations mentioned above may be combined in the same system. Features of one embodiment may be applied to any of the other embodiments.

[0130] In any of the aspects or embodiments of the invention described above, the various features may be implemented in hardware, or as software modules running on one or more processors.

[0131] The invention also provides a computer program or a computer program product for carrying out any of the methods described herein, and a computer readable medium having stored thereon a program for carrying out any of the methods described herein.

[0132] A computer program embodying the invention may be stored on a computer-readable medium, or it may, for example, be in the form of a signal such as a downloadable data signal provided from an Internet website, or it may be in any other form.

[0133] It is to be understood that various changes and/or modifications may be made to the particular embodiments just described without departing from the scope of the claims.

Industrial Applicability

[0134] The invention enables devices, particularly but not exclusively MTC devices, to access a wireless communication system without having to receive all the SI conventionally required in order to obtain the access parameters for an access request. It therefore contributes to efficient use of the system particularly in the Small Data Transmission scenario.

Claims

1. A method of accessing a wireless communication network, comprising:

the network broadcasting system information specifying access parameters for gaining access to the network;
a device which needs access to the network deciding whether to use a stored configuration of the access parameters, and if so:

transmitting an access request to the network on the basis of the stored configuration; and
indicating use of the stored configuration; and

the network deciding whether or not to accept the access request.

2. The method according to claim 1 further comprising the device attempting to receive the broadcast system information and deciding whether to use the stored configuration or access parameters based on received system information, depending on the outcome.
3. The method according to any preceding claim, further comprising the device indicating a failure to receive at least part of the system information.
4. The method according to any preceding claim wherein the device holds a plurality of stored configurations of the access parameters, the method further comprising the device selecting from among the plurality of stored configurations, and indicating the selected stored configuration.
5. The method according to any preceding claim wherein at least one of the indicating use of the stored configuration, indicating a failure to receive at least part of the system information and indicating the selected stored configuration are implicit in the access request.
6. The method according to claim 5 wherein the access request is a random access request including, selected by the device:
- a preamble from among a set of random access preambles; and/or
 - a transmission timing from among a plurality of possible timings; and/or
 - a transmission frequency from among a plurality of possible frequencies; and/or
 - a duration in time from a plurality of possible durations; and/or
 - an extent in frequency from among a plurality of possible frequency ranges; and/or
 - a repetition sequence of signals such as preambles in the time and/or frequency domain from among a plurality of repetition sequences;
- the device indicating use of the stored configuration and/or a failure to receive at least part of the system information by its selection(s).
7. The method according to claim 6 further comprising the network responding to the random access request with a random access response, and repeating transmission of the random access response if the device indicates a failure to receive system information.
8. The method according to any preceding claim, the system information including an indication of whether an access request based on a stored configuration will, or will not, be accepted by the network.
9. The method according to claim 8 wherein if the system information indicates that an access request based on a stored configuration will not be accepted by the network, the device attempts to receive a transmission of further system information, the network repeatedly transmitting the further system information and the device repeating attempts to receive the further system information until it is successfully received.
10. The method according to any preceding claim wherein wireless communication in the network takes place in time units of frames, each frame divided into a plurality of subframes, and the network decides whether or not to accept the access request based on one or more of:
- whether the access parameters used for the access request are valid;
 - the subframe in which the access request was received; and
 - whether or not the access request contains a specific signature assigned to the device.
11. The method according to any preceding claim wherein the device obtains the stored configuration from any of:
- factory setting of the device;
 - an application layer setting;
 - system information received during an earlier access to the network; or
 - network specifications.
12. A wireless communication system, comprising:
- a base station arranged to broadcast system information specifying access parameters for gaining access to the system; and
 - a device arranged to determine a need for access to the system, to decide whether to use a stored configuration of the access parameters for an access request, and if so, to transmit the access request to the base station on the basis of the stored configuration and indicate use of the stored configuration; wherein the base station is arranged to receive the access request and the indication, and to decide whether or not to accept the access request.
13. A base station for use in a wireless communication network, the base station arranged to:
- broadcast system information specifying access parameters for gaining access to the network;
 - receive, from a device wishing to access the network, an access request and an indication of whether or not a stored configuration of the ac-

cess parameters has been used for the access request; and
decide whether or not to accept the access request taking into account the indication.

14. A device for use as a terminal in a wireless communication network, the device arranged to:

receive at least part of broadcast system information specifying access parameters for gaining access to the network;
determine a need for access to the system, decide whether to use a stored configuration of the access parameters for an access request, and if so, to transmit the access request to the network on the basis of the stored configuration and indicate use of the stored configuration.

15. Computer-readable instructions which, when executed by a processor of a transceiver device in a wireless communication system, cause the device to provide the base station according to claim 13 or the device according to claim 14.

Amended claims in accordance with Rule 137(2) EPC.

1. A method of accessing a wireless communication system comprising:

a base station (20) in the system broadcasting system information specifying access parameters for gaining access to the system;
a device (10) which needs access to the system deciding whether to use a stored configuration of the access parameters for an access request, and if so, transmitting the access request to the base station (20) on the basis of the stored configuration; **characterised by:**
the device (10) providing to the base station (20) an indication of use of the stored configuration; and
the base station (20) deciding whether or not to accept the access request taking into account said indication.

2. The method according to claim 1 further comprising the device (10) attempting to receive the broadcast system information and deciding whether to use the stored configuration or access parameters based on received system information, depending on the outcome.
3. The method according to any preceding claim, further comprising the device (10) indicating to the base station (20) a failure to receive at least part of the system information.

4. The method according to any preceding claim wherein the device (10) holds a plurality of stored configurations of the access parameters, the method further comprising the device (10) selecting from among the plurality of stored configurations, and indicating to the base station (20) the selected stored configuration.

5. The method according to any preceding claim wherein at least one of the indication of use of the stored configuration, indicating a failure to receive at least part of the system information and indicating the selected stored configuration are implicit in the access request.

6. The method according to claim 5 wherein the access request is a random access request including, selected by the device (10):

a preamble from among a set of random access preambles; and/or
a transmission timing from among a plurality of possible timings; and/or
a transmission frequency from among a plurality of possible frequencies; and/or
a duration in time from a plurality of possible durations; and/or
an extent in frequency from among a plurality of possible frequency ranges; and/or
a repetition sequence of signals such as preambles in the time and/or frequency domain from among a plurality of repetition sequences;
the device (10) indicating use of the stored configuration and/or a failure to receive at least part of the system information by its selection(s).

7. The method according to claim 6 further comprising the base station (20) responding to the random access request with a random access response, and repeating transmission of the random access response if the device (10) indicates a failure to receive system information.

8. The method according to any preceding claim, the system information including an indication of whether an access request based on a stored configuration will, or will not, be accepted by the base station (20).

9. The method according to claim 8 wherein if the system information indicates that an access request based on a stored configuration will not be accepted by the base station (20), the device (10) attempts to receive a transmission of further system information, the base station (20) repeatedly transmitting the further system information and the device (10) repeating attempts to receive the further system information until it is successfully received.

10. The method according to any preceding claim wherein wireless communication in the system takes place in time units of frames, each frame divided into a plurality of subframes, and the base station (20) decides whether or not to accept the access request based on one or more of:
- whether the access parameters used for the access request are valid;
the subframe in which the access request was received; and
whether or not the access request contains a specific signature assigned to the device (10).
11. The method according to any preceding claim wherein the device (10) obtains the stored configuration from any of:
- factory setting of the device (10);
an application layer setting;
system information received during an earlier access to the system; or
system specifications.
12. A wireless communication system, comprising:
- a device (10) wishing to access the system; and
a base station (20) arranged to broadcast system information specifying access parameters for gaining access to the system, and receive, from the device (10) wishing to access the system, an access request; wherein
the device (10) is arranged to determine a need for access to the system, to decide whether to use a stored configuration of the access parameters for an access request, and if so, to transmit the access request to the base station (20) on the basis of the stored configuration; **characterised in that:**
- the device (10) is further arranged to provide an indication to the base station (20) of use of the stored configuration; and
the base station (20) is further arranged to receive the indication, and to decide whether or not to accept the access request taking into account the indication.
13. A base station (20) for use in a wireless communication system, the base station arranged to:
- broadcast system information specifying access parameters for gaining access to the system; and
receive, from a device (10) wishing to access the system, an access request;
characterised in that:
the base station (20) is further arranged to receive from the device (10) an indication of whether or not a stored configuration of the access parameters has been used for the access request; and
decide whether or not to accept the access request taking into account the indication.
14. A device (10) for use as a terminal in a wireless communication system in which a base station (20) broadcasts system information specifying access parameters for gaining access to the system, the device (10) arranged to:
- determine a need for access to the system, decide whether to use a stored configuration of the access parameters for an access request, and if so, to transmit the access request to the base station (20) on the basis of the stored configuration; **characterised in that:**
the device (10) is further arranged to provide an indication to the base station of use of the stored configuration.
15. Computer-readable instructions which, when executed by a processor of a transceiver device in a wireless communication system, cause the device to provide the base station (20) according to claim 13 or the device (10) according to claim 14.

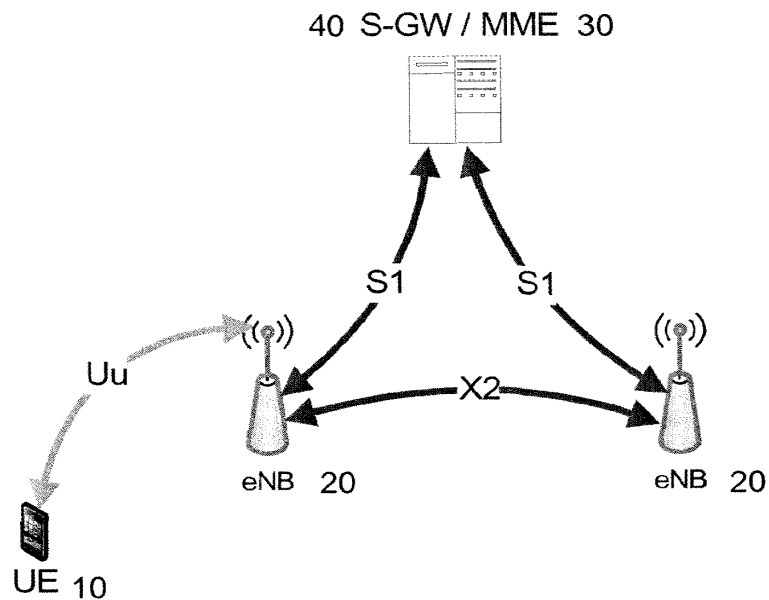


FIGURE 1

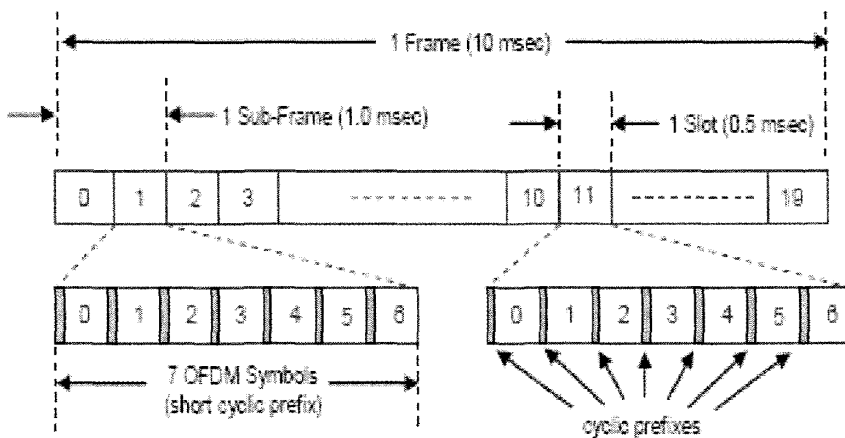


FIGURE 2

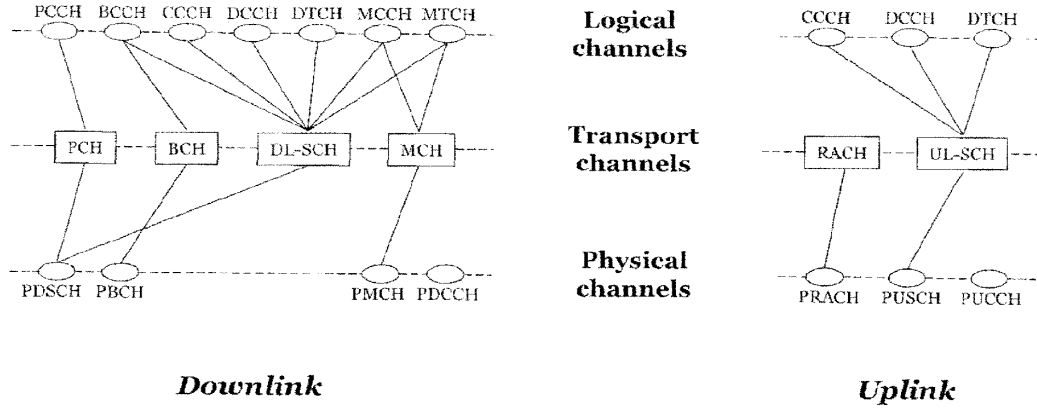


FIGURE 3

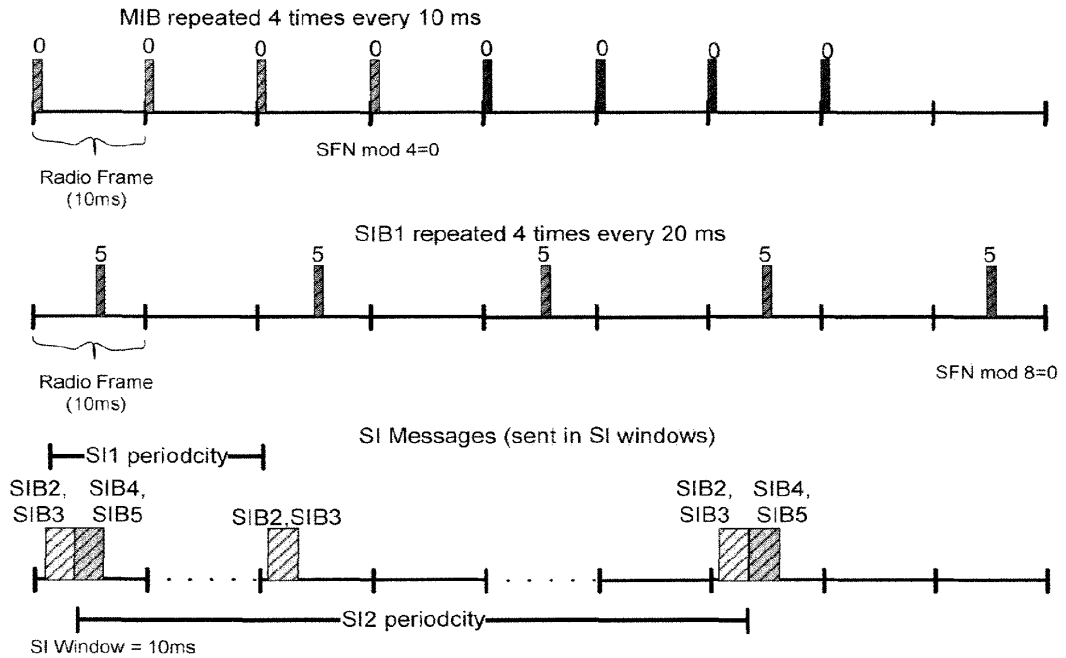


FIGURE 4

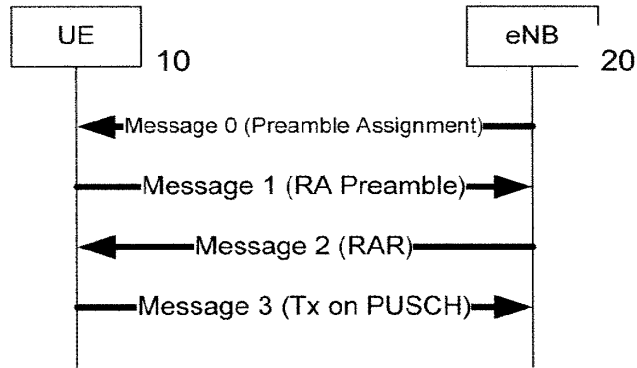


FIGURE 5

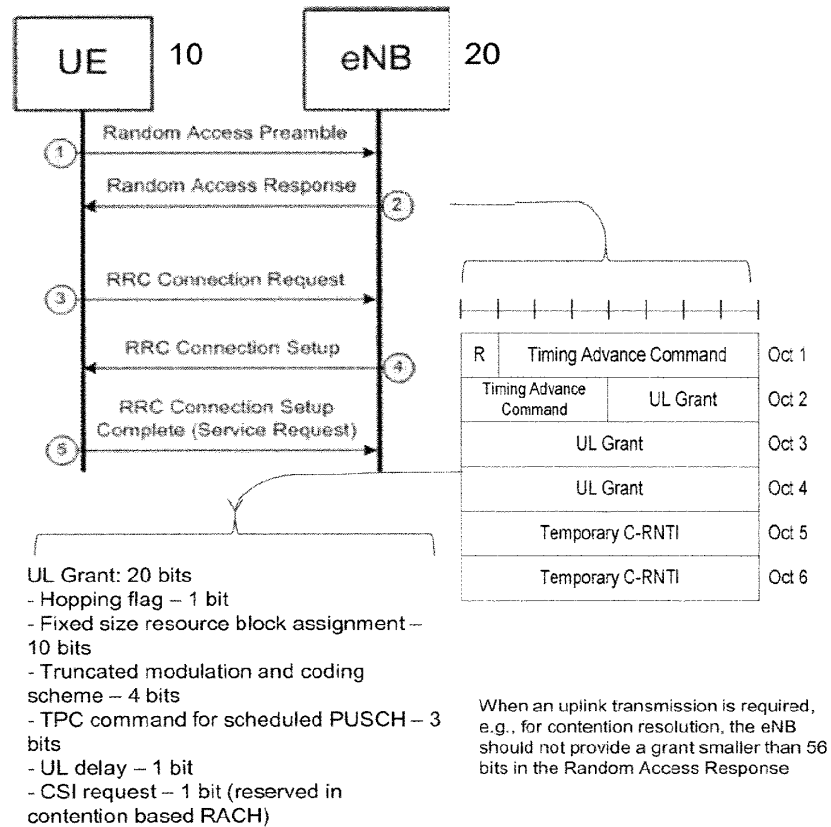


FIGURE 6

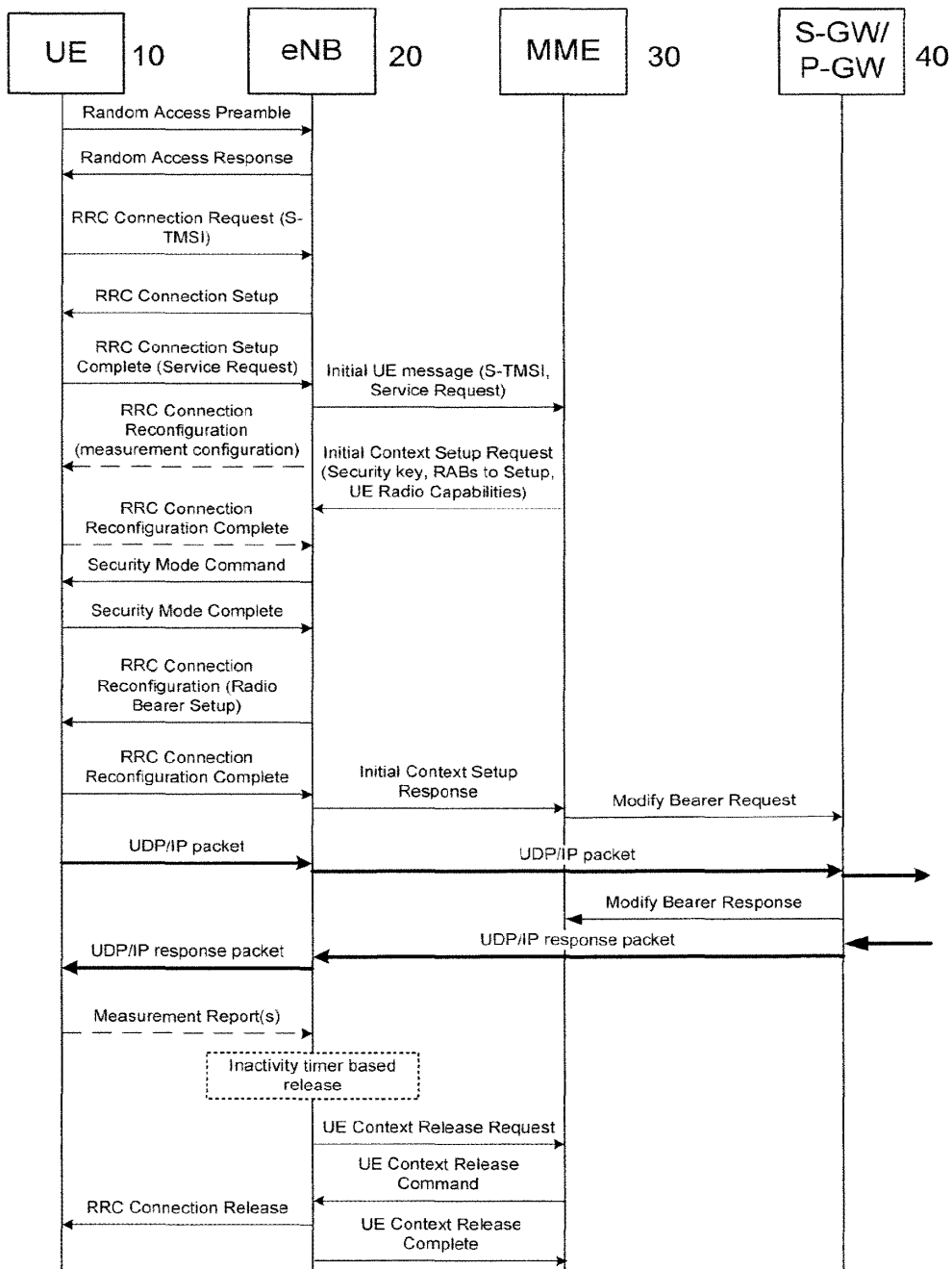


FIGURE 7

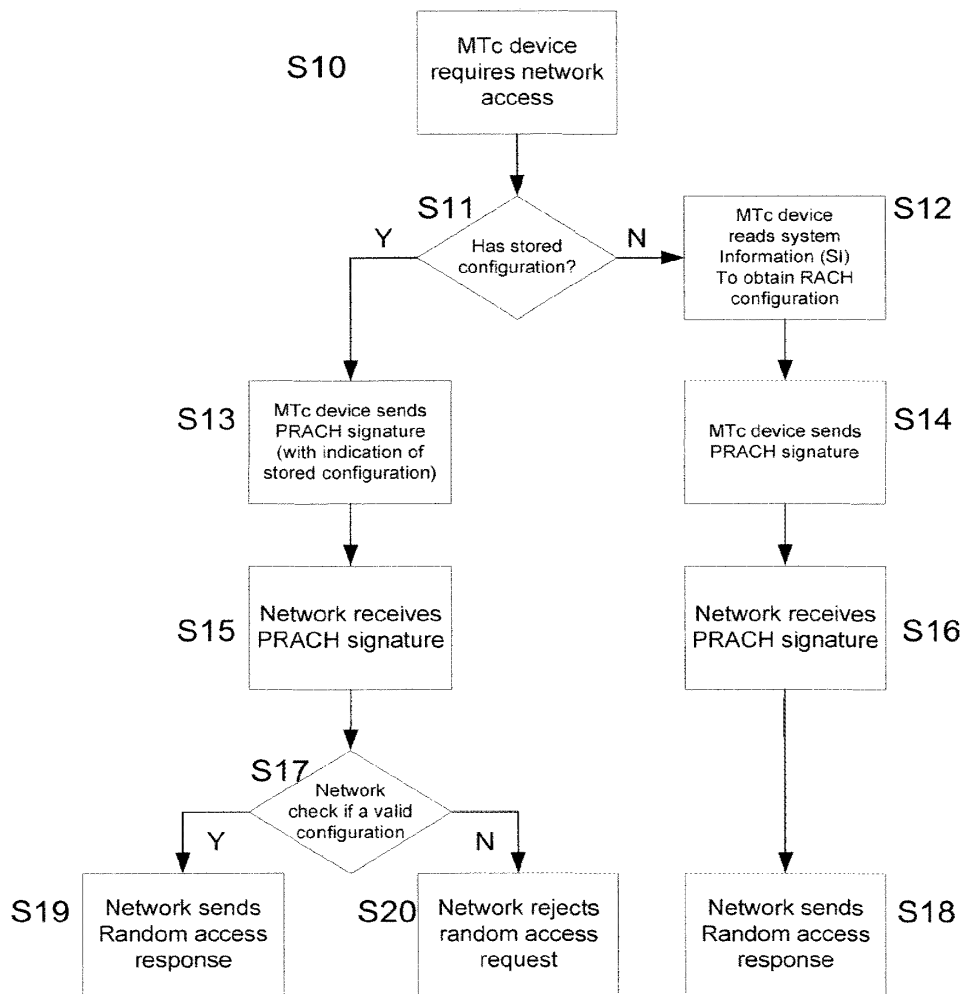


FIGURE 8



FIGURE 9

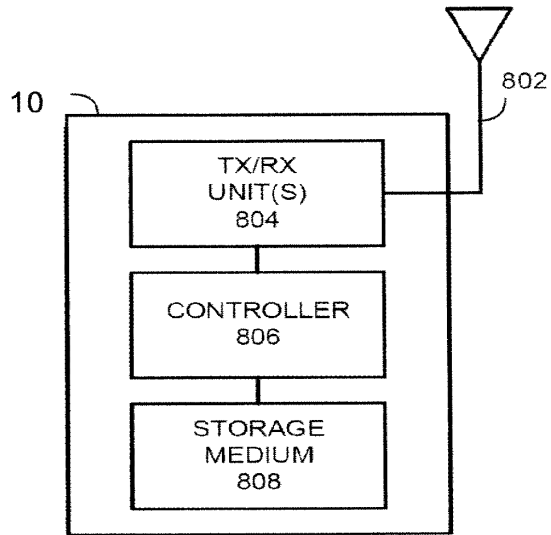


FIGURE 10

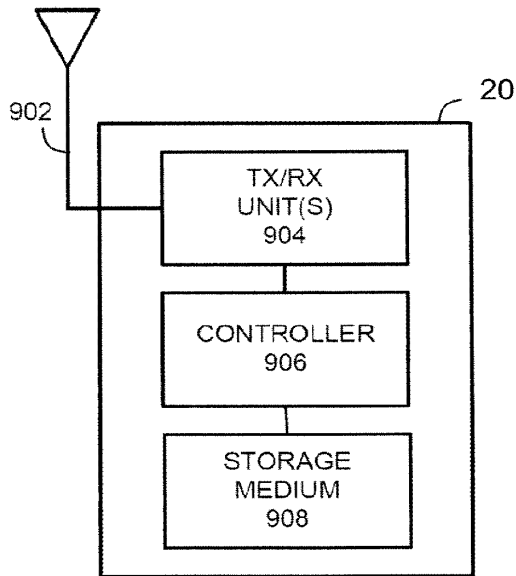


FIGURE 11



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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 June 2014	Examiner Lombardi, Giuseppe
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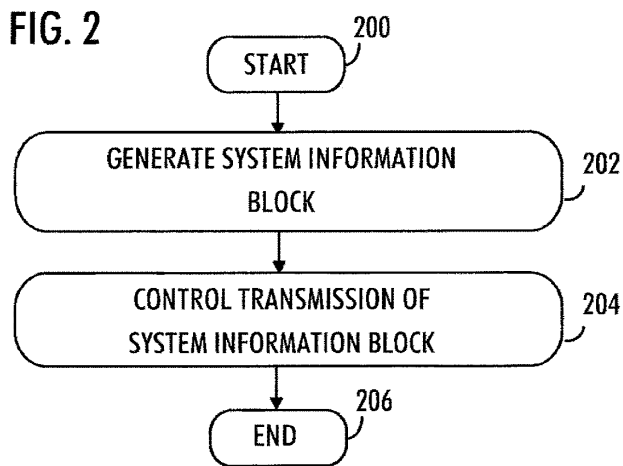
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<p>(21) Application No: 1217314.2</p> <p>(22) Date of Filing: 27.09.2012</p> <hr/> <p>(71) Applicant(s): Broadcom Corporation (Incorporated in USA - California) 5300 California Avenue, Irvine, CA 92617, United States of America</p> <p>(72) Inventor(s): Sami-Jukka Hakola Timo Kalevi Koskela Samuli Turtnen</p> <p>(74) Agent and/or Address for Service: EIP Fairfax House, 15 Fulwood Place, LONDON, WC1V 6HU, United Kingdom</p>	<p>(51) INT CL: H04W 40/24 (2009.01) H04W 8/00 (2009.01) H04W 48/10 (2009.01) H04W 68/00 (2009.01)</p> <p>(56) Documents Cited: GB 2490362 A WO 2011/050996 A1 US 20100120452 A1</p> <p>(58) Field of Search: INT CL H04W Other: EPODOC, WPI, TXTUS1, TXTUS2, TXTUS3, TXTUS4, TXTEP1, TXTGB1, TXTWO1</p>
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(54) Title of the Invention: **Apparatus and methods for communication**
 Abstract Title: **Information Elements in a paging message to indicate a changed system information relating to local area connectivity**

(57) A system information block comprising information on small cell discovery or device-to-device communication is generated (202). The transmission of the system information block is controlled. (204). User equipment is configured to detect one or more information elements received in a paging message indicating a changed system information related to local area connectivity; and acquire on the basis of the detection a system information block comprising information on at least two separate functions related to local area connectivity. The user equipment is further configured to determine from a received system information block, which comprises information on information blocks transmitted by the communication system, if a system information block comprising information on small cell and device-to-device discovery or device-to-device discovery and device-to-device communication is transmitted by the system, and acquire the block if it is transmitted. The user equipment is configured to detect an information element indicating device-to-device system information change; and detect an information element indicating whether the change is related to device-to-device discovery or device-to-device communication. The user equipment is further configured to detect an information element indicating discovery system information change; and detect an information element indicating whether the change is related to small cell discovery or device-to-device discovery.



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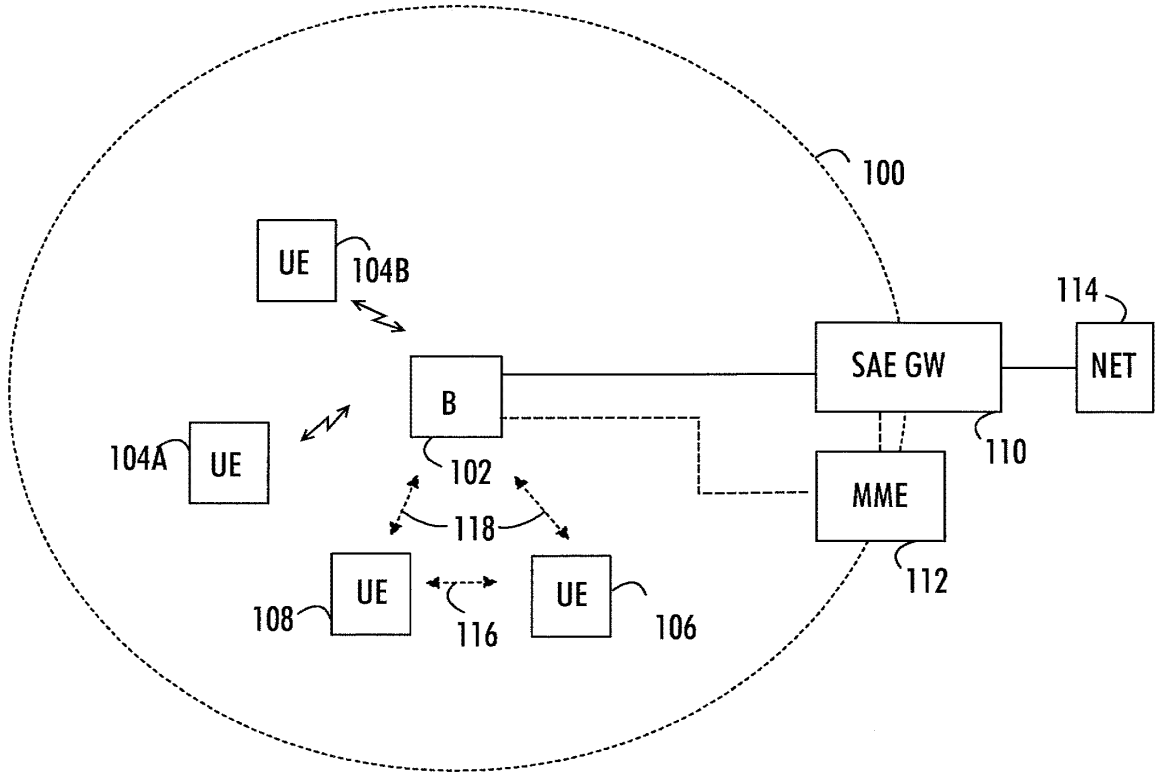


FIG. 1

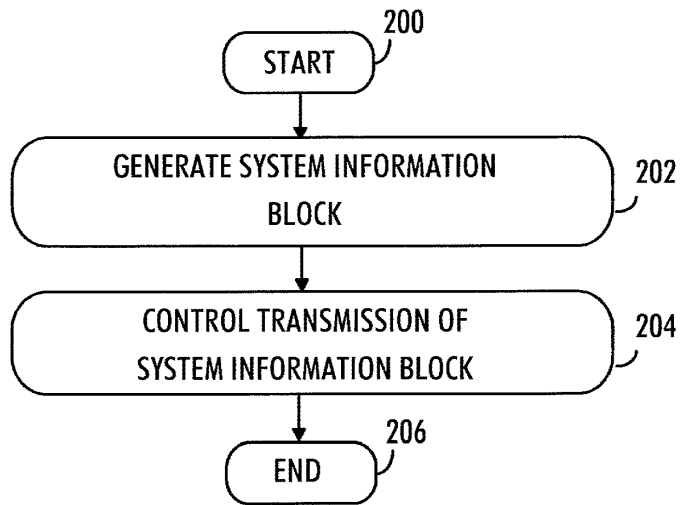


FIG. 2

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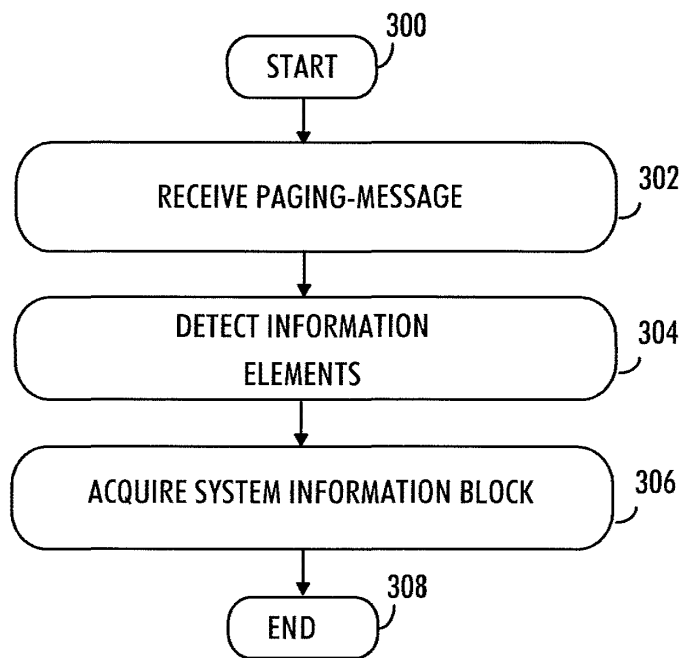


FIG. 3

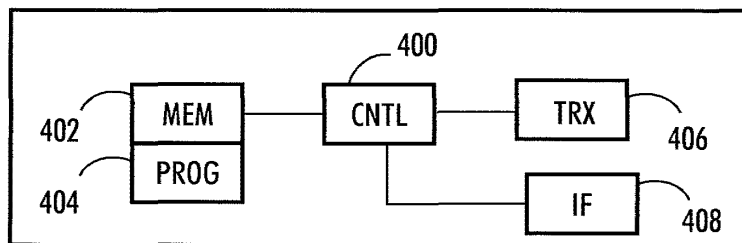


FIG. 4A

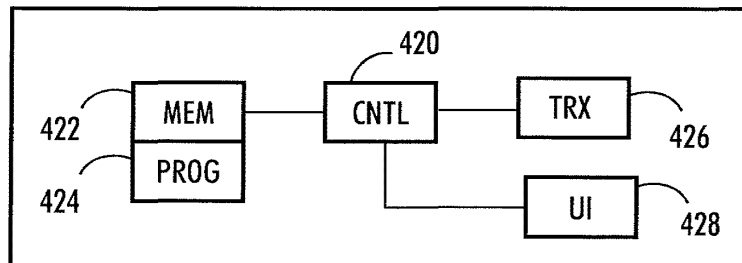


FIG. 4B

APPARATUS AND METHODS FOR COMMUNICATION

Technical Field

The present invention relates to apparatus and methods for use in communication networks. The exemplary and non-limiting embodiments of the invention relate generally to wireless communication networks.

Background

In radio communication networks, such as the Long Term Evolution (LTE) or the LTE-Advanced (LTE-A) of the 3rd Generation Partnership Project (3GPP), network planning comprises the use of common base stations (Node B, NB). User equipment (UE) may communicate with another UE via the base station(s), for example. Alternatively, it is proposed that the UEs may communicate directly with each other by applying resources dedicated by the network for a device-to-device (D2D) direct communication. The D2D communication has proven to be network efficient by offloading the traffic processed in the base station(s), for example.

One part of device-to-device (D2D) communication is discovery. The discovery means basically finding other interesting peers (in general a peer can mean an application, user, service, device, etc.) in proximity. The discovery can be implemented either using the direct radio signals between the devices or it may utilise network side in the process. The same discovery process may be utilised in relation to small cells.

Summary

According to a first aspect of the present invention, there is provided apparatus for use in user equipment, the apparatus comprising a processing system configured to: detect one or more information elements received in a paging message indicating a changed system information related to local area connectivity; and acquire on the basis of the detection a system information block comprising information on at least two separate functions related to local area connectivity.

According to a second aspect of the present invention, there is provided apparatus for use in a communication system, the apparatus comprising a processing system configured to: generate a system information block comprising information on at least two separate functions related to local area connectivity; and control the transmission of the system information block.

According to a third aspect of the present invention, there is provided a method in a communication system, the method comprising: generating a system information block comprising information on at least two separate functions related to local area connectivity; and controlling the transmission of the system information block.

According to a fourth aspect of the present invention, there is provided a method in user equipment, the method comprising: receiving a paging message; detecting one or more information elements in the paging message indicating a changed system information related to local area connectivity; and acquiring on the basis of the detection a system information block comprising information on at least two separate functions related to local area connectivity.

The processing systems described above may comprise at least one processor; and at least one memory including computer program instructions, the at least one memory and the computer program instructions being configured to, with the at least one processor, cause the apparatus at least to perform as described above.

There may also be provided a computer program comprising a set of instructions which when executed on a processing system cause the processing system to perform as described above. The computer program may be provided in or on a computer-readable medium.

Further features and advantages of the invention will become apparent from the following description of preferred embodiments of the invention, given by way of example only, which is made with reference to the accompanying drawings.

5 Brief Description of the Drawings

Figure 1 illustrates schematically an example of a communication environment;

10 Figures 2 and 3 are flowcharts illustrating schematically example embodiments of the invention; and

Figures 4A and 4B illustrate schematically examples of apparatus applying some embodiments of the invention.

15 Detailed Description

Some embodiments of the present invention are applicable to user equipment (UE), a base station, eNodeB, a corresponding component, and/or to any communication system or any combination of different communication systems that support required functionality.

20

The protocols used, the specifications of communication systems, servers and user equipment, especially in wireless communication, develop rapidly. Such development may require extra changes to an embodiment. Therefore, all words and expressions should be interpreted broadly and they are intended to illustrate, not to
25 restrict, embodiments.

Many different radio protocols to be used in communications systems exist. Some examples of different communication systems are the Universal Mobile Telecommunications System (UMTS) radio access network (UTRAN), HSPA (High
30 Speed Packet Access), Long Term Evolution (LTE[®], known also as Evolved UMTS Terrestrial Radio Access Network E-UTRAN), Long Term Evolution Advanced

(LTE-A), Wireless Local Area Network (WLAN) based on IEEE 802.11 standard, Worldwide Interoperability for Microwave Access (WiMAX[®]), Bluetooth[®], personal communications services (PCS) and systems using ultra-wideband (UWB) technology. IEEE refers to the Institute of Electrical and Electronics Engineers. For example, LTE[®] and LTE-A are developed by the Third Generation Partnership Project 3GPP.

Figure 1 illustrates a simplified view of a communication environment only showing some elements and functional entities, all being logical units whose implementation may differ from what is shown. The connections shown in Figure 1 are logical connections; the actual physical connections may be different. It is apparent to a person skilled in the art that the systems also comprise other functions and structures. It should be appreciated that the details of the functions, structures, elements and the protocols used in or for communication are well known to the person skilled in the art and therefore need not be discussed in more detail here.

In the example of Figure 1, a radio system based on LTE/SAE (Long Term Evolution/System Architecture Evolution) network elements is shown. However, the embodiments described in these examples are not limited to the LTE/SAE radio systems but can also be implemented in other radio systems.

The simplified example of a network of Figure 1 comprises a SAE Gateway 110 and an MME (Mobility Management Entity) 112. The SAE Gateway 110 provides a connection to Internet 114. Figure 1 shows a base station or an eNodeB 102 serving a cell 100. In this example, the eNodeB 102 is connected to the SAE Gateway 110 and the MME 112.

The eNodeBs (enhanced Node Bs) of a communication system may host the functions for Radio Resource Management: Radio Bearer Control, Radio Admission Control, Connection Mobility Control, Dynamic Resource Allocation (scheduling). The MME 112 is responsible for the overall UE control in mobility, session/call and

state management with assistance of the eNodeBs through which the UEs connect to the network. The SAE GW 110 is an entity configured to act as a gateway between the network and other parts of a communication network such as the Internet for example. The SAE GW may be a combination of two gateways, a serving gateway (S-GW) and a packet data network gateway (P-GW).

The eNodeB 102 may provide radio coverage to a cell 100. The cell 100 may be a macrocell, a microcell, or any other type of cell where radio coverage is present. Further, the cell 100 may be of any size or form, depending on the antenna system utilised. The eNodeB 102 may be used in order to provide radio coverage to the cell 100. The eNodeB 102 may control a cellular radio communication link established between the eNodeB 102 and terminal devices or user equipment 104A and 104B located within the cell 100. These communication links marked with solid arrows may be referred as conventional communication links for end-to-end communication, where the source device transmits data to the destination device via the base station 100. Therefore, the user equipment 104A and 104B may communicate with each other via the base station 102. The user equipment may be a user equipment of a cellular communication system, e.g. a computer (PC), a laptop, a handheld computer, a mobile phone, or any other user terminal or user equipment capable of communicating with the cellular communication network.

Local area access improvements are predicted to be the next evolution steps in future communication systems. As an option a separate frequency layer may be dedicated for small cell deployment. The small cells are considered to be low power eNodeBs. The operation in a small cell frequency layer can be controlled by the overlaying macro cell that provides the coverage in another frequency layer over a coverage area of multiple small cells. The control relationship between the macro and small cell layer varies depending on the selected architecture.

In addition to or instead of the conventional communication links, direct device-to-device (D2D) connections may be established among terminal devices.

Direct communication links between two devices may be established, e.g. between terminal devices or user equipment 106 and 108 in Figure 1. A direct communication link 116 marked with a dashed arrow may be based on any radio technology such that the terminal devices or user equipment 106 and 108 involved in the direct communication may apply communication according to any of a plurality of radio access technologies. The eNodeB 102 may be responsible for controlling the direct communication link 116, as shown with dotted, bi-directional lines 118 in Figure 1. The radio access technology of the direct communication link 116 may operate on the same frequency band as the conventional communication link and/or outside those frequency bands to provide the arrangement with flexibility. Thus, the eNodeB 102 may be responsible for allocating radio resources to the direct communication link 116 as well as for the conventional communication links. Alternatively, the UEs 106, 108 may perform auto-selection of D2D resources from a common pool of resources.

Generally, eNodeBs send system information to the user equipment in their area. The system information may comprise information related to UE discovery and D2D communications to be received by discovery and D2D communication capable UEs.

One aspect to be taken into account is how to enable discovery and D2D communication-capable UEs to be notified about a system information change without impacting on UEs that are not participating in discovery or D2D communications.

In many present systems, change of system information (other than specific emergency information) only occurs at specific radio frames. Thus, the concept of a modification period is used. System information may be transmitted a number of times with the same content within a modification period, as defined by its scheduling. The modification period may be configured by system information.

30

In an embodiment, when the or some of the system information is changed by the network, it first notifies the UEs about this change, i.e. this may be done throughout a modification period. In the next modification period, the network transmits the updated system information. Upon receiving a change notification, the
5 UE may acquire the new system information immediately from the start of the next modification period. The UE applies the previously acquired system information until the UE acquires the new system information.

In an embodiment, the mechanism used to inform UEs about changed system
10 information is the transmission of System Information Blocks (SIB). The network may transmit a System Information Block denoted as SystemInformationBlockType1 (SIB 1) which comprises cell access information and information on the scheduling of other system information which is transmitted in other SIBs. In an embodiment, SIB
15 1 comprises a schedulingInfoList parameter which indicates which SIBs are transmitted by the network.

In an embodiment, a system information block comprising information on small cell discovery or device-to-device communication is created.

20 Figure 2 is a flowchart illustrating schematically an example embodiment of the invention. The apparatus employing this embodiment may be a base station or an eNodeB of a communication system or network, for example. The process starts at step 200.

25 In step 202, the apparatus is configured to generate a System Information Block which may be denoted as SystemInformationBlockTypeX (wherein X is a predetermined integer number for the block), which conveys information about at least two separate functions that relate to local area connectivity, such as discovery or device-to-device communication. In an embodiment, the two mechanisms are small
30 cell discovery and D2D discovery functions. In another embodiment, the two mechanisms are D2D discovery and D2D communication functions.

In step 204, the apparatus is configured to control the transmission of the system information block, that is, in an embodiment, to cause the system information block to be transmitted as required.

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The process ends in step 206.

In an embodiment, an eNodeB of the network transmits discovery and D2D related information elements in paging messages in paging control channel PCCH.

10

In an embodiment, the eNodeB may transmit a D2D-Indication-parameter to indicate a D2D SIB information change. The eNodeB may further transmit a D2D-function-parameter to indicate whether the D2D SIB information change applies for a D2D discovery or D2D communication function.

15

In an embodiment, the eNodeB may transmit a discovery-Indication-parameter to indicate a discovery SIB information change. The eNodeB may further transmit a discovery-function-parameter to indicate whether the discovery SIB information change applies for small cell discovery or D2D discovery function.

20

Figure 3 is a flowchart illustrating schematically an example embodiment of the invention. The apparatus employing this embodiment may be user equipment of a communication system or network, for example. The process starts at step 300.

25

In step 302, the apparatus is configured to receive a paging message.

In step 304, the apparatus is configured to detect one or more information elements in the received paging message indicating a changed system information related to local area connectivity, such as discovery or device-to-device communication.

30

In step 306, the apparatus is configured to acquire on the basis of the detection a system information block comprising information on at least two separate functions related to local area connectivity. In an embodiment, the apparatus acquires the block only if the apparatus is discovery or device-to-device capable.

5

The process ends in step 308.

Thus in an embodiment, if the UE is discovery/D2D capable and the discovery/D2D-Indication information element is included in the Paging message, respectively, and the schedulingInfoList in SystemInformationBlockType1 indicates that SystemInformationBlockTypeX is present, the UE should re-acquire SystemInformationBlockTypeX.

In another embodiment, if the discovery/D2D-Indication information element is present in the Paging message, it indicates if the changed information is for small cell discovery or D2D discovery function or for D2D discovery or D2D communication function, respectively. If the discovery/D2D-function information element is not present but the discovery/D2D-Indication information element is present, the re-acquiring of SystemInformationBlockTypeX applies for both small cell discovery and D2D discovery functions or D2D discovery and D2D communication functions, respectively.

In an embodiment, if the UE is performing small cell discovery and D2D discovery OR D2D discovery and D2D data communication at the same time, the UE is configured to re-acquire SystemInformationBlockTypeX in both cases regardless of the presence of a discovery/D2D-function IE in the Paging-message.

In an embodiment, the indication about the modified SIB and therefore the command to re-acquire SystemInformationBlockTypeX may be sent via Physical Downlink Control Channel PDCCH with a common discovery/D2D-RNTI (Radio Network Temporary Identifier) which is known by every discovery/D2D device. In

one method of this embodiment, the indication is scheduled M-subframes before the beginning of the scheduling window (indicated via SchedulingInfoList information element) of SystemInformationBlockTypeX. The value of M may be positive, negative or zero, and can be specified as fixed or is configurable by the network. The
5 value of M may be transmitted via SIB.

When receiving a paging message from an eNodeB, the UE is configured to determine the information elements of the paging message.

10 If the UE detects that a D2D-Indication element is included and the UE is D2D capable, the UE is configured to check if the schedulingInfoList of SIB1 indicates that SystemInformationBlockTypeX is present.

Further if a D2D-function element is included and indicates changes for D2D
15 discovery and the UE is performing D2D discovery, the UE is configured to acquire SystemInformationBlockTypeX, waiting until the next system information modification period boundary. Otherwise, if a D2D-function element is included and indicates changes for D2D communication and the UE is performing D2D communication, the UE is configured to acquire SystemInformationBlockTypeX,
20 waiting until the next system information modification period boundary.

If the UE detects that the discovery-Indication element is included and the UE is discovery capable, the UE checks if the schedulingInfoList of SIB 1 indicates that SystemInformationBlockTypeX is present.
25

Further if a discovery-function element is included and indicates changes for small cell discovery and the UE is performing small cell discovery, the UE is configured to acquire SystemInformationBlockTypeX waiting until the next system information modification period boundary.
30

If a discovery-function element is included and indicates changes for D2D discovery and the UE is performing D2D discovery, the UE is configured to acquire SystemInformationBlockTypeX, waiting until the next system information modification period boundary.

5

In an embodiment, if the UE is performing either a device-to-device discovery function or a device-to-device communication function, and the information element indicates that other one of the functions changes, the System Information Block is not acquired.

10

In an embodiment, if the UE is performing either a small cell discovery function or a device-to-device discovery function, and the information element indicates that other one of the functions changes, the System Information Block is not acquired.

15

Figure 4A illustrates schematically a simplified example of a device in which some embodiments of the invention may be applied. In some embodiments, the device may be a base station or an eNodeB of a communication system or network. The device may be a part or a section of a base station or an eNodeB.

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Figure 4B illustrates schematically a simplified example of a device in which some embodiments of the invention may be applied. In some embodiments, the device may be user equipment UE or a respective device communicating with a base station or a NodeB of a communications system. The device may be a part or a section of user equipment.

25

It should be understood that the apparatus are depicted herein as examples illustrating some embodiments. It is apparent to a person skilled in the art that the devices may also comprise other functions and/or structures and not all described functions and structures are required. Although the devices have been depicted as

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single entities, different modules and memory may be implemented in one or more physical or logical entities. In addition, each device may be a part of another device.

Referring to Figure 4A, the device of the example includes one or more
5 control circuitries or processing circuits (CNTL) 400 configured to control at least part of the operation of the device.

The device may comprise one or more memories (MEM) 402 for storing data. Furthermore the memory may store software (PROG) 404 executable by the control
10 circuitry 400. The memory may be integrated in the control circuitry.

The device may comprise a transceiver (TRX) 406. The transceiver is operationally connected to the control circuitry 400. It may be connected to an antenna arrangement (not shown). The device may also comprise a connection to a
15 transceiver instead of a transceiver.

The device may comprise an interface (IF) 408. The interface is operationally connected to the control circuitry 400. The device may be connected to other network elements of the communication system or network via the interface.
20

The software 404 may comprise a computer program comprising program code means adapted to cause the control circuitry 400 of the device to control a transceiver 406.

25 The software 404 may comprise a computer program comprising program code means adapted to cause the control circuitry 400 of the device to generate a system information block comprising information on at least two separate functions related to local area connectivity such as discovery or device-to-device communication and to control the transmission of the system information block.

30

Figure 4B illustrates schematically a simplified example of user equipment UE or a respective device. The device of the example includes one or more control circuitries or processing circuits (CNTL) 420 configured to control at least part of the operation of the device.

5

The device may comprise one or more memories (MEM) 422 for storing data. Furthermore the memory may store software (PROG) 424 executable by the control circuitry 420. The memory may be integrated in the control circuitry.

10

The device may comprise a transceiver (TRX) 426. The transceiver is operationally connected to the control circuitry 420. It may be connected to an antenna arrangement (not shown). The device may also comprise a connection to a transceiver instead of a transceiver.

15

The software 424 may comprise a computer program comprising program code means adapted to cause the control circuitry 420 of the device to control a transceiver 426.

20

The software 424 may comprise a computer program comprising program code means adapted to cause the control circuitry 400 of the device to receive a paging message; detect one or more information elements in the paging message indicating a changed system information related to local area connectivity such as discovery or device-to-device communication; and acquire on the basis of the detection a system information block comprising information on at least two separate functions related to local area connectivity if the user equipment is discovery or device-to-device capable.

25

The device may further comprise a user interface (UI) 428 operationally connected to the control circuitry 420. The user interface may comprise a display which may be touch sensitive, a keyboard or keypad, a microphone and a speaker, for example.

30

The steps and related functions described in the above and attached figures are in no absolute chronological order, and some of the steps may be performed simultaneously or in an order differing from the given ones. Other functions can also
5 be executed between the steps or within the steps. Some of the steps can also be left out or replaced with a corresponding step.

The apparatus or controllers able to perform the above-described steps may be implemented as an electronic digital computer, processing system or a circuitry which
10 may comprise a working memory (RAM), a central processing unit (CPU), and a system clock. The CPU may comprise a set of registers, an arithmetic logic unit, and a controller. The processing system, controller or the circuitry is controlled by a sequence of program instructions transferred to the CPU from the RAM. The controller may contain a number of microinstructions for basic operations. The
15 implementation of microinstructions may vary depending on the CPU design. The program instructions may be coded by a programming language, which may be a high-level programming language, such as C, Java, etc., or a low-level programming language, such as a machine language, or an assembler. The electronic digital computer may also have an operating system, which may provide system services to a
20 computer program written with the program instructions.

As used in this application, the term "circuitry" refers to all of the following:
(a) hardware-only circuit implementations, such as implementations in only analog and/or digital circuitry, and (b) combinations of circuits and software (and/or
25 firmware), such as (as applicable): (i) a combination of processor(s) or (ii) portions of processor(s)/software including digital signal processor(s), software, and memory(ies) that work together to cause an apparatus to perform various functions, and (c) circuits, such as a microprocessor(s) or a portion of a microprocessor(s), that require software or firmware for operation, even if the software or firmware is not physically present.
30

This definition of “circuitry” applies to all uses of this term in this application. As a further example, as used in this application, the term “circuitry” would also cover an implementation of merely a processor (or multiple processors) or a portion of a processor and its (or their) accompanying software and/or firmware. The term
5 “circuitry” would also cover, for example and if applicable to the particular element, a baseband integrated circuit or application-specific integrated circuit for a mobile phone or a similar integrated circuit in a server, a cellular network device, or another network device.

10 An embodiment provides a computer program embodied on a distribution medium, comprising program instructions which, when loaded into an electronic apparatus, are configured to control the apparatus to execute the embodiments described above.

15 The computer program may be in source code form, object code form, or in some intermediate form, and it may be stored in some sort of carrier, which may be any entity or device capable of carrying the program. Such carriers include a record medium, computer memory, read-only memory, and a software distribution package, for example. Depending on the processing power needed, the computer program may
20 be executed in a single electronic digital computer or it may be distributed amongst a number of computers.

The apparatus may also be implemented as one or more integrated circuits, such as application-specific integrated circuits ASIC. Other hardware embodiments
25 are also feasible, such as a circuit built of separate logic components. A hybrid of these different implementations is also feasible. When selecting the method of implementation, a person skilled in the art will consider the requirements set for the size and power consumption of the apparatus, the necessary processing capacity, production costs, and production volumes, for example.

30

It will be obvious to a person skilled in the art that, as technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

5

The above embodiments are to be understood as illustrative examples of the invention. Further embodiments of the invention are envisaged. It is to be understood that any feature described in relation to any one embodiment may be used alone, or in combination with other features described, and may also be used in combination with one or more features of any other of the embodiments, or any combination of any other of the embodiments. Furthermore, equivalents and modifications not described above may also be employed without departing from the scope of the invention, which is defined in the accompanying claims.

10

CLAIMS

1. Apparatus for use in user equipment, the apparatus comprising a processing system configured to:
 - 5 detect one or more information elements received in a paging message indicating a changed system information related to local area connectivity; and
 - acquire on the basis of the detection a system information block comprising information on at least two separate functions related to local area connectivity.

- 10 2. Apparatus according to claim 1, the apparatus being configured to:
 - determine from a received system information block, which comprises information on information blocks transmitted by the communication system, if a system information block comprising information on small cell and device-to-device discovery or device-to-device discovery and device-to-device communication is
 - 15 transmitted by the system, and
 - acquire the block if it is transmitted.

3. Apparatus according to claim 1 or claim 2, the apparatus being configured to:
 - 20 detect an information element indicating device-to-device system information change; and
 - detect an information element indicating whether the change is related to device-to-device discovery or device-to-device communication.

4. Apparatus according to claim 3, wherein if the apparatus is performing either a
- 25 device-to-device discovery function or a device-to-device communication function, and the information element indicates that the other one of the functions changes, the block is not acquired.

5. Apparatus according to any of claims 1 to 4, the apparatus being configured
- 30 to:

detect an information element indicating discovery system information change; and

detect an information element indicating whether the change is related to small cell discovery or device-to-device discovery.

5

6. Apparatus according to claim 5, wherein if the apparatus is performing either a small cell discovery function or a device-to-device discovery function, and the information element indicates that the other one of the functions changes, the block is not acquired.

10

7. Apparatus according to any of claims 1 to 6, wherein the apparatus is user equipment.

15

8. Apparatus according to claim 7, wherein the user equipment is a mobile device.

9. Apparatus according to any of claims 1 to 8, wherein the apparatus is a user equipment of a Long Term Evolution based communication system.

20

10. Apparatus for use in a communication system, the apparatus comprising a processing system configured to:

generate a system information block comprising information on at least two separate functions related to local area connectivity; and

control the transmission of the system information block.

25

11. Apparatus according to claim 10, the apparatus being configured to:

control transmission of an information element in a paging message indicating changed system information related to small cell discovery or device-to-device communication.

30

12. Apparatus according to claim 10 or claim 11, wherein the system information block comprises information on small cell discovery and device-to-device discovery functions.
- 5 13. Apparatus according to claim 10 or claim 11, wherein the system information block comprises information on device-to-device discovery and device-to-device communication functions.
14. Apparatus according to claim 11, wherein the information element in the
10 paging message indicates device-to-device system information change.
15. Apparatus according to claim 14, wherein the information element in the paging message indicates whether device-to-device system information change applies for device-to-device discovery or device-to-device communication.
- 15 16. Apparatus according to claim 11, wherein the information element in the paging message indicates discovery system information change.
17. Apparatus according to claim 11, wherein the information element in the
20 paging message indicates whether discovery system information change applies for small cell discovery or device-to-device discovery.
18. Apparatus according to any of claims 10 to 17, wherein the apparatus is a base station.
- 25 19. Apparatus according to any of claims 10 to 18, wherein the apparatus is a base station of a Long Term Evolution or Long Term Evolution Advanced based communication system.
- 30 20. Apparatus according to any of claims 10 to 19, the apparatus being configured to:

control the transmission of an information element in a Physical Downlink Control Channel with a common Radio Network Temporary Identifier, the information element indicating changed system information related to small cell discovery or device-to-device communication.

5

21. Apparatus according to claim 20, wherein the information element is scheduled M-subframes before the beginning of a scheduling window of the system information block, where M is an integer.

10

22. A method in a communication system, the method comprising:
generating a system information block comprising information on at least two separate functions related to local area connectivity; and
controlling the transmission of the system information block.

15

23. A method according to claim 22, comprising:
controlling transmission of an information element in a paging message indicating changed system information related to small cell and device-to-device discovery or device-to-device discovery and device-to-device communication.

20

24. A method according to claim 22 or claim 23, wherein the system information block comprises information on small cell discovery and device-to-device discovery functions.

25

25. A method according to claim 22 or claim 23, wherein the system information block comprises information on device-to-device discovery and device-to-device communication functions.

30

26. A method according to claim 23, wherein the information element in the paging message indicates device-to-device system information change.

27. A method according to claim 26, wherein the information element in the paging message indicates whether device-to-device system information change applies for device-to-device discovery or device-to-device communication.
- 5 28. A method according to claim 23, wherein the information element in the paging message indicates discovery system information change.
29. A method according to claim 23, wherein the information element in the paging message indicates whether discovery system information change applies for
10 small cell discovery or device-to-device discovery.
30. A method according to any of claims 22 to 29, comprising:
controlling the transmission of an information element in a Physical Downlink
Control Channel with a common Radio Network Temporary Identifier, the
15 information element indicating changed system information related to small cell
discovery or device-to-device communication.
31. A method according to claim 30, wherein the information element is
scheduled M-subframes before the beginning of scheduling window of the system
20 information block, where M is an integer.
32. A method in user equipment, the method comprising:
receiving a paging message;
detecting one or more information elements in the paging message indicating a
25 changed system information related to local area connectivity; and
acquiring on the basis of the detection a system information block comprising
information on at least two separate functions related to local area connectivity.
33. A method according to claim 32, comprising:
30 receiving a system information block comprising information on information
blocks transmitted by the communication system;

determining from the received system information block if a system information block comprising information on small cell discovery or device-to-device communication is transmitted by the system; and
acquiring the block if it is transmitted.

5

34. A method according to claim 32 or claim 33, comprising:
detecting an information element indicating device-to-device system information change; and

10 detecting an information element indicating whether the change is related to device-to-device discovery or device-to-device communication.

35. A method according to any of claims 32 to 34, comprising:

detecting an information element indicating discovery system information change; and

15 detecting an information element indicating whether the change is related to small cell discovery or device-to-device discovery.

36. A computer program comprising a set of instructions which when executed on a processing system cause the processing system to perform the steps of any of claims
20 22 to 31.

37. A computer program comprising a set of instructions which when executed on a processing system cause the processing system to perform the steps of any of claims
25 32 to 35.

38. Apparatus for wireless communications, substantially in accordance with any of the examples as described herein with reference to and illustrated by the accompanying drawings.

39. A method of wireless communications, substantially in accordance with any of the examples as described herein with reference to and illustrated by the accompanying drawings.



Application No: GB1217314.2

Examiner: Dr Andrew Courtenay

Claims searched: 1 to 37

Date of search: 22 January 2013

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 to 27	US 2010/120452 A1 (SOMASUNDARAM et al.) See claim 3 for example.
X	1 to 27	WO 2011/050996 A1 (ERICSSON) See page 2, lines 29 to 36 for example.
A,E	-	GB 2490362 A (RENESAS MOBILE CORP) See page 4, line 25 to page 5, line 3.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

H04W

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI, TXTUS1, TXTUS2, TXTUS3, TXTUS4, TXTEP1, TXTGB1, TXTWO1

International Classification:

Subclass	Subgroup	Valid From
H04W	0040/24	01/01/2009
H04W	0008/00	01/01/2009
H04W	0048/10	01/01/2009
H04W	0068/00	01/01/2009

Electronic Acknowledgement Receipt

EFS ID:	36438698
Application Number:	15568431
International Application Number:	
Confirmation Number:	2730
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
First Named Inventor/Applicant Name:	Rui FAN
Customer Number:	131247
Filer:	William W. Kidd/Julie Farrar
Filer Authorized By:	William W. Kidd
Attorney Docket Number:	4906P51954US1
Receipt Date:	27-JUN-2019
Filing Date:	20-OCT-2017
Time Stamp:	19:54:43
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		P51954_US1_2019-06-27_Resp onse.pdf	43574 d2c578819791e74fa6e1353e9222d04bfb8 e89af	yes	7

Multipart Description/PDF files in .zip description					
Document Description			Start	End	
Amendment/Req. Reconsideration-After Non-Final Reject			1	1	
Claims			2	5	
Applicant Arguments/Remarks Made in an Amendment			6	7	
Warnings:					
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2	Information Disclosure Statement (IDS) Form (SB08)	P51954_US1_2019-06-27_IDS.pdf	1053419	no	4
			18de3292d255ac2860327b3a2d5616fd76c4430e		
Warnings:					
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3	Foreign Reference	P51954_US1_2019-06-27_FR1_EP2903349A1.PDF	4481626	no	26
			39792dc2b541cb23cf4b6c859455a78c36720419		
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4	Foreign Reference	P51954_US1_2019-06-27_FR2_GB2506389A.PDF	6032579	no	27
			707c618f8cec920e5ccdd432d4775dbc774ff50		
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5	Non Patent Literature	P51954_US1_2019-06-27_NPL1_EESR_EP17784155_11APR2019_7PGS.PDF	1570988	no	7
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875			Application or Docket Number 15/568,431		Filing Date 10/20/2017		<input type="checkbox"/> To be Mailed				
ENTITY: <input checked="" type="checkbox"/> LARGE <input type="checkbox"/> SMALL <input type="checkbox"/> MICRO											
APPLICATION AS FILED - PART I											
		(Column 1)		(Column 2)							
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)			
<input type="checkbox"/> BASIC FEE <small>(37 CFR 1.16(a), (b), or (c))</small>		N/A		N/A		N/A					
<input type="checkbox"/> SEARCH FEE <small>(37 CFR 1.16(k), (l), or (m))</small>		N/A		N/A		N/A					
<input type="checkbox"/> EXAMINATION FEE <small>(37 CFR 1.16(o), (p), or (q))</small>		N/A		N/A		N/A					
TOTAL CLAIMS <small>(37 CFR 1.16(j))</small>		minus 20 = *				x \$80 =					
INDEPENDENT CLAIMS <small>(37 CFR 1.16(h))</small>		minus 3 = *				x \$420 =					
<input type="checkbox"/> 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).									
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))											
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL					
APPLICATION AS AMENDED - PART II											
		(Column 1)		(Column 2)		(Column 3)					
AMENDMENT	06/27/2019		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)	
	<small>Total (37 CFR 1.16(i))</small>		* 21		Minus ** 23		= 0		x \$ 100 =		0
	<small>Independent (37 CFR 1.16(h))</small>		* 3		Minus *** 3		= 0		x \$ 460 =		0
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))										
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))											
TOTAL ADD'L FEE									0		
AMENDMENT			CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)	
	<small>Total (37 CFR 1.16(i))</small>		*		Minus **		=		x \$ 0 =		
	<small>Independent (37 CFR 1.16(h))</small>		*		Minus ***		=		x \$ 0 =		
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))										
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))											
TOTAL ADD'L FEE											
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.									LIE		
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NDWE LLP/Ericsson
99 Almaden Boulevard, Suite 710
San Jose, CA 95113

EXAMINER
MARCELO, MELVIN C

ART UNIT PAPER NUMBER
2463

DATE MAILED: 07/30/2019

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
15/568,431 10/20/2017 Rui FAN 4906P51954US1 2730

TITLE OF INVENTION: ON-DEMAND REQUEST FOR SYSTEM INFORMATION

Table with 7 columns: APPLN. TYPE, ENTITY STATUS, ISSUE FEE DUE, PUBLICATION FEE DUE, PREV. PAID ISSUE FEE, TOTAL FEE(S) DUE, DATE DUE
nonprovisional UNDISCOUNTED \$1000 \$0.00 \$0.00 \$1000 10/30/2019

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.

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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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/568,431	10/20/2017	Rui FAN	4906P51954US1	2730

TITLE OF INVENTION: ON-DEMAND REQUEST FOR SYSTEM INFORMATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	10/30/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
MARCELO, MELVIN C	2463	370-254000

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

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: Issue Fee Publication Fee (if required) Advance Order - # of Copies _____

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

- Electronic Payment via EFS-Web Enclosed check Non-electronic payment by credit card (Attach form PTO-2038)
- The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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

- Applicant certifying micro entity status. See 37 CFR 1.29
- Applicant asserting small entity status. See 37 CFR 1.27
- Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____



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United States Patent and Trademark Office
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www.uspto.gov

Table with columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO., EXAMINER, ART UNIT, PAPER NUMBER. Includes application details for Rui FAN and examiner Marcelo, Melvin C.

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 30 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. 15/568,431	Applicant(s) FAN et al.	
	Examiner MELVIN C MARCELO	Art Unit 2463	AIA (FITF) Status Yes

-- 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 6-27-2019.
 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 1,3-12,14-22 and 24 . 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 areply 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 _____.


/MELVIN C MARCELO/
Primary Examiner, Art Unit 2463

Issue Classification 	Application/Control No. 15/568,431	Applicant(s)/Patent Under Reexamination FAN et al.
	Examiner MELVIN C MARCELO	Art Unit 2463

CPC						
Symbol					Type	Version
H04W		48		08	F	2013-01-01
H04W		72		0446	I	2013-01-01
H04W		48		14	I	2013-01-01
Y02D		70		1262	A	2018-01-01
Y02D		70		1226	A	2018-01-01
Y02D		70		21	A	2018-01-01
Y02D		70		00	A	2018-01-01
Y02D		70		126	A	2018-01-01
Y02D		70		10	A	2018-01-01
Y02D		70		12	A	2018-01-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

NONE	Total Claims Allowed:	
(Assistant Examiner)	(Date)	21
/MELVIN C MARCELO/ Primary Examiner, Art Unit 2463	22 July 2019	O.G. Print Claim(s)
(Primary Examiner)	(Date)	1
		O.G. Print Figure
		1


Issue Classification 	Application/Control No. 15/568,431	Applicant(s)/Patent Under Reexamination FAN et al.
	Examiner MELVIN C MARCELO	Art Unit 2463

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H04W		48	08
H04W		72	04
NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				


NONE			Total Claims Allowed:	
(Assistant Examiner)	(Date)	21		
/MELVIN C MARCELO/ Primary Examiner, Art Unit 2463 (Primary Examiner)	22 July 2019 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1	

Issue Classification 	Application/Control No. 15/568,431	Applicant(s)/Patent Under Reexamination FAN et al.
	Examiner MELVIN C MARCELO	Art Unit 2463

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

CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	9	10	17	19	-	28	-	37	-	46				
-	2	10	11	18	20	-	29	-	38	-	47				
2	3	11	12	19	21	-	30	-	39						
3	4	-	13	20	22	-	31	-	40						
4	5	12	14	-	23	-	32	-	41						
5	6	13	15	21	24	-	33	-	42						
6	7	14	16	-	25	-	34	-	43						
7	8	15	17	-	26	-	35	-	44						
8	9	16	18	-	27	-	36	-	45						

NONE	Total Claims Allowed:	
(Assistant Examiner)	(Date)	21
/MELVIN C MARCELO/ Primary Examiner, Art Unit 2463	22 July 2019	O.G. Print Claim(s)
(Primary Examiner)	(Date)	1
		O.G. Print Figure
		1

Search Notes 	Application/Control No. 15/568,431	Applicant(s)/Patent Under Reexamination FAN et al.
	Examiner MELVIN C MARCELO	Art Unit 2463

CPC - Searched*		
Symbol	Date	Examiner
H04W48/08; H04W48/14; H04W72/0446	04/01/2019	MMarcelo
above updated.	07/22/2019	MMarcelo

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
PE2E-checked inventor name and continuity data.	04/01/2019	MMarcelo
EAST-see search history printout.	04/01/2019	MMarcelo
above updated	07/22/2019	MMarcelo

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
see	Interference search history printout.	07/22/2019	MMarcelo

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Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. 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	15568431
	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	2463
	Examiner Name	Melvin C MARCELO
	Attorney Docket Number	4906P51954US1

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		
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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	20120106516	A1	2012-05-03	JUNG; Soojung et al.			
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FOREIGN PATENT DOCUMENTS							Remove	
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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	2903349	EP	A1	2015-08-05	FUJITSU LTD [JP]		
	2	2506389	GB	A	2014-04-02	BROADCOM CORP [US]		
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15568431
	Filing Date		2017-10-20
	First Named Inventor	Rui FAN	
	Art Unit	2463	
	Examiner Name	Melvin C MARCELO	
	Attorney Docket Number	4906P51954US1	

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	Extended European Search Report for Application No. 17784155.8 (Atty. Docket No. 4906P51954EP1), mailed April 11, 2019, 7 pages.	

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

EXAMINER SIGNATURE

Examiner Signature Date Considered

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

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		15568431
	Filing Date		2017-10-20
	First Named Inventor	Rui FAN	
	Art Unit	2463	
	Examiner Name	Melvin C MARCELO	
	Attorney Docket Number	4906P51954US1	

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	/William W. Kidd; Reg. No. 31,772/	Date (YYYY-MM-DD)	2019-06-27
Name/Print	William W. Kidd	Registration Number	31,772

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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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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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.

~~ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.C.M/~~

EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	25013	system adj1 information adj1 block\$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/07/22 12:38
L2	775	group\$3 near3 (L1 or sib or sibs)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/07/22 12:38
L3	82359	h04w48/08.cpc. or h04w48/14.cpc. or h04w72/0446.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/07/22 12:38
L4	89	L3 and L2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/07/22 12:38

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L5	22091	system adj1 information adj1 block\$1	US-PGPUB; USPAT	OR	OFF	2019/07/22 12:40
L6	681	group\$3 near3 (5 or sib or sibs)	US-PGPUB; USPAT	OR	OFF	2019/07/22 12:41
L7	16	6 with (preamble\$1 or "pre-amble" or header\$1)	US-PGPUB; USPAT	OR	OFF	2019/07/22 12:41

7/ 22/ 2019 12:56:05 PM

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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(10) International Publication Number
WO 2018/126731 A1

(43) International Publication Date
12 July 2018 (12.07.2018)

- (51) International Patent Classification:
H04L 29/06 (2006.01) *H04W 72/12* (2009.01)
- (21) International Application Number:
PCT/CN2017/101576
- (22) International Filing Date:
13 September 2017 (13.09.2017)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
PCT/CN2017/070130
04 January 2017 (04.01.2017) CN
- (71) Applicant: TELEFONAKTIEBOLAGET LM ERICSSON (PUBL) [SE/SE]; S-164 83 Stockholm (SE).
- (72) Inventor; and
(71) Applicant (for SC only): FAN, Rui [CN/CN]; No.5 Lize East Street, Chaoyang District, Beijing 100102 (CN).
- (72) Inventors: LIU, Jinhua; No.5 Lize East Street, Chaoyang District, Beijing 100102 (CN). FRENGER, Pål; Enskiftesgatan 8, S-583 34 Linköping (SE).
- (74) Agent: ZHONGZI LAW OFFICE; 7F, New Era Building, 26 Pinganli Xidajie, Xicheng District, Beijing 100034 (CN).
- (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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, 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, KM, ML, MR, NE, SN, TD, TG).

(54) Title: ON-DEMAND REQUEST FOR SYSTEM INFORMATION

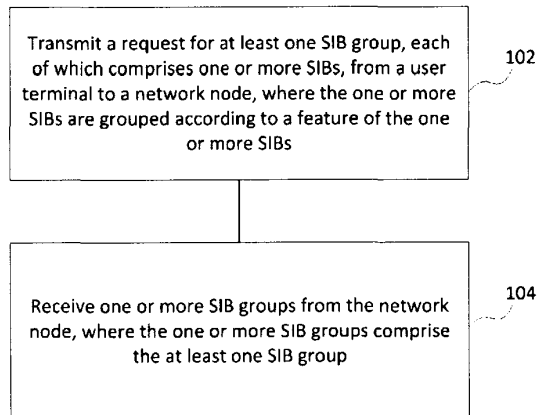


Fig. 1

(57) Abstract: A method for requesting system information is proposed. The method may comprise transmitting a request for at least one system information block group, each of which comprises one or more system information blocks, from a user terminal to a network node. The one or more system information blocks may be grouped according to a feature of the one or more system information blocks. The method may further comprise receiving one or more system information block groups from the network node. The one or more system information block groups may comprise the at least one system information block group.

[Continued on next page]

WO 2018/126731 A1

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15568431
	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	2463
	Examiner Name	MARCELO, MELVIN C
	Attorney Docket Number	4906P51954US1

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	2	3454620	EP	A1	2019-03-13	LG ELECTRONICS INC	English Abstract Submitted	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15568431
	Filing Date		2017-10-20
	First Named Inventor	Rui FAN	
	Art Unit	2463	
	Examiner Name	MARCELO, MELVIN C	
	Attorney Docket Number	4906P51954US1	

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	Communication pursuant to Article 94(3) EPC received for European Patent Application No. 17784155.8 (Attorney Docket No. 4906P51954EP), mailed on July 22, 2019, 4 pages.	
	2	International Preliminary Report on Patentability received for PCT Patent Application No. PCT/CN2017/101576 (Attorney Docket No. 4906P51954PCT), mailed on July 18, 2019, 6 pages.	
	3	Preliminary Search Report received for Moroccan Patent Application No. 46151 (Attorney Docket No. 4906P51954MA), completed on October 02, 2019, 4 pages of Original Document Only.	

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EXAMINER SIGNATURE

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

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

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	15568431
	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	2463
	Examiner Name	MARCELO, MELVIN C
	Attorney Docket Number	4906P51954US1

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	/William W. Kidd/	Date (YYYY-MM-DD)	2019-10-16
Name/Print	William W. Kidd	Registration Number	31772

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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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.

ADVANCE E-MAIL

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING
TRANSMITTAL OF COPY OF INTERNATIONAL
PRELIMINARY REPORT ON PATENTABILITY
(CHAPTER I OF THE PATENT COOPERATION
TREATY)
(PCT Rule 44bis.1(c))

To:

ZHONGZI LAW OFFICE
7F, New Era Building, 26 Pinganli Xidajie, Xicheng
District
Beijing 100034
CHINE

Date of mailing (<i>day/month/year</i>) 18 July 2019 (18.07.2019)		
Applicant's or agent's file reference PF170510PCT		IMPORTANT NOTICE
International application No. PCT/CN2017/101576	International filing date (<i>day/month/year</i>) 13 September 2017 (13.09.2017)	Priority date (<i>day/month/year</i>) 04 January 2017 (04.01.2017)
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (PUBL) et al		

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Xin Wang
Facsimile No. +41 22 338 82 70	e-mail: pct.team2@wipo.int

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference PF170510PCT	FOR FURTHER ACTION		See item 4 below
International application No. PCT/CN2017/101576	International filing date (<i>day/month/year</i>) 13 September 2017 (13.09.2017)	Priority date (<i>day/month/year</i>) 04 January 2017 (04.01.2017)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)			

<p>1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>																								
<p>3. This report contains indications relating to the following items:</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> <p>4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).</p>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
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<input type="checkbox"/>	Box No. II	Priority																						
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability																						
<input type="checkbox"/>	Box No. IV	Lack of unity of invention																						
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																						
<input type="checkbox"/>	Box No. VI	Certain documents cited																						
<input type="checkbox"/>	Box No. VII	Certain defects in the international application																						
<input type="checkbox"/>	Box No. VIII	Certain observations on the international application																						

<p align="center">The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. +41 22 338 82 70</p>	<p>Date of issuance of this report 09 July 2019 (09.07.2019)</p>
	<p>Authorized officer</p> <p align="center">Xin Wang</p> <p>e-mail: pct.team2@wipo.int</p>

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: 100034 China 7F, New Era Building, 26 Pinganli Xidajie, Xicheng District, Beijing ZHONGZI LAW OFFICE
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PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Applicant's or agent's file reference PF170510PCT		Date of mailing (day/month/year) 30 November 2017	
International application No. PCT/CN2017/101576		FOR FURTHER ACTION See paragraph 2 below	
International filing date (day/month/year) 13 September 2017	Priority date (day/month/year) 04 January 2017		
International Patent Classification (IPC) or both national classification and IPC H04L 29/06(2006.01)i; H04W 72/12(2009.01)i			
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (PUBL) et al			

<p>1. This opinion contains indications relating to the following items:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Box No. I Basis of the opinion <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application <p>2. FURTHER ACTION</p> <p>If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.</p> <p>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.</p> <p>For further options, see Form PCT/ISA/220.</p>
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Name and mailing address of the ISA/ STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA China 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088 Facsimile No. (86—10) 62019451	Date of completion of this opinion 24 November 2017	Authorized officer PENG,Liang Telephone No. (86-10)62413350
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Form PCT/ISA/237 (Cover sheet) (July 2011)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/CN2017/101576

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 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/CN2017/101576

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement		
1. Statement	Novelty (N)	Claims	1-47 ----- None -----
			YES NO
	Inventive step (IS)	Claims	1-47 ----- None -----
			YES NO
	Industrial applicability (IA)	Claims	1-47 ----- None -----
			YES NO
2. Citations and explanations :			
[1] Reference is made to the following document:			
[2] D1: CN 101217689 A, 09.07.2008			
[3] Novelty and Inventive Step:			
[4] D1 discloses (see description, page 1 lines 13 -17, page 5 line 2- page 6 line 10) a method for requesting system information, comprising: transmitting a request for at least one system information block group, each of which comprises one or more system information blocks from a user terminal to a network node, and receiving one or more system information block groups from the network node based on schedule information of the system information.			
[5] The technical features "the one or more system information blocks are grouped according to a feature of the one or more system information blocks" and "the one or more system information block groups comprise the at least one system information block group" as defined in claims 1, 24 are not explicitly or implicitly disclosed in D1. Therefore claims 1, 24 are novel in the sense of PCT Article 33(2). Meanwhile, claims 1, 24 are neither indicated nor obviously rendered from the prior art, so claims 1, 24 are not obvious to a person skilled in the art on the basis of the prior art. Therefore claims 1, 24 involve an inventive step under PCT Article 33(3).			
[6] Claims 2-11 are dependent on claim 1 directly or indirectly, claims 25-34 are dependent on claim 24 directly or indirectly, therefore they also meet the requirements of PCT with respect to novelty (PCT Article 33(2)) and an inventive step (PCT Article 33(3)).			
[7] Claim 12 claims an apparatus which comprises the processor and memory, wherein the processor is configured to implement corresponding steps in claim 1. Hence, based on the analysis of claim 1, claim 12 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).			
[8] Claim 23 claims an apparatus, each component in the product of claim 23 completely corresponds to each step in the process of claim 1. Hence, based on the analysis of claim 1, claim 23 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).			
[9] Claim 35 claims an apparatus which comprises the processor and memory, wherein the processor is configured to implement corresponding steps in claim 24. Hence, based on the analysis of claim 24, claim 35 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).			
[10] Claim 46 claims an apparatus, each component in the product of claim 46 completely corresponds to each step in the process of claim 24. Hence, based on the analysis of claim 24, claim 46 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).			
[11] Claims 13-22 are dependent on claim 12 directly or indirectly, claims 36-45 are dependent on claim 35 directly or indirectly, therefore they also meet the requirements of PCT with respect to novelty (PCT Article 33(2)) and an inventive step (PCT Article 33(3)).			
[12] Claim 47 claims a computer program product comprising a computer-readable medium bearing computer program codes embodied therein for use with a computer, wherein the computer program codes comprise codes for performing the method according to any one of claims 1-11 and claims 24-34. Hence, based on the analysis of claims 1-11 and claims 24-34, claim 47 is novel (PCT Article 33 (2)) and involves an inventive step (PCT Article 33 (3)).			

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/CN2017/101576

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

[13] **Industrial Applicability:**

[14] Claims 1 - 47 can find industrial applicability in the technical field of wireless communication, and thus meet the requirements of PCT Article 33(4).

Publication Number: EP 3413632 A1

Publication Date: Dec 12, 2018

Abstract

A terminal apparatus includes a receiver for receiving non-demand SI transmitted regardless of a system information request, and multiple pieces of on-demand SI (System Information) transmitted based on a system information request, and a transmitter for transmitting a system information request to request transmission of a first piece of on-demand SI (System information) among the multiple pieces of on-demand SI.



(11) **EP 3 413 632 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

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H04W 74/08 (2009.01)

(21) Application number: **17747210.7**

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(22) Date of filing: **19.01.2017**

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(72) Inventors:
• **SUZUKI, Shoichi**
Osaka 590-8522 (JP)
• **AIBA, Tatsushi**
Osaka 590-8522 (JP)
• **OHUCHI, Wataru**
Osaka 590-8522 (JP)
• **HAYASHI, Takashi**
Osaka 590-8522 (JP)

(30) Priority: **04.02.2016 JP 2016019540**

(74) Representative: **Müller-Boré & Partner**
Patentanwälte PartG mbB
Friedenheimer Brücke 21
80639 München (DE)

(71) Applicant: **Sharp Kabushiki Kaisha**
Sakai City, Osaka 590-8522 (JP)

(54) **TERMINAL DEVICE, BASE STATION DEVICE, COMMUNICATION METHOD, AND INTEGRATED CIRCUIT**

(57) A terminal apparatus includes a receiver for receiving non-demand SI transmitted regardless of a system information request, and multiple pieces of on-demand SI (System Information) transmitted based on a system information request, and a transmitter for transmitting a system information request to request transmission of a first piece of on-demand SI (System information) among the multiple pieces of on-demand SI.

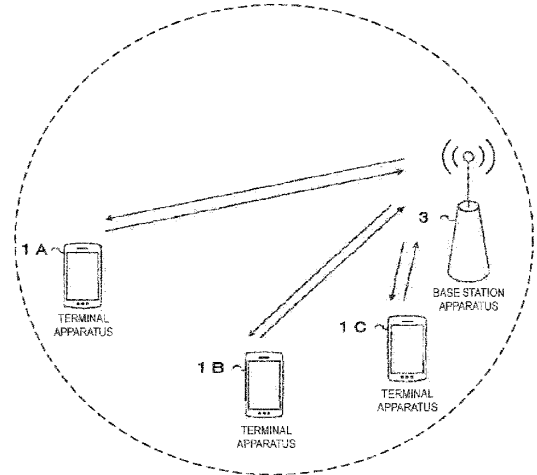


FIG. 1

EP 3 413 632 A1

Description

Technical Field

5 **[0001]** An embodiment of the present invention relates to a terminal apparatus, a base station apparatus, a communication method, and an integrated circuit.

Background Art

10 **[0002]** In the 3rd Generation Partnership Project (3GPP), a radio access method for 4th generation cellular mobile communications (hereinafter, referred to as "Long Term Evolution (LTE, trade name)", or "Evolved Universal Terrestrial Radio Access (EUTRA)") has been standardized (NPL 1, 2, 3, 4, 5).

15 **[0003]** In the 3GPP, a discussion about a radio access method for 5th generation cellular mobile communications (hereinafter, referred to as "NX") started (NPL 6, 7). In the 3GPP, a method with which a base station apparatus transmits NX system information has been discussed.

Citation List

Non Patent Literature

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[0004]

NPL 1: "3GPP TS 36.211 V13.0.0 (2015-12)", 6th January, 2016.

NPL 2: "3GPP TS 36.212 V13.0.0 (2015-12)", 6th January, 2016.

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NPL 3: "3GPP TS 36.213 V13.0.0 (2015-12)", 6th January, 2016.

NPL 4: "3GPP TS 36.321.V13.0.0.(2015-12)", 14th January, 2016.

NPL 5: "3GPP TS 36.331 V13.0.0 (2015-12)", 7th January, 2016.

NPL 6: "5G - key component of the Networked Society", RWS-150009, Ericsson, 3GPP RAN Workshop on 5G, Phoenix, USA, 17th - 18th September 2015.

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NPL 7: "5G Views on Technology & Standardization", RWS-150012, Qualcomm, 3GPP RAN Workshop on 5G, Phoenix, USA, 17th - 18th September 2015.

Summary of Invention

35 Technical Problem

40 **[0005]** An embodiment of the present invention provides a radio communication system in which system information is efficiently transmitted, a base station apparatus of the radio communication system, the base station apparatus of the radio communication system, a communication method used for the terminal apparatus, a communication method used for the base station apparatus, an integrated circuit mounted on the terminal apparatus, and an integrated circuit mounted on the base station apparatus.

Solution to Problem

45 **[0006]**

(1) According to some aspects of the present invention, the following measures are provided. In other words, a first aspect of the present invention is a terminal apparatus that includes a receiver for receiving multiple pieces of on-demand SI (System Information), and a transmitter for transmitting a system information request to request transmission of a first piece of on-demand SI among the multiple pieces of on-demand SI.

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(2) A second aspect of the present invention is a base station apparatus that includes a transmitter for transmitting multiple pieces of on-demand SI (System Information), and a receiver for receiving a system information request to request transmission of a first piece of on-demand SI among the multiple pieces of on-demand SI.

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(3) A third aspect of the present invention is a communication method used for a terminal apparatus that receives multiple pieces of on-demand SI (System Information), and transmits a system information request to request transmission of a first piece of on-demand SI among the multiple pieces of on-demand SI.

(4) A fourth aspect of the present invention is a communication method used for a base station apparatus that transmits multiple pieces of on-demand SI (System Information), and receives a system information request to

request transmission of a first piece of on-demand SI among the multiple pieces of on-demand SI.

(5) A fifth aspect of the present invention is an integrated circuit mounted on a terminal apparatus that includes a reception circuit for receiving multiple pieces of on-demand SI (System Information), and a transmission circuit for transmitting a system information request to request transmission of a first piece of on-demand SI among the multiple pieces of on-demand SI.

(6) A sixth aspect of the present invention is an integrated circuit mounted on a base station apparatus that includes a transmission circuit for transmitting multiple pieces of on-demand SI (System Information), and a reception circuit for receiving a system information request to request transmission of a first piece of on-demand SI among the multiple pieces of on-demand SI.

Advantageous Effects of Invention

[0007] According to this invention, system information is effectively transmitted.

Brief Description of Drawings

[0008]

FIG. 1 is a conceptual diagram of a radio communication system according to the present embodiment.

FIG. 2 is a diagram illustrating an example of a configuration of a radio frame according to the present embodiment.

FIG. 3 is a diagram illustrating a schematic configuration of a slot according to the present embodiment.

FIG. 4 is a diagram illustrating an example of a set of resources for transmitting a system information request in the present embodiment.

FIG. 5 is a sequence diagram illustrating an example of a procedure for a system information request in the present embodiment.

FIG. 6 is a sequence diagram illustrating an example of a retransmission process of the system information request in the present embodiment.

FIG. 7 is a diagram illustrating an example of a monitoring window in the present embodiment.

FIG. 8 is a schematic block diagram illustrating a configuration of a terminal apparatus 1 according to the present embodiment.

FIG. 9 is a schematic block diagram illustrating a configuration of a base station apparatus 3 according to the present embodiment.

Description of Embodiments

[0009] Embodiments of the present invention will be described below.

[0010] FIG. 1 is a conceptual diagram of a radio communication system according to the present embodiment. In FIG. 1, a radio communication system includes a terminal apparatus 1A, a terminal apparatus 1B, a terminal apparatus 1C, and the base station apparatus 3. The base station apparatus 3 may include a core network apparatus. The terminal apparatus 1A, the terminal apparatus 1B, and the terminal apparatus 1C are collectively referred to as a terminal apparatus 1.

[0011] A state of the terminal apparatus 1 may be changed from RRC_IDLE to RRC_CONNECTED by a connection establishment procedure. A state of the terminal apparatus 1 may be changed from RRC_CONNECTED to RRC_IDLE by a connection release procedure.

[0012] The terminal apparatus 1 in RRC_IDLE may select one cell with a cell selection procedure and camp on the selected one cell.

[0013] One or multiple serving cells may be configured for the terminal apparatus 1 in RRC_CONNECTED. A technology in which the terminal apparatus 1 communicates via multiple serving cells is referred to as cell aggregation or carrier aggregation. An embodiment of the present invention may be applied to each of the multiple serving cells configured for the terminal apparatus 1. Furthermore, an embodiment of the present invention may be applied to some of the configured multiple serving cells. Furthermore, an embodiment of the present invention may be applied to some of the groups of the configured multiple serving cells. In carrier aggregation, the configured multiple serving cells are also referred to as aggregated serving cells.

[0014] The configured multiple serving cells may include one primary cell and one or multiple secondary cells. The primary cell is a cell in which an initial connection establishment procedure has been performed, a cell in which a connection re-establishment procedure has started, or a cell indicated as a primary cell in a handover procedure. At the point in time when a Radio Resource Control (RRC) connection is established, or later, a secondary cell may be configured.

[0015] A carrier corresponding to a serving cell in a downlink is referred to as a downlink component carrier. A carrier corresponding to a serving cell in an uplink is referred to as an uplink component carrier. The downlink component carrier and the uplink component carrier are collectively referred to as a component carrier.

5 **[0016]** The terminal apparatus 1 can perform simultaneous transmission on multiple physical channels/of multiple physical signals in the multiple serving cells (component carriers) to be aggregated. The terminal apparatus 1 can perform simultaneous reception on multiple physical channels/of multiple physical signals in the multiple serving cells (component carriers) to be aggregated.

[0017] FIG. 2 is a diagram illustrating an example of a configuration of a radio frame according to the present embodiment. In FIG. 2, a horizontal axis is a time axis.

10 **[0018]** Each of the radio frames may include ten contiguous subframes in a time domain. Each subframe i may include two contiguous slots in the time domain. The two contiguous slots in the time domain may be a slot having a slot number n_s of $2i$ in the radio frame and a slot having a slot number n_s of $2i + 1$ in the radio frame respectively. Each of the radio frames may include ten contiguous subframes in the time domain. Each of the radio frames may include 20 contiguous slots ($n_s = 0, 1, \dots, 19$) in the time domain. The configuration of the above-described radio frame may be applied to both

15 the uplink and the downlink.
[0019] A configuration of the slot in the present embodiment will be described below. FIG. 3 is a diagram illustrating a schematic configuration of the slot according to the present embodiment. FIG. 3 illustrates a configuration of a slot in one serving cell. In FIG. 3, a horizontal axis is a time axis, and a vertical axis is a frequency axis. In FIG. 3, l is a symbol number/index, and k is a subcarrier number/index. Here, a symbol may be an Orthogonal Frequency Division Multiplexing (OFDM) symbol, or a Single Carrier Frequency Division Multiple Access (SC-FDMA) symbol. N_{sc} is a total number of subcarriers included in a cell bandwidth. N_{symb} is a total number of symbols included in one slot. N_{symb} may be given based on a subcarrier spacing.

20 **[0020]** A physical signal or a physical channel transmitted in each of the slots is expressed by a resource grid. The resource grid is defined by multiple subcarriers and multiple symbols. Each element within the resource grid is referred to as a resource element. A resource element $a_{k,1}$ is expressed by a subcarrier number/index k and a symbol number/index 1. That is, a resource for transmitting the physical signal or the physical channel may be expressed by the resource element.

[0021] The resource grid may be defined for each antenna port. In the present embodiment, description is given for one antenna port. The present embodiment may be applied to each of multiple antenna ports.

30 **[0022]** System information in the present embodiment will be described.

[0023] A Radio Resource Control (RRC) layer has a function for broadcasting system information. The system information may include (a) Non Access Stratum (NAS) common information, (b) information applicable to the terminal apparatus 1 in RRC_IDLE, (c) information applicable to the terminal apparatus 1 in RRC_CONNECTED, (d) information applicable to both the terminal apparatus 1 in RRC_IDLE and the terminal apparatus 1 in RRC_CONNECTED, (e) an Earthquake and Tsunami Warning System (ETWS) notification, and (f) a Commercial Mobile Alert Service (CMAS) notification. The information applicable to the terminal apparatus 1 in RRC_IDLE may include a parameter for the cell selection procedure, a parameter for cell re-selection, and information of a neighbor cell. The information applicable to the terminal apparatus 1 in RRC_CONNECTED and the information applicable to both the terminal apparatus 1 in RRC_IDLE and the terminal apparatus 1 in RRC_CONNECTED may include information for a channel configuration common to multiple terminal apparatuses 1. The ETWS notification and the CMAS notification may include information for indicating a warning type. The warning type may correspond to an earthquake or a tsunami.

[0024] The system information may be divided into multiple information blocks. The information block may be referred to as a Master Information Block (MIB) and a System Information Block (SIB). One or multiple information blocks may be transmitted using a system information message.

45 **[0025]** Hereinafter, an example of the information block will be described. Multiple information blocks may include the following SI type A to SI type O. Information included in the following SI type A to SI type O may be included in different information blocks. Information other than the information included in the following SI type A to SI type O may be included in any one of the following SI type A to SI type.

50 **[0026]** The SI type A includes information necessary to acquire system information other than the SI type A from a cell. The SI type A may include information for indicating a transmission bandwidth configuration of a cell in the downlink, and information for indicating a System Frame Number (SFN). The SFN denotes a radio frame number.

[0027] The SI type B includes information used for evaluating whether the terminal apparatus 1 is allowed to access to a cell or not.

55 **[0028]** The SI type C may include information for a channel configuration for transmitting a system information request. The system information request is information for requesting transmission of specific system information (a specific SI type, a group of specific SI types) to a cell (base station apparatus 3). The specific system information is referred to as on-demand SI (System Information).

[0029] The SI type D includes information associated with scheduling of other system information. The information

associated with the scheduling of other system information may include information for indicating a time window in which an SI type other than the SI type C is transmitted. The time window may be defined for each SI type. The SI type D may indicate a set of subframes in which a certain SI type can be transmitted, and/or a set of subframes in which the certain SI type cannot be transmitted. The set of subframes may be common to multiple SI types.

- 5 [0030] The SI type E includes information for a radio resource configuration common to multiple pieces of UE.
 [0031] The SI type F includes information for cell re-selection in an intra Radio Access Technology.
 [0032] The SI type G includes information for cell re-selection in a first inter Radio Access Technology.
 [0033] The SI type H includes information for cell re-selection in a second inter Radio Access Technology.
 [0034] The SI type I includes the ETWS notification.
- 10 [0035] The SI type J includes the CMAS notification.
 [0036] The SI type K includes information necessary to acquire information of a Multimedia Broadcast Multicast Service (MBMS). The MBMS is a function for providing a multicast service. Multiple cells (base station apparatuses 3) may simultaneously broadcast multicast service data in an identical frequency/time resource. The multicast service data may be broadcast by one cell (base station apparatus 3).
- 15 [0037] The SI type L includes information associated with a Global Positioning System (GPS) time, and a Coordinated Universal Time (UTC). The terminal apparatus 1 may use information included in the SI type L in order to acquire UTC, GPS (coordinates, a geographical position), and a local time.
 [0038] The SI type M includes information for traffic steering between a cellular network (e.g., NX) and a Wireless Local Area Network (WLAN).
- 20 [0039] The SI type N includes information for indicating that a cell (base station apparatus 3) supports a sidelink communication procedure. The SI type N may include information for configuring a resource associated with sidelink direct communication.
 [0040] The SI type O includes information for indicating that a cell (base station apparatus 3) supports a sidelink discovery procedure. The SI type O may include information for configuring a resource associated with sidelink direct discovery.
- 25 [0041] A sidelink is an interface between the terminal apparatuses 1 for the sidelink communication and the sidelink discovery. The sidelink communication is an Access Stratum (AS) function enabling proximity based services (ProSe) direct communication among multiple neighboring terminal apparatuses 1. The ProSe direct communication is communication among the multiple neighboring terminal apparatuses 1 via a path through which no network node passes.
- 30 [0042] The sidelink discovery is an AS function enabling proximity based services (ProSe) direct discovery. The ProSe direct discovery is defined as a process/procedure for detecting and specifying another neighboring terminal apparatus 1 using a direct radio signal.
 [0043] The SI type D may include information for indicating transmission of a specific SI type supported by a cell (base station apparatus 3) and/or a specific function supported by a cell (base station apparatus 3). For example, the SI type D may include information for indicating that a cell (base station apparatus 3) supports the sidelink communication and/or transmission of the SI type N associated with the sidelink communication.
- 35 [0044] The system information may be classified into on-demand SI (System Information) and non-demand SI (System Information). On-demand SI is system information transmitted by the base station apparatus 3 based on reception/detection of a system information request from the terminal apparatus 1. Non-demand SI is system information transmitted by the base station apparatus 3 regardless of reception/detection of the system information request from the terminal apparatus 1. Non-demand SI may be transmitted periodically. Non-demand SI may be transmitted at a timing (subframe) predetermined by a specification or the like. A first piece of non-demand SI may be transmitted at a timing (subframe) indicated by a second piece of non-demand SI.
- 40 [0045] The above-described SI type A to SI type O may be on-demand SI. The above-described SI type A to SI type O may be non-demand SI. Some of the above-described SI type A to SI type O may be on-demand SI and the others may be non-demand SI. The SI type A, the SI type B, the SI type C, the SI type D, and the SI type I may be non-demand SI and the other SI types may be on-demand SI.
- 45 [0046] Physical channels and physical signals in the present embodiment will be described.
 [0047] In FIG. 1, the following downlink physical channels are used for downlink radio communication from the base station apparatus 3 to the terminal apparatus 1. The downlink physical channels are used by a physical layer for transmitting information output from higher layers.
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- NX-PBCH (NX Physical Broadcast CHannel)
- NX-PDCCH (NX Physical Downlink Control CHannel)
- 55 • NX-PDSCH (NX Physical Downlink Shared CHannel)

[0048] The NX-PBCH may be used to broadcast non-demand SI.

[0049] The NX-PDCCH is used for transmitting downlink control information used for scheduling the NX-PDSCH

(Narrow Band Downlink Control Information (DCI)), and downlink control information used for scheduling an NX-PUSCH (Narrow Band Physical Uplink Shared CHannel).

5 [0050] The NX-PDSCH is used for transmitting downlink data (Downlink Shared CHannel (DL-SCH)). The NX-PDSCH may be used for transmitting downlink control information. The NX-PDSCH may be used for transmitting the downlink control information together with the downlink data. The terminal apparatus 1 may decode the NX-PDSCH based on reception/detection of the downlink control information (NX-PDCCH, NX-PDSCH). The terminal apparatus 1 may decode the NX-PDSCH regardless of the reception/detection of the downlink control information (NX-PDCCH, NX-PDSCH).

10 [0051] The downlink data may include on-demand SI and non-demand SI. On-demand SI and non-demand SI may be transmitted on the different NX-PDSCHs. That is, the on-demand SI and the non-demand SI are not necessarily transmitted on an identical NX-PDSCH.

[0052] In FIG. 1, the following downlink physical signals are used for downlink radio communication from the base station apparatus 3 to the terminal apparatus 1. The downlink physical signals are not used for transmitting information output from a higher layer, but are used by a physical layer.

- 15 • NX-SS (NX Synchronization Signal)
- NX-DL RS (NX Downlink Reference Signal)

20 [0053] The NX-SS may be used for cell search. The cell search is a procedure in which the terminal apparatus 1 acquires time and frequency synchronization with a cell and detects a Physical layer Cell Identity (PCI) of the cell. In a handover procedure, a PCI of a target cell may be notified from a source cell (base station apparatus 3) to the terminal apparatus 1. A handover command may include information for indicating the PCI of the target cell. The NX-SS may be transmitted periodically. The NX-SS may be referred to as a discovery signal (DS).

25 [0054] The NX-DL RS may be used in order for the terminal apparatus 1 to perform channel compensation on a downlink physical channel of a cell. The NX-DL RS may be used in order for the terminal apparatus 1 to calculate downlink channel state information of a cell.

[0055] In FIG. 1, the following uplink physical channels are used for uplink radio communication from the base station apparatus 3 to the terminal apparatus 1. The uplink physical channels are used by a physical layer for transmitting information output from higher layers.

- 30 • NX-PRACH (NX Physical Random Access CHannel)
- NX-PUCCH (NX Physical Uplink Control CHannel)
- NX-PUSCH (NX Physical Uplink Shared CHannel)

35 [0056] The NX-PRACH is used for transmitting a preamble (preamble sequence). The NX-PRACH may be used for a random access procedure. The NX-PRACH may also be used for transmitting a system information request. That is, the system information request may be a preamble.

40 [0057] A set of NX-PRACH resources for a random access procedure, and a set of NX-PRACH resources for transmitting a system information request may be individually configured. Information for indicating the set of NX-PRACH resources for the random access procedure may be included in on-demand SI. Information for indicating the set of NX-PRACH resources for transmitting the system information request may be included in non-demand SI.

[0058] A preamble may be given by performing a cyclic shift on a Zadoff-Chu sequence corresponding to a physical route sequence index u . The Zadoff-Chu sequence is generated based on the physical route sequence index u . Multiple preambles may be defined in a cell. A preamble may be specified by a preamble index. Different preambles corresponding to different preamble indices correspond to different combinations of a physical route sequence index u and a cyclic shift.

45 [0059] A physical route sequence index u and a cyclic shift corresponding to a preamble corresponding to a system information request may be given at least based on information included in non-demand SI and/or a PCI. A physical route sequence index u and a cyclic shift corresponding to a preamble corresponding to a random access procedure may be given at least based on information included in on-demand SI and/or the PCI.

50 [0060] A preamble corresponding to a system information request may be transmitted on a physical channel other than the NX-PRACH.

[0061] A Zadoff-Chu sequence $x_u(n)$ corresponding to a physical route sequence index u is given by Equation (1) below. e is the Napier's constant. N_{zc} is a length of the Zadoff-Chu sequence $X_u(n)$. n is an integer incremented from 0 to $N_{zc} - 1$.

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[Equation 1]

$$x_u(n) = e^{-j \frac{\pi u n(n+1)}{N_{ZC}}}, \quad 0 \leq n \leq N_{ZC} - 1$$

[0062] A preamble (preamble sequence) $x_{u,v}(n)$ is given by Equation (2) below. C_v is a value of a cyclic shift. $X \bmod Y$ is a function outputting a remainder obtained by dividing X by Y .

[Equation 2]

$$x_{u,v}(n) = x_u((n + C_v) \bmod N_{ZC})$$

[0063] The NX-PUCCH may be used for transmitting uplink control information. The uplink control information may include Hybrid Automatic Repeat reQuest ACKnowledgment (HARQ-ACK) and channel state information corresponding to the NX-PDSCH (downlink data).

[0064] The NX-PUSCH may be used for transmitting uplink data (UpLink-Shared CHannel (UL-SCH)) and/or uplink control information. The uplink data may include a system information request.

[0065] In FIG. 1, the following uplink physical signals are used for uplink radio communication from the base station apparatus 3 to the terminal apparatus 1. The uplink physical signal is not used for transmission of information output from the higher layer, but is used by the physical layer.

- NX-UL RS (Narrow Band Downlink Reference Signal)

[0066] The NX-UL RS may be used in order for the base station apparatus 3 to perform channel compensation of uplink physical channel.

[0067] The downlink physical channels and the downlink physical signals are collectively referred to as a downlink signal. The uplink physical channels and the uplink physical signals are collectively referred to as an uplink signal. The downlink physical channels and the uplink physical channels are collectively referred to as a physical channel. The downlink physical signals and the uplink physical signals are collectively referred to as a physical signal.

[0068] The DL-SCH is a transport channel. A channel used in a Medium Access Control (MAC) layer is referred to as a transport channel. A unit of the transport channel used in the MAC layer is also referred to as a transport block (TB) or a MAC Protocol Data Unit (PDU). A Hybrid Automatic Repeat reQuest (HARQ) is controlled for each transport block in the MAC layer. The transport block is a unit of data that the MAC layer delivers to the physical layer. In the physical layer, the transport block is mapped to a codeword and subjected to coding processing on a codeword-by-codeword basis.

[0069] The transport block may include data of a Signalling Radio Bearer (SRB), and data of a Data Radio Bearer (DRB). The SRB is defined as a radio bearer used only for transmitting a Radio Resource Control (RRC) message and a Non Access Stratum (NAS) message. The DRB is defined as a radio bearer for transmitting user data.

[0070] The base station apparatus 3 and the terminal apparatus 1 exchange (transmit and/or receive) a signal in the higher layer. For example, the base station apparatus 3 and the terminal apparatus 1 may transmit and/or receive, in a Radio Resource Control (RRC) layer, RRC signalling (also referred to as a Radio Resource Control message (RRC message) or Radio Resource Control information (RRC information)). Furthermore, the base station apparatus 3 and the terminal apparatus 1 may transmit and/or receive, in the Medium Access Control (MAC) layer, a MAC Control Element (CE). Here, the RRC signalling and/or the MAC CE is also referred to as higher layer signaling.

[0071] Hereinafter, a channel configuration for transmitting a system information request will be described.

[0072] The channel configuration for transmitting a system information request may be common to multiple terminal apparatuses 1. Non-demand SI may include information for configuring a channel for transmitting a system information request. The information for configuring a channel for transmitting a system information request may include some or all of the following information A to information I.

- Information A: Information for indicating whether a system information request is transmitted as a preamble, a message, or both the preamble and the message
- Information B: Information for indicating a frequency/time resource for transmitting a system information request

- Information C: Information for indicating a length of a Zadoff-Chu sequence corresponding to a preamble
- Information D: Information for indicating a physical route sequence index u corresponding to a preamble
- Information E: Information for indicating a cyclic shift applied to a Zadoff-Chu sequence corresponding to a preamble
- 5 • Information F: Information for indicating subcarrier spacings of a channel used for transmitting a system information request
- Information G: Information for indicating a length of a Cyclic Prefix (CP) applied to a preamble
- Information H: Information for indicating the number of times that a preamble or a message is repeatedly transmitted in one transmission instance of a system information request
- 10 • Information I: Information for indicating a parameter used for setting transmit power for transmitting a system information request

[0073] FIG. 4 is a diagram illustrating an example of a set of resources for transmitting a system information request in the present embodiment. In FIG. 4, the horizontal axis represents a time axis, and the vertical axis represents a frequency axis. A reference sign 700 denotes a resource belonging to a first set. A reference sign 701 denotes a resource belonging to a second set. A resource 700 may correspond to a first SI type, or a first group to which multiple SI types belong. A resource 701 may correspond to a second SI type, or a second group to which multiple SI types belong. The first group and the second group may include identical SI types. Note that, the first group and the second group may include different SI types.

[0074] Transmission of a system information request may be divided into transmission of a system information request A and transmission of a system information request B. FIG. 5 is a sequence diagram illustrating an example of a procedure for a system information request in the present embodiment. In 500, the terminal apparatus 1 transmits the system information request A to the base station apparatus 3. The system information request A may be a preamble transmitted on the NX-PRACH. In 501, the base station apparatus 3 transmits information for assigning a resource (resource assignment) corresponding to the received preamble. In 502, the terminal apparatus 1 transmits the system information request B based on the received resource assignment. The system information request B may include a message (information bit) for indicating an SI type (information block) to which the system information request corresponds. In 503, the base station apparatus 3 may transmit on-demand SI of the SI type indicated by the system information request B, based on reception of the system information request B.

[0075] Hereinafter, system information update will be described.

[0076] The base station apparatus 3 may transmit a system information change. A system information change may indicate that on-demand SI and/or non-demand SI will be updated. A system information change may indicate that on-demand SI and/or non-demand SI was updated. Non-demand SI may include information for indicating that a timing at which on-demand SI and non-demand SI will be updated.

[0077] Non-demand SI may include information for indicating a subframe for monitoring a system information change.

[0078] A system information change is not included in non-demand SI. A system information change may be included in on-demand SI. A system information change may be included in the NX-PDCCH or the NX-PDSCH. A system information change and/or on-demand SI may indicate SI types to be updated. The terminal apparatus 1 may attempt to decode on-demand SI for indicating SI types to be updated, based on reception of a system information change.

[0079] In a case that a system information change and/or on-demand SI indicates on-demand SI update of interest, the terminal apparatus 1 may transmit a system information request corresponding to the on-demand SI of interest.

[0080] A method for deciding an SI type (information block) to which a system information request corresponds will be described.

[0081] A system information request may include a message (information bit) for indicating an SI type (information block) to which the system information request corresponds. In this case, the system information request may be included in uplink data and transmitted on the NX-PUSCH. The terminal apparatus 1 may set a value of the message (information bit), based on an SI type that the terminal apparatus 1 requests the base station apparatus 3 to transmit. The base station apparatus 3, based on reception of the message (information bit), may transmit an SI type corresponding to the value of the information bit. The message (information bit) may be transmitted on the NX-PUSCH.

[0082] A system information request may include the above-described preamble. In a case that a system information request is a preamble, an SI type (information block) to which the system information request corresponds may be given by a preamble index (a physical route sequence index u and a cyclic shift C_v). The terminal apparatus 1, based on an SI type that the terminal apparatus 1 requests the base station apparatus 3 to transmit, may decide a preamble index (a physical route sequence index u , and a cyclic shift C_v). The base station apparatus 3, based on reception of a preamble corresponding to the preamble index (the physical route sequence index u , and the cyclic shift C_v) may transmit an SI type corresponding to the preamble index. Non-demand SI may include information for indicating correspondence between a preamble index (a physical route sequence index u , and a cyclic shift C_v) and an SI type.

[0083] An SI type (information block) to which a system information request corresponds may be given by a resource to which the system information request is transmitted. The base station apparatus 3 may transmit non-demand SI for

indicating multiple sets of resources for transmitting a system information request. Each of the multiple sets may correspond to a different SI type. That is, for each of SI types to which the system information request corresponds, a set of resources may be configured. For example, a first set of resources for transmitting a system information request corresponding to a first SI type and a second set of resources for transmitting a system information request corresponding to a second SI type may be individually configured.

[0084] The terminal apparatus 1 may select one set from the multiple sets, based on an SI type that the terminal apparatus 1 requests the base station apparatus 3 to transmit. The terminal apparatus 1 may select one resource from the selected one set. The terminal apparatus 1 may randomly select one resource from the selected one set.

[0085] The base station apparatus 3, based on a resource that the base station apparatus 3 has received a system information request, may transmit an SI type corresponding to the resource. The base station apparatus 3, based on a set of resources to which a resource that the base station apparatus 3 has received a system information request corresponds, may transmit an SI type corresponding to the set.

[0086] A resource to which a system information request is transmitted may be common to multiple terminal apparatuses 1. Information for indicating the resource to which the system information request is transmitted may be included in non-demand SI common to the multiple terminal apparatuses 1.

[0087] An SI type (information block) to which a system information request corresponds may be decided by combining the above-described multiple methods. For example, an SI type (information block) to which a system information request corresponds may be decided by a value of a message (information bit), a preamble index, a physical route sequence index u , a cyclic shift C_v , and some or all of resources to which the system information request is transmitted.

[0088] The terminal apparatus 1 may select one set from multiple sets of resources for transmitting a system information request, at least based on an identifier detected based on the NX-SS (for example, a PCI of a cell, an identifier of the base station apparatus 3), an identifier of the terminal apparatus 1, and/or a value that the terminal apparatus 1 stores in advance. The terminal apparatus 1 may select one resource from the selected one set. The terminal apparatus 1 may randomly select one resource from the selected one set. A value that the terminal apparatus 1 holds in advance may be a value that is stored in a memory in advance that the terminal apparatus 1 can read from.

[0089] A system information request may include an identity or identifier of the terminal apparatus 1, an identity or identifier indicated by non-demand SI, and/or information for indicating a geographical position of the terminal apparatus 1. The base station apparatus 3 may transmit system information only in a specific area of a cell, based on reception of the system information request.

[0090] Hereinafter, retransmission of a system information request will be described.

[0091] FIG. 6 is a sequence diagram illustrating an example of a retransmission process of a system information request in the present embodiment. In 600, the terminal apparatus 1 transmits a system information request to a cell (base station apparatus 3). In 601, the base station apparatus 3 transmits, based on reception of the system information request, during a monitoring window 603, on-demand SI corresponding to the system information request. In 602, the base station apparatus 3 may retransmit the on-demand SI, during the monitoring window 603.

[0092] The monitoring window 603 is a duration in which the terminal apparatus 1 monitors on-demand SI. The monitoring of on-demand SI may denote an attempt to decode on-demand SI or the NX-PDSCH including on-demand SI. The monitoring of on-demand SI may denote an attempt to decode the NX-PDCCH in accordance with downlink control information used for scheduling on-demand SI.

[0093] The terminal apparatus 1 may not necessarily monitor on-demand SI, in some subframes during the monitoring window 603. The terminal apparatus 1 may monitor on-demand SI, in subframes other than the some subframes during the monitoring window 603. The base station apparatus 3 may not necessarily transmit on-demand SI, in some subframes during the monitoring window 603. The base station apparatus 3 may transmit on-demand SI, in subframes other than the some subframes during the monitoring window 603. Information for indicating the some subframes and the subframes other than the some subframes may be included in non-demand SI.

[0094] In 604, the terminal apparatus 1, in a case that all pieces of on-demand SI to which the system information request corresponds cannot be decoded successfully during the monitoring window 603, retransmits the system information request. The terminal apparatus 1, in a case that all pieces of on-demand SI to which the system information request corresponds are decoded successfully during the monitoring window 603, does not retransmit the system information request.

[0095] The terminal apparatus 1 may count transmission times of the system information requests. The terminal apparatus 1 may count retransmission times of the system information requests. The transmission times may be managed by a counter. The terminal apparatus 1 may not necessarily reset the counter, even in a case that an SI type requested to a cell (base station apparatus 3) is changed. The terminal apparatus 1 may reset the counter, in the case that the SI type requested to the cell (base station apparatus 3) is changed. The terminal apparatus 1 may reset the counter, only in a case that the SI type requested to the cell (base station apparatus 3) is changed to a specific SI type. The terminal apparatus 1 may decide whether to reset the counter, based on SI type to which the SI type requested to the cell (base station apparatus 3) is changed. The terminal apparatus 1, in a case that all pieces of on-demand SI to which the system

information request corresponds are decoded successfully, may reset the counter to zero. The terminal apparatus 1, immediately before performing initial transmission of system information request information, may reset the counter to zero.

5 **[0096]** The terminal apparatus 1 may start a timer based on the initial transmission of the system information request. The terminal apparatus 1 may not necessarily restart the counter, even in the case that the SI type requested to the cell (base station apparatus 3) is changed. The terminal apparatus 1 may restart the timer, in the case that the SI type requested to the cell (base station apparatus 3) is changed. The terminal apparatus 1 may restart the timer, only in the case that the SI type requested to the cell (base station apparatus 3) is changed to a specific SI type. The terminal apparatus 1 may decide whether to restart the timer, based on SI type to which the SI type requested to the cell (base station apparatus 3) is changed. The terminal apparatus 1 may retransmit the system information request while the timer is running. The terminal apparatus 1 may not necessarily retransmit the system information request while the timer is not running. The terminal apparatus 1, in the case that the all pieces of on-demand SI to which the system information request corresponds are decoded successfully, may stop the timer.

10 **[0097]** The terminal apparatus 1, in a case that transmission times of the system information requests reach a prescribed value (maximum value), or in a case that the above-described timer expires, may perform some or all of the following process A, process B, and process C.

- Process A: A cell selection procedure is started
- Process B: Transmission failure of a system information request, reception failure of on-demand SI, update failure of on-demand SI, establishment failure of an RRC connection, and/or Radio Link Failure (RLF) are notified to higher layers of the terminal apparatus 1
- Process C: Transmission failure of a system information request, reception failure of on-demand SI, and/or update failure of on-demand SI are reported to a cell (base station apparatus 3)

25 **[0098]** The terminal apparatus 1 in RRC_IDLE, in the case that the transmission times of the system information requests reach the prescribed value (maximum value), or in the case that the above-described timer expires, may perform the process A and the process B, and may not necessarily perform the process C. The terminal apparatus 1 in RRC_ConNECTED, in the case that transmission times of the system information requests reach the prescribed value (maximum value), or in the case that the above-described timer expires, may perform the process C, and may not necessarily perform the process A and the process B.

30 **[0099]** Information associated with a configuration of the above-described prescribed value (maximum value), and information associated with a configuration of the above-described timer may be included in non-demand SI. The information associated with the configuration of the above-described prescribed value (maximum value) may indicate the above-described prescribed value (maximum value). The information associated with the configuration of the above-described timer may indicate a length of the above-described timer.

[0100] The above-described prescribed value (maximum value) and the length of the above-described timer may be predetermined by a specification or the like. The above-described prescribed value (maximum value) may be one.

40 **[0101]** Higher layers of the terminal apparatus 1 in RRC_IDLE may store that a cause of RLF is transmission failure of a system information request, reception failure of on-demand SI, and/or update failure of on-demand SI. The terminal apparatus 1 whose state is changed from RRC_IDLE to RRC_ConNECTED may report that a cause of RLF is transmission failure of a system information request, reception failure of on-demand SI, and/or update failure of on-demand SI to a cell (base station apparatus 3).

[0102] Hereinafter, a monitoring window will be described.

45 **[0103]** FIG. 7 is a diagram illustrating an example of a monitoring window in the present embodiment. A start time of a monitoring window 700 may be given by a transmission time of a system information request. 707 denotes a duration between system information request transmission 704 and the monitoring window 700 corresponding to the system information request transmission 704. A length of the duration denoted by the reference sign 707 may be predetermined by a specification or the like. Non-demand SI may include information for indicating the length of the duration denoted by the reference sign 707 and/or information for indicating a length of the monitoring window 700.

50 **[0104]** A reference sign 701 denotes a window corresponding to a first SI type on-demand SI. A reference sign 702 denotes a window corresponding to a second SI type on-demand SI. A reference sign 703 denotes a window corresponding to a third SI type on-demand SI.

55 **[0105]** The base station apparatus 3, during the window 701 corresponding to the first SI type on-demand SI, may transmit a first SI type on-demand SI 705. The terminal apparatus 1, during the window 701 corresponding to the first SI type on-demand SI, may monitor the first SI type on-demand SI 705. The base station apparatus 3, during a window 702 corresponding to the second SI type on-demand SI, may transmit a second SI type on-demand SI 706. The terminal apparatus 1, during the window 702 corresponding to the second SI type on-demand SI, may monitor the second SI type on-demand SI 706.

[0106] A window corresponding to an Xth SI type on-demand SI may be given by information included in non-demand SI. A duration of the window corresponding to the Xth SI type on-demand SI may be given regardless of a transmission time of a system information request. The duration of the window corresponding to the Xth SI type on-demand SI may be given by a start time, an end time, a window length, a repetition cycle, or the like.

5 **[0107]** The duration of the window corresponding to the Xth SI type on-demand SI may be given regardless of the transmission time of the system information request.

[0108] In FIG. 6, the system information request transmission 704 requests transmission of the first SI type on-demand SI 705 and the second type on-demand SI 706. The terminal apparatus 1, during the monitoring window 700, in a case that the first type on-demand SI 705 and the second type on-demand SI 706 are decoded successfully, may end processing associated with on-demand SI reception. The terminal apparatus 1, during the monitoring window 700, in a case that the first type on-demand SI 705 and the second type on-demand SI 706 are not decoded successfully, may perform processing associated with system information request retransmission.

[0109] The monitoring window 700 may be expressed by a monitoring timer. The terminal apparatus 1 may start the monitoring timer at a time 709. The monitoring timer expires at a time 710. The terminal apparatus 1 may perform processing associated with the system information request retransmission, based on the monitoring timer expiration. The terminal apparatus 1, in the case that the first type on-demand SI 705 and the second type on-demand SI 706 are decoded successfully, may stop the monitoring timer, and end the processing associated with on-demand SI reception.

[0110] In the present embodiment, the above-described information indicated by the non-demand SI may be indicated by the NX-SS. For example, the above-described information indicated by the non-demand SI may be expressed by an NX-SS sequence, an NX-SS resource, and/or a message (information bit) transmitted together with the NX-SS.

[0111] Structures of apparatuses according to the present embodiment will be described below.

[0112] FIG. 8 is a schematic block diagram illustrating a configuration of a terminal apparatus 1 according to the present embodiment. As illustrated, the terminal apparatus 1 is configured to include a radio transmission and/or reception unit 10 and a higher layer processing unit 14. The radio transmission and/or reception unit 10 is configured to include an antenna unit 11, a Radio Frequency (RF) unit 12, and a baseband unit 13. The higher layer processing unit 14 is configured to include a medium access control layer processing unit 15 and a radio resource control layer processing unit 16. The radio transmission and/or reception unit 10 is also referred to as a transmitter, a receiver, or a physical layer processing unit.

[0113] The higher layer processing unit 14 outputs uplink data (transport block) generated by a user operation or the like, to the radio transmission and/or reception unit 10. The higher layer processing unit 14 performs processing of the Medium Access Control (MAC) layer, the Packet Data Convergence Protocol (PDCP) layer, a Radio Link Control (RLC) layer, and the Radio Resource Control (RRC) layer.

[0114] The medium access control layer processing unit 15 included in the higher layer processing unit 14 performs processing of the Medium Access Control layer.

[0115] The radio resource control layer processing unit 16 included in the higher layer processing unit 14 performs processing of the Radio Resource Control layer. The radio resource control layer processing unit 16 manages the various types of configuration information/parameters of the terminal apparatus 1. The radio resource control layer processing unit 16 sets the various types of configuration information/parameters, based on higher layer signaling received from the base station apparatus 3. That is, the radio resource control layer processing unit 16 sets the various types of configuration information/parameters, based on information indicating the various types of configuration information/parameters received from the base station apparatus 3.

[0116] The radio transmission and/or reception unit 10 performs processing of the physical layer, such as modulation, demodulation, coding, and decoding. The radio transmission and/or reception unit 10 demultiplexes, demodulates, and decodes a signal received from the base station apparatus 3, and outputs the information resulting from the decoding to the higher layer processing unit 14. The radio transmission and/or reception unit 10 modulates and codes data to generate a transmit signal, and transmits the transmit signal to the base station apparatus 3.

[0117] The RF unit 12 converts (down-converts) a signal received via the antenna unit 11 into a baseband signal by orthogonal demodulation and removes unnecessary frequency components. The RF unit 12 outputs the processed analog signal to the baseband unit.

[0118] The baseband unit 13 converts the analog signal input from the RF unit 12 into a digital signal. The baseband unit 13 removes a portion corresponding to a Cyclic Prefix (CP) from the digital signal resulting from the conversion, performs Fast Fourier Transform (FFT) on the signal from which the CP has been removed, and extracts a signal in the frequency domain.

[0119] The baseband unit 13 performs Inverse Fast Fourier Transform (IFFT) on data, generates an SC-FDMA symbol, attaches a CP to the generated SC-FDMA symbol, generates a baseband digital signal, and converts the baseband digital signal into an analog signal. The baseband unit 13 outputs the analog signal resulting from the conversion, to the RF unit 12.

[0120] The RF unit 12 removes unnecessary frequency components from the analog signal input from the baseband

unit 13 using a low-pass filter, up-converts the analog signal into a signal of a carrier frequency, and transmits the final result via the antenna unit 11. Furthermore, the RF unit 12 amplifies power. Furthermore, the RF unit 12 may have a function of controlling transmit power. The RF unit 12 is also referred to as a transmit power controller.

5 [0121] FIG. 9 is a schematic block diagram illustrating a configuration of a base station apparatus 3 according to the present embodiment. As illustrated, the base station apparatus 3 is configured to include a radio transmission and/or reception unit 30 and a higher layer processing unit 34. The radio transmission and/or reception unit 30 is configured to include an antenna unit 31, an RF unit 32, and a baseband unit 33. The higher layer processing unit 34 is configured to include a medium access control layer processing unit 35 and a radio resource control layer processing unit 36. The radio transmission and/or reception unit 30 is also referred to as a transmitter, a receiver, or a physical layer processing unit.

10 [0122] The higher layer processing unit 34 performs processing of the Medium Access Control (MAC) layer, the Packet Data Convergence Protocol (PDCP) layer, the Radio Link Control (RLC) layer, and the Radio Resource Control (RRC) layer.

15 [0123] The medium access control layer processing unit 35 included in the higher layer processing unit 34 performs processing of the Medium Access Control layer.

[0124] The radio resource control layer processing unit 36 included in the higher layer processing unit 34 performs processing of the Radio Resource Control layer. The radio resource control layer processing unit 36 generates, or acquires from a higher node, downlink data (transport block) arranged on a physical downlink shared channel, system information, an RRC message, a MAC Control Element (CE), and the like, and outputs the generated or acquired data to the radio transmission and/or reception unit 30. Furthermore, the radio resource control layer processing unit 36 manages various types of configuration information/parameters for each of the terminal apparatuses 1. The radio resource control layer processing unit 36 may set various types of configuration information/parameters for each of the terminal apparatuses 1 via the higher layer signaling. In other words, the radio resource control layer processing unit 36 transmits/broadcasts information indicating various types of configuration information/parameters.

20 [0125] The functionality of the radio transmission and/or reception unit 30 is similar to that of the radio transmission and/or reception unit 10, and hence description thereof is omitted.

[0126] Each of the units having the reference signs 10 to 16 included in the terminal apparatus 1 may be configured as a circuit. Each of the units having the reference signs 30 to 36 included in the base station apparatus 3 may be configured as a circuit.

30 [0127] Aspects of the terminal apparatus 1 according to the present embodiment will be described below.

[0128]

(1) A first aspect of the present embodiment is the terminal apparatus 1 that includes a receiver 10 for receiving non-demand SI (System Information) including information for indicating on-demand SI supported by a cell, and a transmitter 10 for transmitting a system information request to request transmission of on-demand SI supported by the cell.

(2) In the first aspect of the present embodiment, the on-demand SI is transmitted based on the system information request, and the non-demand SI is transmitted regardless of the system information request.

40 (3) A second aspect of the present embodiment is the base station apparatus 3 that includes a transmitter 30 for transmitting non-demand SI (System Information) including information for indicating on-demand SI supported by a cell, and a receiver 30 for receiving a system information request to request transmission of on-demand SI supported by the cell.

45 (4) In the second aspect of the present embodiment, the on-demand SI is transmitted based on the system information request, and the non-demand SI is transmitted regardless of the system information request.

(5) A third aspect of the present embodiment is the terminal apparatus 1 that includes the receiver 10 for receiving multiple pieces of on-demand SI (System Information), and the transmitter 10 for transmitting a system information request to request transmission of a first piece of on-demand SI among the multiple pieces of on-demand SI.

50 (6) In the third aspect of the present embodiment, the system information request to request transmission of the first piece of on-demand SI is transmitted in a resource belonging to a first set corresponding to the first piece of on-demand SI among multiple sets of resources for transmitting the system information request.

(7) In the third aspect of the present embodiment, the receiver 10 receives non-demand SI including information for indicating the multiple sets, the multiple sets include at least a first set corresponding to the first piece of on-demand SI, and a second set corresponding to a second piece of on-demand SI, and the non-demand SI is transmitted regardless of the system information request.

55 (8) In the third aspect of the present embodiment, the system information request to request transmission of the first piece of on-demand SI includes a preamble sequence corresponding to the first piece of on-demand SI.

(9) In the third aspect of the present embodiment, the receiver 10 receives non-demand SI including information for

indicating the preamble sequence, and the non-demand SI is transmitted regardless of the system information request.

(10) A fourth aspect of the present embodiment is the base station apparatus 3 that includes the transmitter 30 for transmitting multiple pieces of on-demand SI (System Information), and the receiver 30 for receiving a system information request to request transmission of a first piece of on-demand SI among the multiple pieces of on-demand SI.

(11) In the fourth aspect of the present embodiment, the system information request to request transmission of the first piece of on-demand SI is received in a resource belonging to a first set corresponding to the first piece of on-demand SI among the multiple sets of resources for transmitting the system information request.

(12) In the fourth aspect of the present embodiment, the transmitter 30 transmits non-demand SI including information for indicating the multiple sets, the multiple sets include at least a first set corresponding to the first piece of on-demand SI, and a second set corresponding to a second piece of on-demand SI, and the non-demand SI is transmitted regardless of the system information request.

(13) In the fourth aspect of the present embodiment, the system information request to request transmission of the first piece of on-demand SI includes a preamble sequence corresponding to the first piece of on-demand SI.

(14) In the fourth aspect of the present embodiment, the transmitter 30 receives non-demand SI including information for indicating the preamble sequence, and the non-demand SI is transmitted regardless of the system information request.

(15) A fifth aspect of the present embodiment is the terminal apparatus 1 that includes the transmitter 10 for transmitting a system information request to request transmission of a first piece of on-demand SI among multiple pieces of on-demand SI, and the receiver 10 for monitoring the first piece of on-demand SI based on transmission of a system information request to request transmission of the first piece of on-demand SI, in which the first piece of on-demand SI is monitored during a first window included in a monitoring window, a duration of the monitoring window is at least based on a transmission timing of a system information request to request transmission of the first piece of on-demand SI, the first window is given at least based on information included in non-demand SI, the on-demand SI is transmitted based on the system information request, and the non-demand SI is transmitted regardless of the system information request.

(16) In the fifth aspect of the present embodiment, the first window is given regardless of the transmission timing of the system information request to request transmission of the first piece of on-demand SI.

(17) In the fifth aspect of the present embodiment, a length of the monitoring window is given based on information included in the non-demand SI.

(18) A sixth aspect of the present embodiment is the base station apparatus 3 that includes the receiver 30 for receiving a system information request to request transmission of a first piece of on-demand SI among multiple pieces of on-demand SI, and the transmitter 30 for transmitting the first piece of on-demand SI based on reception of a system information request to request transmission of the first piece of on-demand SI, in which the first piece of on-demand SI is transmitted during a first window included in a monitoring window, a duration of the monitoring window is at least based on a reception timing of a system information request to request transmission of the first piece of on-demand SI, the first window is given at least based on information included in non-demand SI, the on-demand SI is transmitted based on the system information request, and the non-demand SI is transmitted regardless of the system information request.

(19) In the sixth aspect of the present embodiment, the first window is given regardless of a transmission timing of the system information request to request transmission of the first piece of on-demand SI.

(20) In the sixth aspect of the present embodiment, a length of the monitoring window is given based on information included in the non-demand SI.

[0129] Accordingly, system information is effectively transmitted.

[0130] The base station apparatus 3 according to an embodiment of the present invention can also be achieved as an aggregation (an apparatus group) constituted of multiple apparatuses. Each of the apparatuses constituting the apparatus group may include some or all portions of each function or each functional block of the base station apparatus 3 according to the above-described embodiment. The apparatus group may include each general function or each functional block of the base station apparatus 3. Furthermore, the terminal apparatus 1 according to the above-described embodiment can also communicate with the base station apparatus as the aggregation.

[0131] Furthermore, the base station apparatus 3 according to the above-described embodiment may serve as an Evolved Universal Terrestrial Radio Access Network (EUTRAN). Furthermore, the base station apparatus 3 according to the above-described embodiment may have some or all portions of functions of a node higher than an eNodeB.

[0132] A program running on an apparatus according to an aspect of the present invention may serve as a program that controls a Central Processing Unit (CPU) and the like, and causes a computer to operate in such a manner as to enable the functions of the above-described embodiment according to an aspect of the present invention. Programs or

the information handled by the programs are temporarily read into a volatile memory, such as a Random Access Memory (RAM) while being processed, or stored in a non-volatile memory, such as a flash memory, or a Hard Disk Drive (HDD), and then read by the CPU to be modified or rewritten, as necessary.

5 [0133] Moreover, the apparatuses in the above-described embodiment may be partially enabled by a computer. In such a case, a program for enabling such control functions may be recorded on a computer-readable recording medium to cause a computer system to read and perform the program recorded on the recording medium. It is assumed that the "computer system" refers to a computer system built into the apparatuses, and the computer system includes an operating system and hardware components such as a peripheral device. Furthermore, the "computer-readable recording medium" may be any of a semiconductor recording medium, an optical recording medium, a magnetic recording medium, and
10 the like.

[0134] Moreover, the "computer-readable recording medium" may include a medium that dynamically retains a program for a short period of time, such as a communication line that is used to transmit the program over a network such as the Internet or over a communication line such as a telephone line, and may also include a medium that retains a program for a fixed period of time, such as a volatile memory within the computer system for functioning as a server or a client
15 in such a case. Furthermore, the above-described program may be configured to enable some of the functions described above, and additionally may be configured to enable the functions described above, in combination with a program already recorded in the computer system.

[0135] Furthermore, each functional block or various characteristics of the apparatuses used in the above-described embodiment may be mounted or performed on an electric circuit, that is, typically an integrated circuit or multiple integrated
20 circuits. An electric circuit designed to perform the functions described in the present specification may include a general-purpose processor, a Digital Signal Processor (DSP), an Application Specific Integrated Circuit (ASIC), a Field Programmable Gate Array (FPGA), or other programmable logic devices, discrete gates or transistor logic, discrete hardware components, or a combination thereof. The general-purpose processor may be a microprocessor, or the processor may be a processor of known type, a controller, a micro-controller, or a state machine instead. The general-purpose processor
25 or the above-mentioned circuits may be constituted of a digital circuit, or may be constituted of an analog circuit. Furthermore, in a case that with advances in semiconductor technology, a circuit integration technology appears that replaces the present integrated circuits, it is also possible to use an integrated circuit based on the technology.

[0136] Note that the invention of the present patent application is not limited to the above-described embodiments. In the embodiment, apparatuses have been described as an example, but the invention of the present application is not
30 limited to these apparatuses, and is applicable to a terminal apparatus or a communication device of a fixed-type or a stationary-type electronic apparatus installed indoors or outdoors, for example, an AV apparatus, a kitchen apparatus, a cleaning or washing machine, an air-conditioning apparatus, office equipment, a vending machine, and other household apparatus.

[0137] The embodiments of the present invention have been described in detail above referring to the drawings, but the specific configuration is not limited to the embodiments and includes, for example, an amendment to a design that
35 falls within the scope that does not depart from the gist of the present invention. Furthermore, various modifications are possible within the scope of an embodiment of the present invention defined by claims, and embodiments that are made by suitably combining technical means disclosed according to the different embodiments are also included in the technical scope of an embodiment of the present invention. Furthermore, a configuration in which a constituent element that
40 achieves the same effect is substituted for the one that is described in the embodiments is also included in the technical scope of the present invention.

Cross-Reference of Related Application

45 [0138] This application claims priority based on JP 2016-019540 filed in Japan on February 4, 2016, and the contents of which are incorporated herein by reference.

Reference Signs List

50 [0139]

- 1 (1A, 1B, 1C) Terminal apparatus
- 3 Base station apparatus
- 10 Radio transmission and/or reception unit
- 55 11 Antenna unit
- 12 RF unit
- 13 Baseband unit
- 14 Higher layer processing unit

- 15 Medium access control layer processing unit
- 16 Radio resource control layer processing unit
- 30 Radio transmission and/or reception unit
- 31 Antenna unit
- 5 32 RF unit
- 33 Baseband unit
- 34 Higher layer processing unit
- 35 Medium access control layer processing unit
- 36 Radio resource control layer processing unit

Claims

- 15 1. A terminal apparatus comprising:
 - a receiver configured to receive multiple pieces of on-demand SI (System Information); and
 - a transmitter configured to transmit a system information request to request transmission of a first piece of on-demand SI among the multiple pieces of on-demand SI.
- 20 2. The terminal apparatus according to claim 1, wherein a system information request to request transmission of the first piece of on-demand SI is transmitted in a resource belonging to a first set corresponding to the first piece of on-demand SI among multiple sets of resources for transmission of a system information request.
- 25 3. The terminal apparatus according to claim 2, wherein the receiver receives non-demand SI including information for indicating the multiple sets, the multiple sets include at least a first set corresponding to the first piece of on-demand SI, and a second set corresponding to a second piece of on-demand SI, and the non-demand SI is transmitted regardless of the system information request.
- 30 4. The terminal apparatus according to claim 1, wherein a system information request to request transmission of the first piece of on-demand SI includes a preamble sequence corresponding to the first piece of on-demand SI.
- 35 5. The terminal apparatus according to claim 4, wherein the receiver receives non-demand SI including information for indicating the preamble sequence, and the non-demand SI is transmitted regardless of the system information request.
- 40 6. A base station apparatus comprising:
 - a transmitter configured to transmit multiple pieces of on-demand SI (System Information); and
 - a receiver configured to receive a system information request to request transmission of a first piece of on-demand SI among the multiple pieces of on-demand SI.
- 45 7. The base station apparatus according to claim 6, wherein a system information request to request transmission of the first piece of on-demand SI is received in a resource belonging to a first set corresponding to the first piece of on-demand SI among multiple sets of resources for transmission of a system information request.
- 50 8. The base station apparatus according to claim 7, wherein the transmitter transmits non-demand SI including information for indicating the multiple sets, the multiple sets include at least a first set corresponding to the first piece of on-demand SI, and a second set corresponding to a second piece of on-demand SI, and the non-demand SI is transmitted regardless of the system information request.
- 55 9. The base station apparatus according to claim 6, wherein a system information request to request transmission of the first piece of on-demand SI includes a preamble sequence corresponding to the first piece of on-demand SI.
10. The base station apparatus according to claim 9, wherein the transmitter receives non-demand SI including information for indicating the preamble sequence, and the non-demand SI is transmitted regardless of the system information request.

11. A communication method used for a terminal apparatus, comprising the steps of:
- receiving multiple pieces of on-demand SI (System Information); and
transmitting a system information request to request transmission of a first piece of on-demand SI among the
multiple pieces of on-demand SI.
12. The communication method according to claim 11, wherein a system information request to request transmission
of the first piece of on-demand SI is transmitted in a resource belonging to a first set corresponding to the first piece
of on-demand SI among multiple sets of resources for transmission of a system information request.
13. The communication method according to claim 12, wherein
non-demand SI including information for indicating the multiple sets is received,
the multiple sets include at least a first set corresponding to the first piece of on-demand SI, and a second set
corresponding to a second piece of on-demand SI, and
the non-demand SI is transmitted regardless of the system information request.
14. The communication method according to claim 11, wherein a system information request to request transmission
of the first piece of on-demand SI includes a preamble sequence corresponding to the first piece of on-demand SI.
15. The communication method according to claim 14, wherein
non-demand SI including information for indicating the preamble sequence is received, and
the non-demand SI is transmitted regardless of the system information request.
16. A communication method used for a base station apparatus, comprising the steps of:
- transmitting multiple pieces of on-demand SI (System Information); and
receiving a system information request to request transmission of a first piece of on-demand SI among the
multiple pieces of on-demand SI.
17. The communication method according to claim 16, wherein a system information request to request transmission
of the first piece of on-demand SI is received in a resource belonging to a first set corresponding to the first piece
of on-demand SI among multiple sets of resources for transmission of a system information request.
18. The communication method according to claim 17, wherein
non-demand SI including information for indicating the multiple sets is transmitted,
the multiple sets include at least a first set corresponding to the first piece of on-demand SI, and a second set
corresponding to a second piece of on-demand SI, and
the non-demand SI is transmitted regardless of the system information request.
19. The communication method according to claim 16, wherein a system information request to request transmission
of the first piece of on-demand SI includes a preamble sequence corresponding to the first piece of on-demand SI.
20. The communication method according to claim 19, wherein
non-demand SI including information for indicating the preamble sequence is received, and
the non-demand SI is transmitted regardless of the system information request.
21. An integrated circuit mounted on a terminal apparatus, the integrated circuit comprising:
- a reception circuit configured to receive multiple pieces of on-demand SI (System Information); and
a transmission circuit configured to transmit a system information request to request transmission of a first piece
of on-demand SI among the multiple pieces of on-demand SI.
22. An integrated circuit mounted on a base station apparatus, the integrated circuit comprising:
- a transmission circuit for transmitting multiple pieces of on-demand SI (System Information); and
a reception circuit for receiving a system information request to request transmission of a first piece of on-
demand SI among the multiple pieces of on-demand SI.

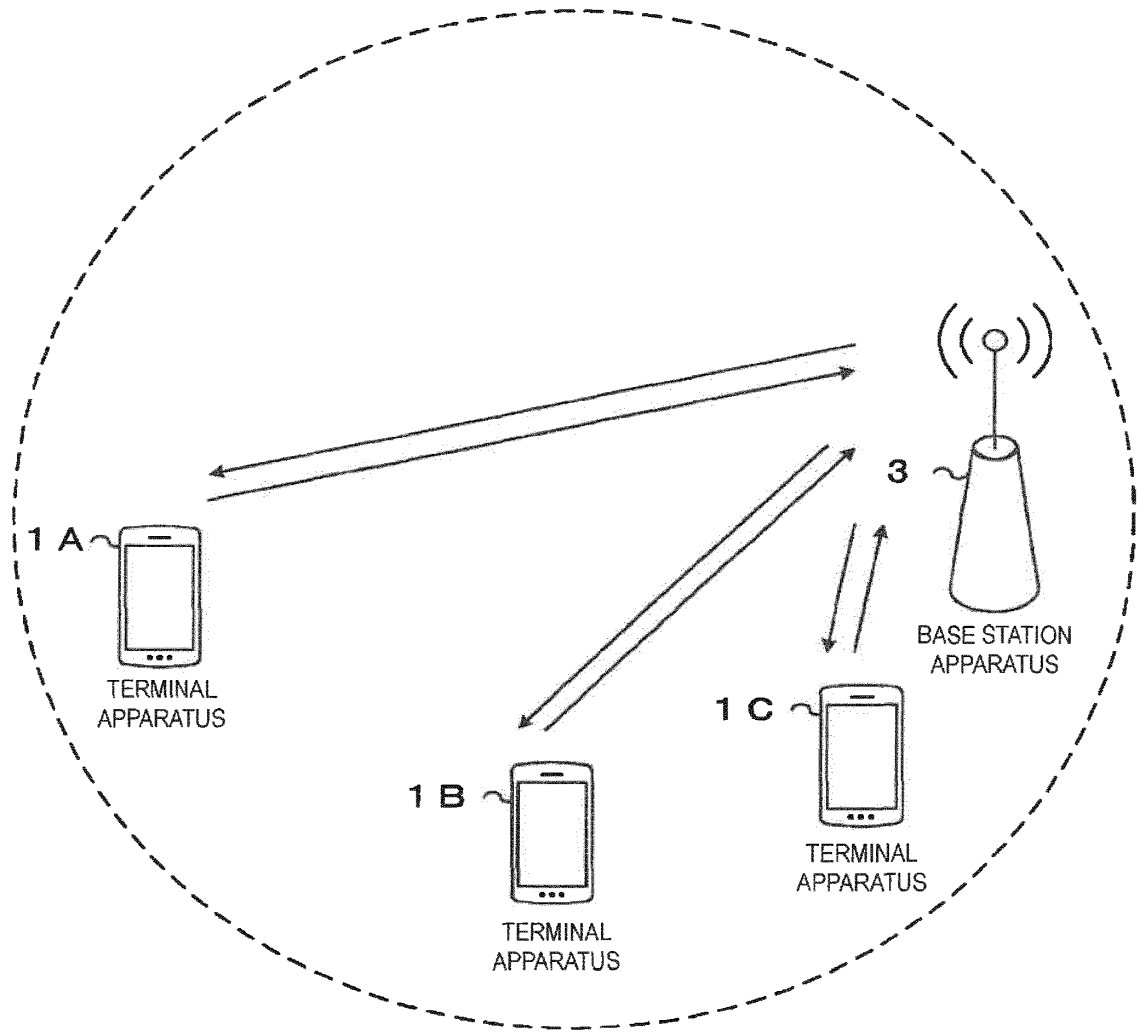


FIG. 1

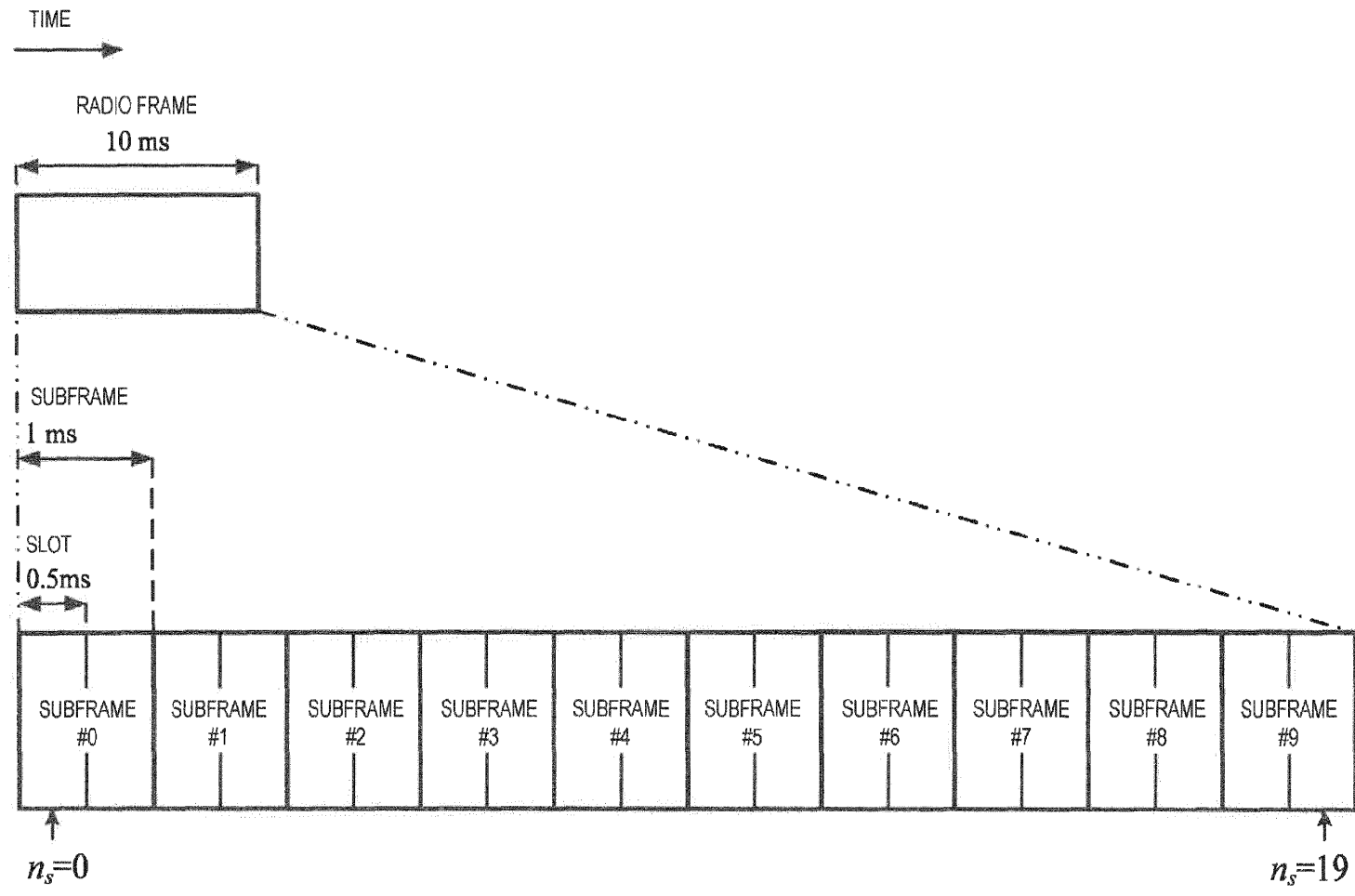


FIG. 2

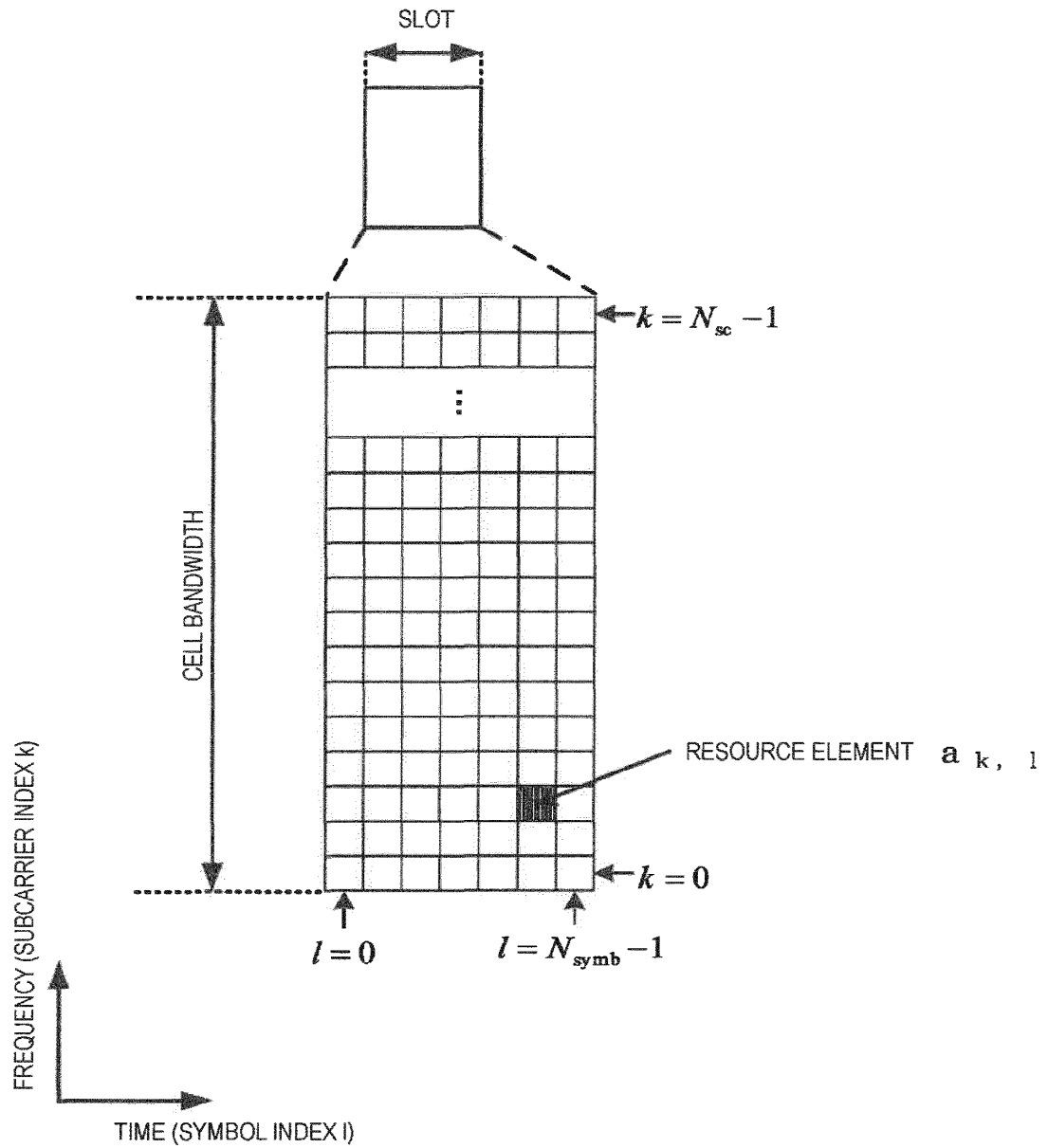


FIG. 3

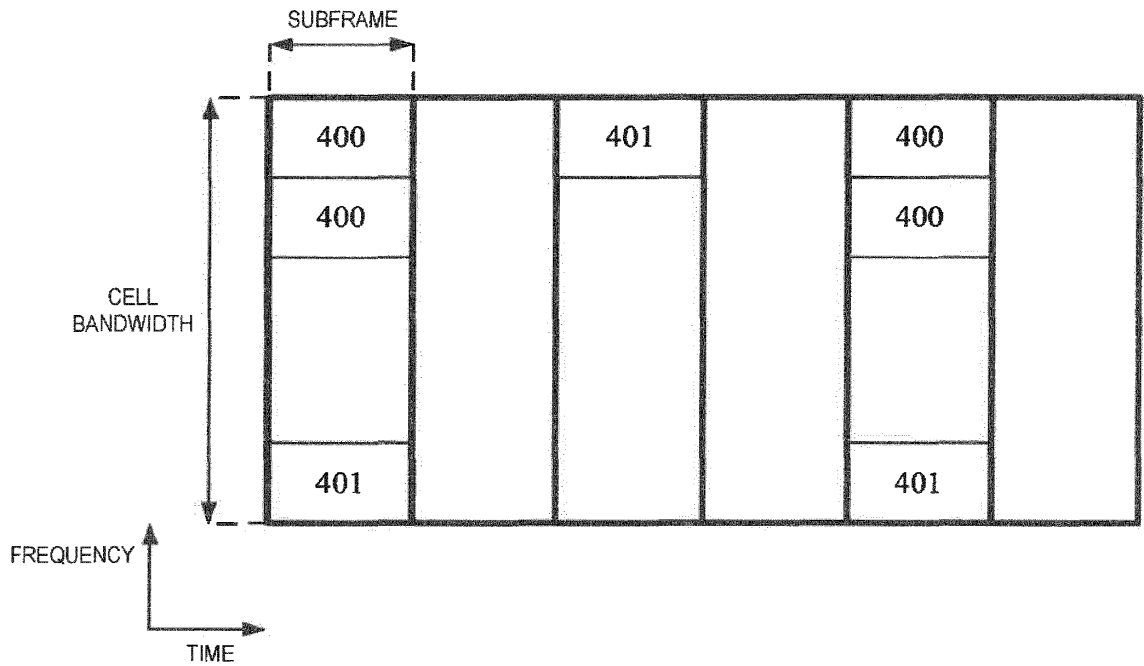


FIG. 4

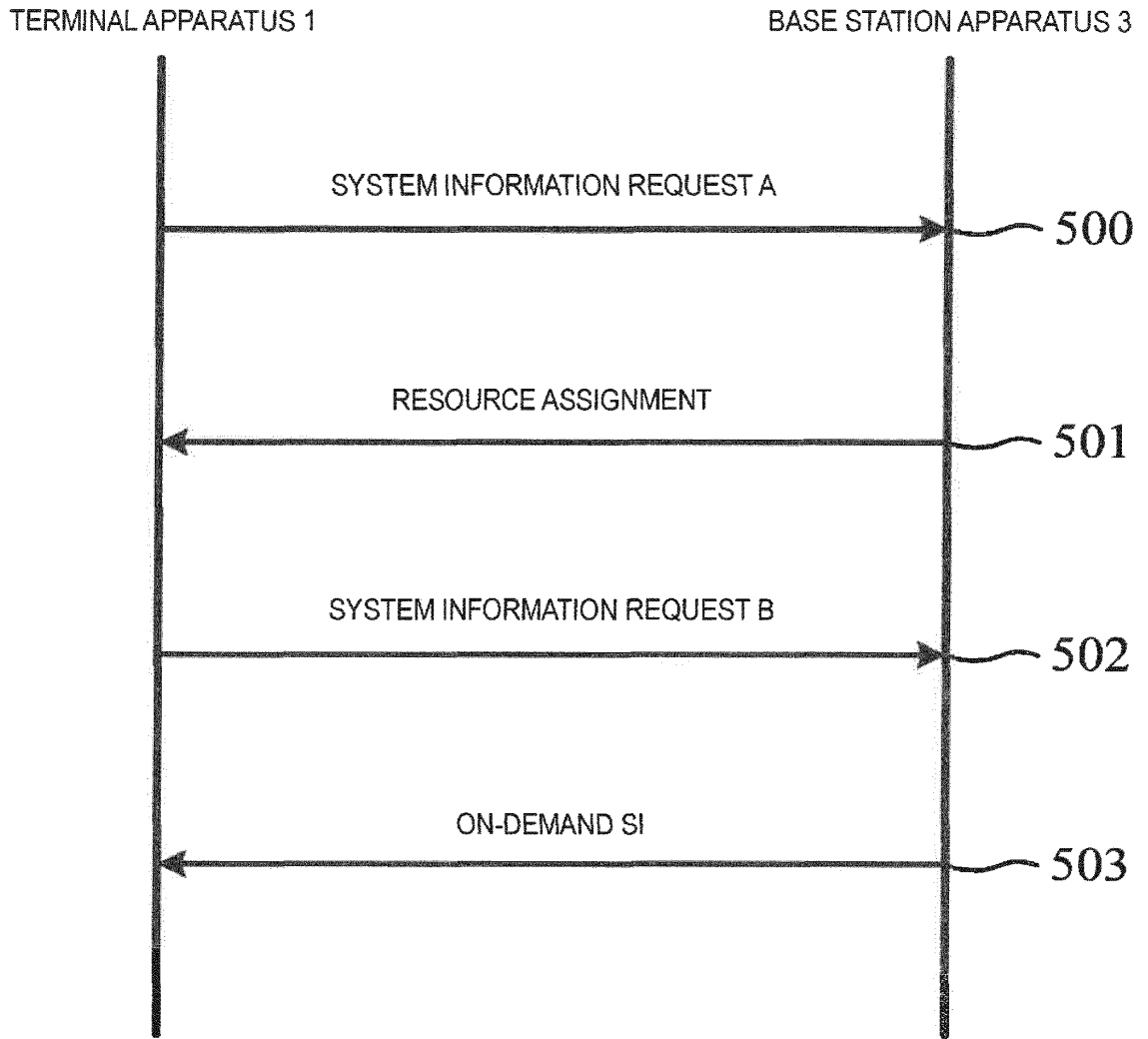


FIG. 5

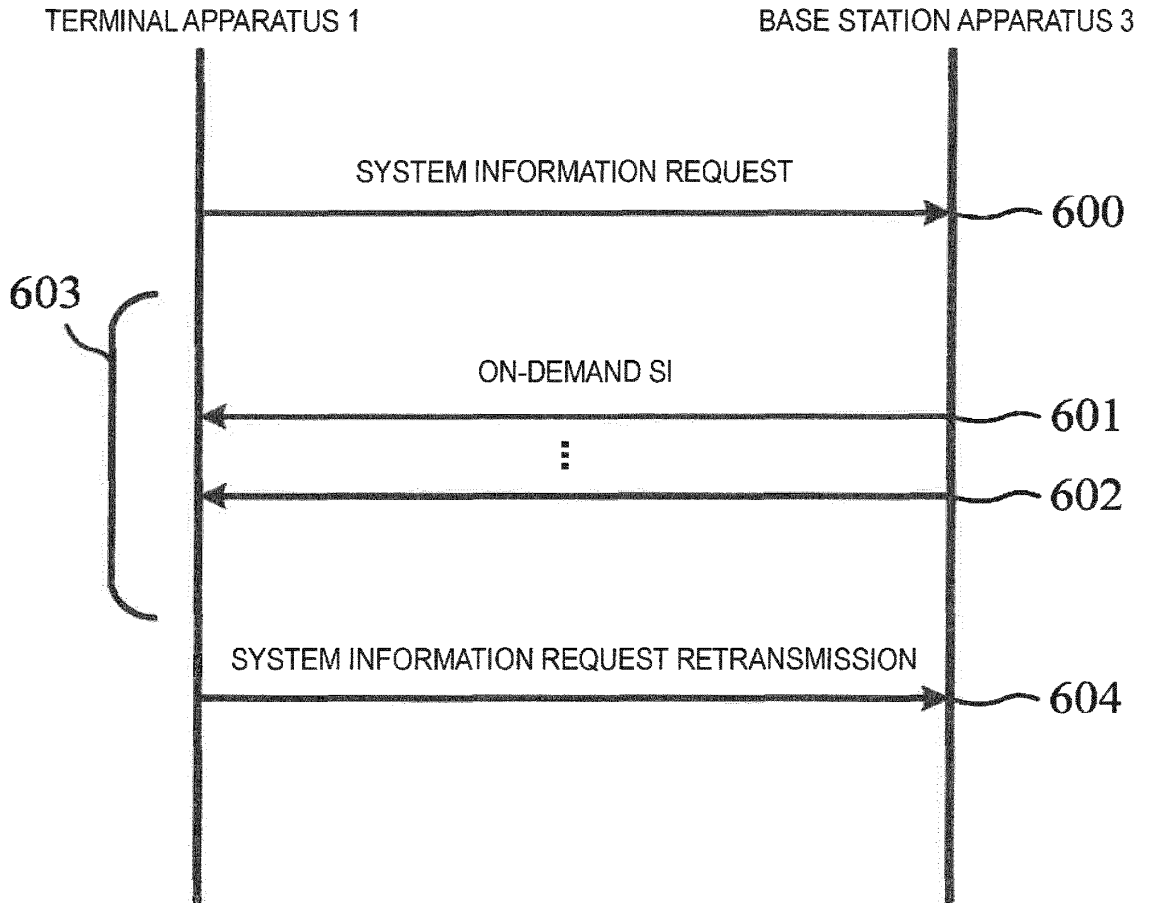
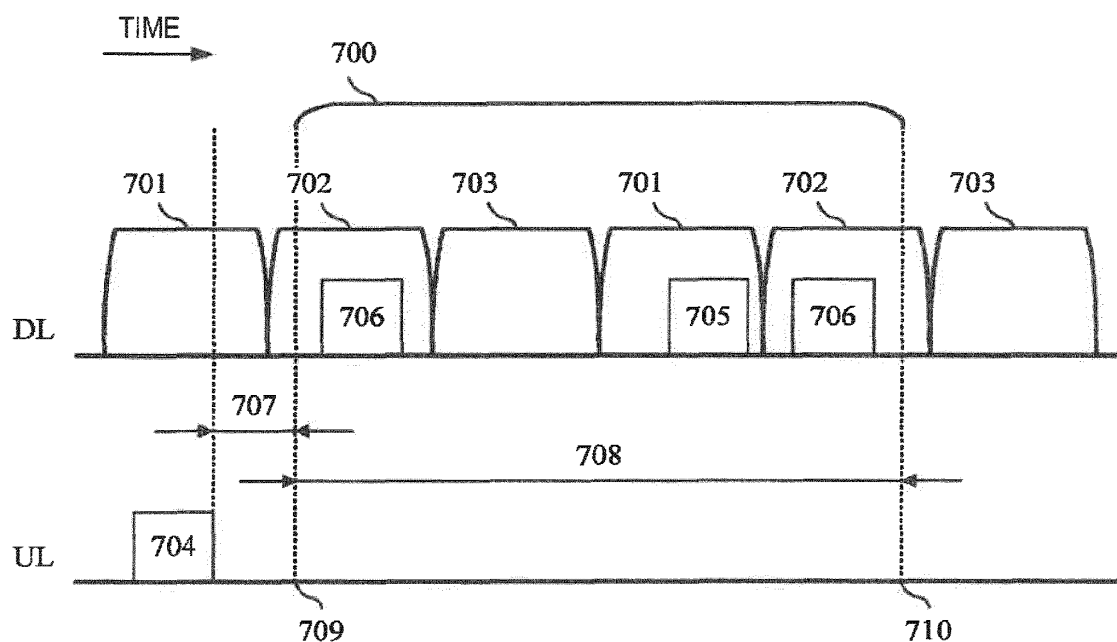


FIG. 6



- 700: MONITORING WINDOW CORRESPONDING TO ON-DEMAND SI
- 701: WINDOW CORRESPONDING TO FIRST SI TYPE ON-DEMAND SI
- 702: WINDOW CORRESPONDING TO SECOND SI TYPE ON-DEMAND SI
- 703: WINDOW CORRESPONDING TO THIRD SI TYPE ON-DEMAND SI
- 704: SYSTEM INFORMATION REQUEST TRANSMISSION
- 705: FIRST SI TYPE ON-DEMAND SI TRANSMISSION
- 706: SECOND SI TYPE ON-DEMAND SI TRANSMISSION
- 707: DURATION BETWEEN 700 AND 704
- 708: LENGTH OF 700
- 709: START TIME OF 700
- 710: END TIME OF 700

FIG. 7

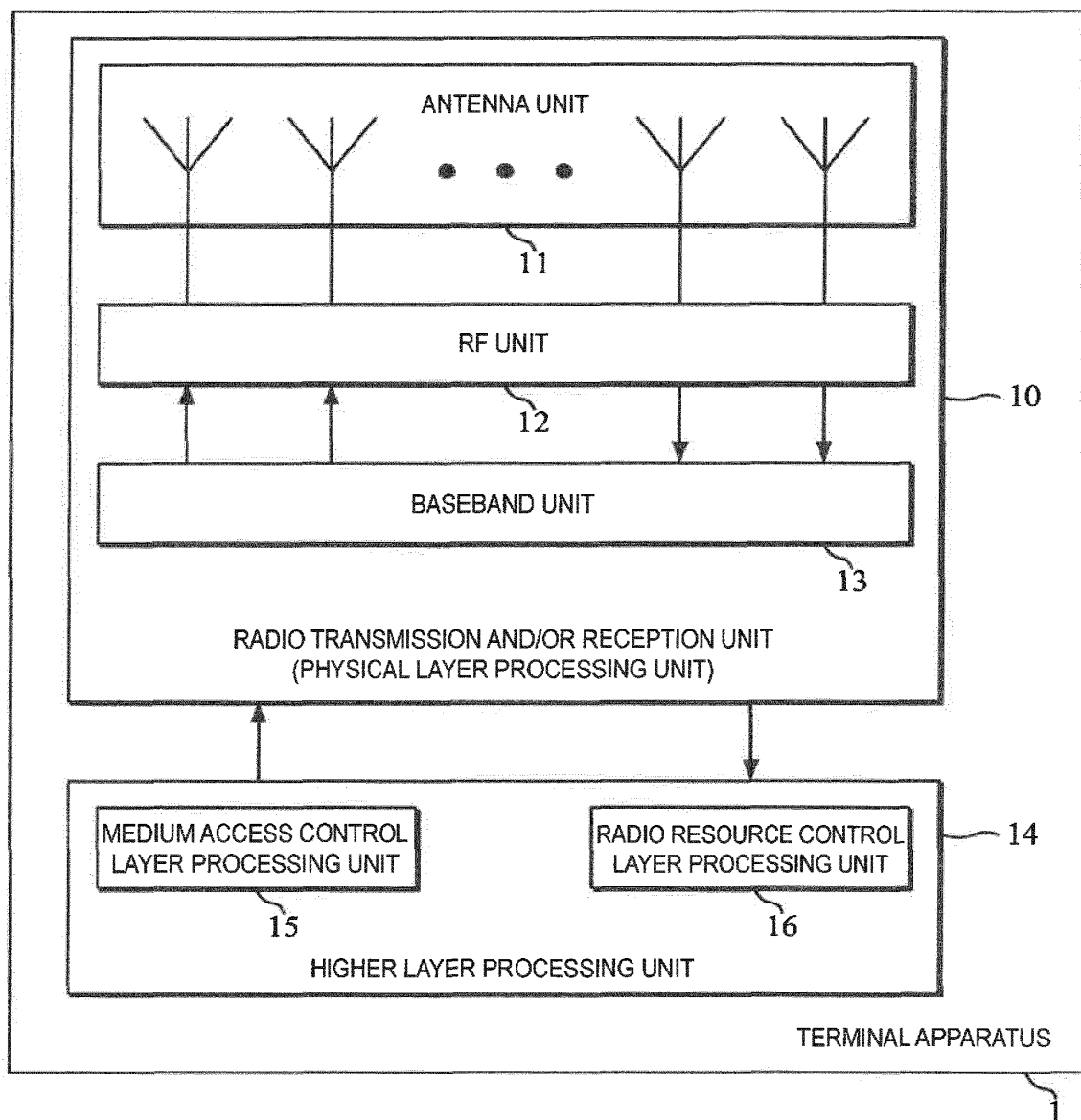


FIG. 8

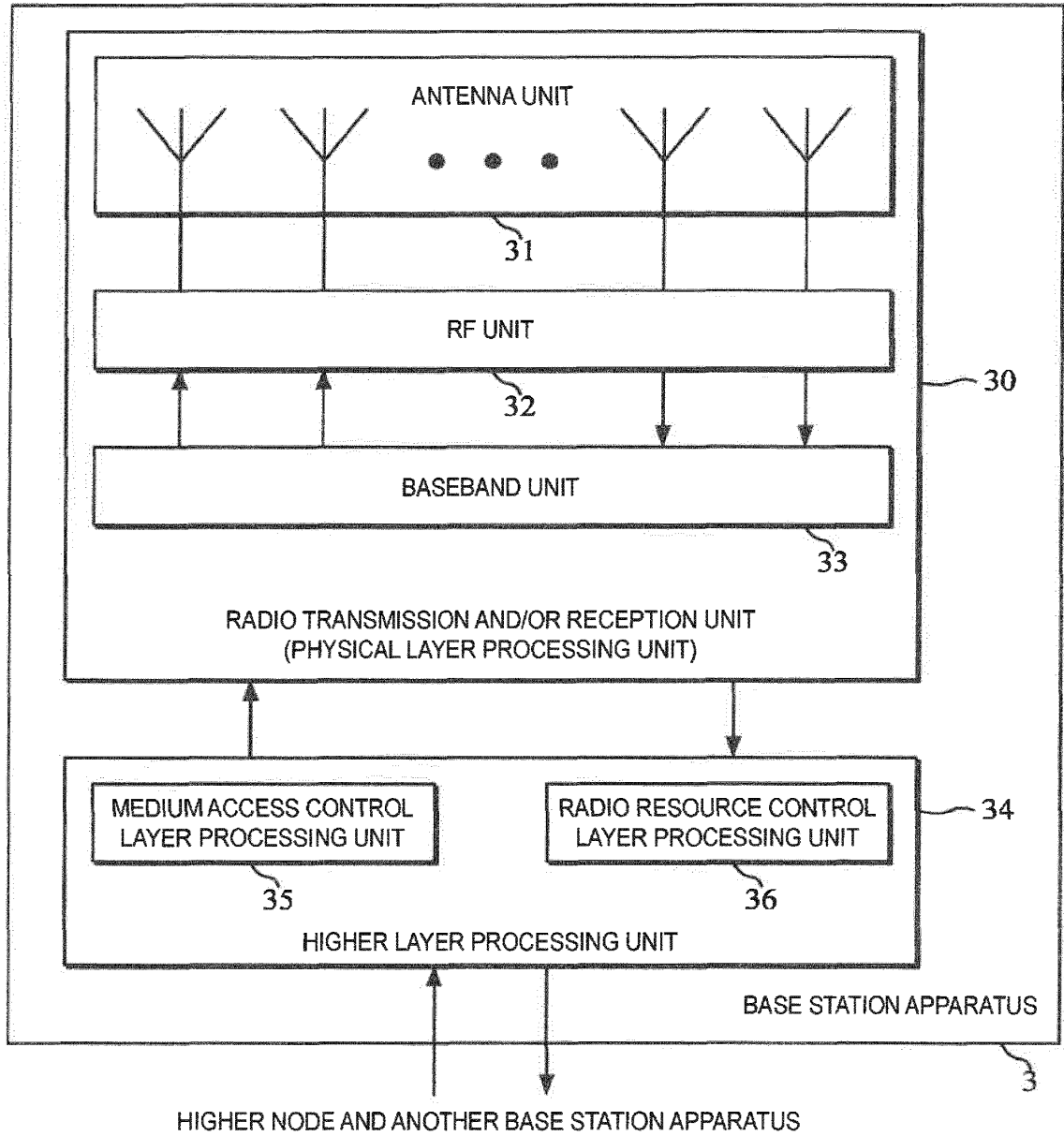


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/001741

5	A. CLASSIFICATION OF SUBJECT MATTER H04W48/14(2009.01)i, H04W72/04(2009.01)i, H04W74/08(2009.01)i		
	According to International Patent Classification (IPC) or to both national classification and IPC		
10	B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) H04W48/14, H04W72/04, H04W74/08		
15	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017 Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017		
	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	
		Relevant to claim No.	
25	X	CATT, Transfer mechanism of system information, 3GPP TSG-RAN WG2 Meeting #56bis R2-070112 [online], 2007.01.12, pages 1-5, [retrieved on 2017-02-27], Retrieved from the Internet:<URL: http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_56bis/Documents/R2-070112.zip>	1, 6, 11, 16, 21, 22 4, 9, 14, 19 2, 3, 5, 7, 8, 10, 12, 13, 15, 17, 18, 20
30	Y	JP 2010-506434 A (NEC Corp.), 25 February 2010 (25.02.2010), paragraphs [0037] to [0043]; fig. 4 to 5 & US 2010/0027466 A1 paragraphs [0054] to [0069]; fig. 4 to 5 & WO 2008/044664 A1 & EP 2070366 A1 & CN 101523957 A & KR 10-2009-0095555 A	4, 9, 14, 19
35			
40	<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
45	* 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	
50	Date of the actual completion of the international search 27 February 2017 (27.02.17)	Date of mailing of the international search report 07 March 2017 (07.03.17)	
55	Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/001741

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	QUALCOMM, 5G Views on Technology & Standardization, 3GPP RAN workshop on 5G (September 2015) [online], 2015.09.01, pages 1-21, [retrieved on 2017-02-27], Retrieved from the Internet:<URL: http://www.3gpp.org/ftp/workshop/2015-09-17_18_RAN_5G/Docs/RWS-150012.zip >	1-22

Form PCT/ISA/210 (continuation of second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

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With respect to claims 10, 20:

Claim 10 recites that "said transmission unit (of a base station apparatus) receives non-demand SI including information for indicating said preamble sequence" and claim 20 recites that "(a base station apparatus in a communication method used in the base station apparatus) receives non-demand SI including information for indicating said preamble sequence". These claim recitations are unclear because of a contradiction that the base station apparatus which transmits non-demand SI receives this non-demand SI.

It should be noted that, with respect to the aforementioned claim recitations, the international search report has been made by considering the descriptions in the aforementioned claims and claims 5 and 10, i.e., claims of a terminal apparatus corresponding to the aforementioned claims, and assuming that the transmission unit transmits the non-demand SI including information for indicating the preamble sequence (claim 10) and that (the base station apparatus in the communication method) transmits the non-demand SI including information for indicating the preamble sequence (claim 20).

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Form PCT/ISA/210 (extra sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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- 3GPP TS 36.212 V13.0.0, December 2015 [0004]
- 3GPP TS 36.213 V13.0.0, December 2015 [0004]
- 3GPP TS 36.321.V13.0.0, December 2015 [0004]
- 3GPP TS 36.331 V13.0.0, December 2015 [0004]
- **ERICSSON**. 5G - key component of the Networked Society", RWS-150009. 3GPP RAN Workshop on 5G, 18 September 2015 [0004]
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Publication Number: EP 3454620 A1

Publication Date: Mar 13, 2019

Abstract

Provided are a method for receiving an on-demand system information (OSI) block by a terminal in a wireless communication system and an apparatus for supporting the same. The method may comprise the steps of: receiving, from a network, an on-demand system information (OSI) configuration including information on mapping between the OSI block and information on a system information request (SIR) preamble; determining an OSI block of interest; selecting an SIR preamble corresponding to the OSI block of interest on the basis of the OSI configuration; transmitting the selected SIR preamble to a serving cell so as to request the determined OSI block of interest; and receiving the requested OSI block of interest.



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(71) Applicant: **LG Electronics Inc.**
Seoul 07336 (KR)

(72) Inventor: **KIM, Sangwon**
Seoul 06772 (KR)

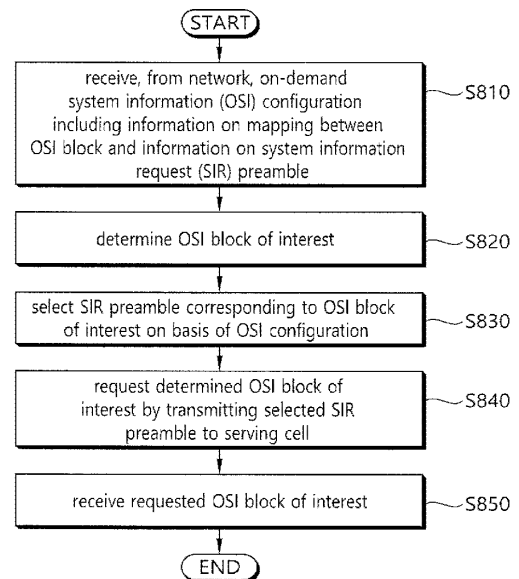
(74) Representative: **Katérlé, Axel**
Wuesthoff & Wuesthoff
Patentanwälte PartG mbB
Schweigerstraße 2
81541 München (DE)

(30) Priority: **04.05.2016 US 201662331448 P**

(54) **METHOD AND APPARATUS FOR RECEIVING OSI BLOCK IN WIRELESS COMMUNICATION SYSTEM**

(57) Provided are a method for receiving an on-demand system information (OSI) block by a terminal in a wireless communication system and an apparatus for supporting the same. The method may comprise the steps of: receiving, from a network, an on-demand system information (OSI) configuration including information on mapping between OSI block and information on system information request (SIR) preamble; determining an OSI block of interest; selecting an SIR preamble corresponding to the OSI block of interest on the basis of the OSI configuration; transmitting the selected SIR preamble to a serving cell so as to request the determined OSI block of interest; and receiving the requested OSI block of interest.

FIG. 8



EP 3 454 620 A1

Description**BACKGROUND OF THE INVENTION**Field of the invention

[0001] The present invention relates to a wireless communication system, and more particularly, to a method for a user equipment (UE) to receive on-demand system information (OSI) block and an apparatus supporting the same.

Related Art

[0002] In order to meet the demand for wireless data traffic soaring since the 4th generation (4G) communication system came to the market, there are ongoing efforts to develop enhanced 5th generation (5G) communication systems or pre-5G communication systems. For the reasons, the 5G communication system or pre-5G communication system is called the beyond 4G network communication system or post long-term evolution (LTE) system.

[0003] In order to achieve the high data rates, 5G communication system may be implemented in very high frequency (mmWave) range (e.g., 60 gigabytes (60GHz), such as a band) is being considered. In order to increase the path transfer distance loss mitigation and radio wave propagation in the very high frequency band, 5G communication system, beam forming (beamforming), giant array multiple-input multiple-output (massive MIMO), I-D multiple-input multiple-output (Full Dimensional MIMO: FD-MIMO), comprising: an array antenna (antenna array), an analog beam forming (analog beam-forming), and the large antenna (large scale antenna) techniques are discussed.

[0004] In addition to the network to improve the system, 5G communication system, the evolved small cells, improved small cell (advanced small cell), cloud radio access network (cloud radio access network: cloud RAN), high density network (ultra-dense network), device communications (device to device communication: D2D), wireless backhaul (wireless backhaul), mobile network (moving network), cooperative communication (cooperative communication), CoMP (Coordinated Multi-Points), and receiving an interference cancellation (interference cancellation) development of technologies such as this have been made.

[0005] In addition, 5G system, advanced coding and modulation (Advanced Coding Modulation: ACM) approach is FQAM (Hybrid FSK and QAM Modulation) and SWSC (Sliding Window Superposition Coding), and advanced access technologies FBMC (Filter Bank Multi Carrier), NOMA have been developed, such as (non orthogonal multiple access), and SCMA (sparse code multiple access).

[0006] System information refers to essential information for communication between a terminal and a base

station. In 3GPP LTE, the system information is divided into an MIB (Master Information Block) and an SIB (System Information Block). The MIB is the most essential information. The SIB is subdivided into SIB-x forms according to its importance or cycle. The MIB is transmitted through a PBCH (Physical Broadcast Channel) which is a physical channel. The SIB is common control information and is transmitted through a PDCCH differently from the MIB.

SUMMARY OF THE INVENTION

[0007] Meanwhile, the number of system information blocks is continuously increasing, and radio resources are required to broadcast a system information block. Thus, as the number of system information blocks increases, the quantity of radio resources required to broadcast a system information block also inevitably increases. To transmit continuously increasing system information to a user equipment (UE), it is necessary to propose a method for acquiring system information that efficiently utilizes radio resources.

[0008] According to an embodiment, there is provided a method for receiving, by a UE, an on-demand system information (OSI) block in a wireless communication system. The method may include: receiving, from a network, an OSI configuration including information on mapping between information on a system information request (SIR) preamble and an OSI block; determining an OSI block of interest; selecting an SIR preamble corresponding to the OSI block of interest on the basis of the OSI configuration; requesting the determined OSI block of interest by transmitting the selected SIR preamble to a serving cell; and receiving the requested OSI block of interest.

[0009] The information on the SIR preamble may be a pattern of the SIR preamble.

[0010] The information on the SIR preamble may be an identifier (ID) of the SIR preamble.

[0011] The information on the SIR preamble may be an index of the SIR preamble.

[0012] The information on the SIR preamble may be a resource for the SIR preamble.

[0013] Different SIR preambles may be mapped to different OSI blocks. One SIR preamble may be mapped to a plurality of OSI blocks.

[0014] When the UE is interested in receiving a particular OSI block, the particular OSI block is not broadcast by the serving cell of the UE, and the UE does not have the particular OSI block that is valid, the particular OSI block may be determined as the OSI block of interest.

[0015] The method may further include requesting the OSI block of interest again by transmitting the selected SIR preamble to the serving cell when the OSI block of interest is not received within an OSI window.

[0016] The method may further include considering that obtaining system information fails when the OSI block of interest is not received within an OSI window

and the number of times the SIR preamble is transmitted to the serving cell reaches the maximum number of SIR preamble transmissions. The serving cell may be considered by the UE as a barred cell.

[0017] The OSI configuration may further include at least one of a set of resources for transmitting the SIR preamble, a power-ramping factor for transmitting the SIR preamble, or a maximum transmission value for the SIR preamble.

[0018] The selected SIR preamble may be transmitted to the serving cell only during an SIR occasion.

[0019] The selected SIR preamble may be transmitted to the serving cell only when the OSI block of interest is not broadcast.

[0020] The OSI configuration may be broadcast through a network slice instance (NSI).

[0021] According to another embodiment, there is provided a UE for receiving an OSI block in a wireless communication system. The UE may include: a memory; a transceiver; and a processor to connect the memory and the transceiver, wherein the processor may be configured to: control the transceiver to receive, from a network, an OSI configuration including information on mapping between information on an SIR preamble and an OSI block; determine an OSI block of interest; select an SIR preamble corresponding to the OSI block of interest on the basis of the OSI configuration; control the transceiver to request the determined OSI block of interest by transmitting the selected SIR preamble to a serving cell; and control the transceiver to receive the requested OSI block of interest.

[0022] A UE can selectively receive OSI of interest.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

FIG. 1 shows LTE system architecture.

FIG. 2 shows a control plane of a radio interface protocol of an LTE system.

FIG. 3 shows a user plane of a radio interface protocol of an LTE system.

FIG. 4 shows an example of transmitting a master information block (MIB), system information block1 (SIB1), and other SIBs.

FIG. 5 shows an update of system information.

FIG. 6 illustrates a contention-based random access procedure.

FIG. 7 illustrates a non-contention random access procedure.

FIG. 8 is a block diagram illustrating a method for a UE to receive an on-demand system information (OSI) block according to an embodiment of the present invention.

FIG. 9 is a block diagram illustrating a wireless communication system according to the embodiment of the present invention.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0024] The technology described below can be used in various wireless communication systems such as code division multiple access (CDMA), frequency division multiple access (FDMA), time division multiple access (TDMA), orthogonal frequency division multiple access (OFDMA), single carrier frequency division multiple access (SC-FDMA), etc. The CDMA can be implemented with a radio technology such as universal terrestrial radio access (UTRA) or CDMA-2000. The TDMA can be implemented with a radio technology such as global system for mobile communications (GSM)/general packet radio service (GPRS)/enhanced data rate for GSM evolution (EDGE). The OFDMA can be implemented with a radio technology such as institute of electrical and electronics engineers (IEEE) 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20, evolved UTRA (E-UTRA), etc. IEEE 802.16m is evolved from IEEE 802.16e, and provides backward compatibility with a system based on the IEEE 802.16e. The UTRA is a part of a universal mobile telecommunication system (UMTS). 3rd generation partnership project (3GPP) long term evolution (LTE) is a part of an evolved UMTS (E-UMTS) using the E-UTRA. The 3GPP LTE uses the OFDMA in a downlink and uses the SC-FDMA in an uplink. LTE-advanced (LTE-A) is an evolution of the LTE. 5G is an evolution of the LTE-A.

[0025] For clarity, the following description will focus on LTE-A/5G. However, technical features of the present invention are not limited thereto.

[0026] FIG. 1 shows LTE system architecture. The communication network is widely deployed to provide a variety of communication services such as voice over internet protocol (VoIP) through IMS and packet data.

[0027] Referring to FIG. 1, the LTE system architecture includes one or more user equipment (UE; 10), an evolved-UMTS terrestrial radio access network (E-UTRAN) and an evolved packet core (EPC). The UE 10 refers to a communication equipment carried by a user. The UE 10 may be fixed or mobile, and may be referred to as another terminology, such as a mobile station (MS), a user terminal (UT), a subscriber station (SS), a wireless device, etc.

[0028] The E-UTRAN includes one or more evolved node-B (eNB) 20, and a plurality of UEs may be located in one cell. The eNB 20 provides an end point of a control plane and a user plane to the UE 10. The eNB 20 is generally a fixed station that communicates with the UE 10 and may be referred to as another terminology, such as a base station (BS), a base transceiver system (BTS), an access point, etc. One eNB 20 may be deployed per cell. There are one or more cells within the coverage of the eNB 20. A single cell is configured to have one of bandwidths selected from 1.25, 2.5, 5, 10, and 20 MHz, etc., and provides downlink or uplink transmission services to several UEs. In this case, different cells can be configured to provide different bandwidths.

[0029] Hereinafter, a downlink (DL) denotes commu-

nication from the eNB 20 to the UE 10, and an uplink (UL) denotes communication from the UE 10 to the eNB 20. In the DL, a transmitter may be a part of the eNB 20, and a receiver may be a part of the UE 10. In the UL, the transmitter may be a part of the UE 10, and the receiver may be a part of the eNB 20.

[0030] The EPC includes a mobility management entity (MME) which is in charge of control plane functions, and a system architecture evolution (SAE) gateway (S-GW) which is in charge of user plane functions. The MME/S-GW 30 may be positioned at the end of the network and connected to an external network. The MME has UE access information or UE capability information, and such information may be primarily used in UE mobility management. The S-GW is a gateway of which an endpoint is an E-UTRAN. The MME/S-GW 30 provides an end point of a session and mobility management function for the UE 10. The EPC may further include a packet data network (PDN) gateway (PDN-GW). The PDN-GW is a gateway of which an endpoint is a PDN.

[0031] The MME provides various functions including non-access stratum (NAS) signaling to eNBs 20, NAS signaling security, access stratum (AS) security control, Inter core network (CN) node signaling for mobility between 3GPP access networks, idle mode UE reachability (including control and execution of paging retransmission), tracking area list management (for UE in idle and active mode), P-GW and S-GW selection, MME selection for handovers with MME change, serving GPRS support node (SGSN) selection for handovers to 2G or 3G 3GPP access networks, roaming, authentication, bearer management functions including dedicated bearer establishment, support for public warning system (PWS) (which includes earthquake and tsunami warning system (ETWS) and commercial mobile alert system (CMAS)) message transmission. The S-GW host provides assorted functions including per-user based packet filtering (by e.g., deep packet inspection), lawful interception, UE Internet protocol (IP) address allocation, transport level packet marking in the DL, UL and DL service level charging, gating and rate enforcement, DL rate enforcement based on APN-AMBR. For clarity MME/S-GW 30 will be referred to herein simply as a "gateway," but it is understood that this entity includes both the MME and S-GW.

[0032] Interfaces for transmitting user traffic or control traffic may be used. The UE 10 and the eNB 20 are connected by means of a Uu interface. The eNBs 20 are interconnected by means of an X2 interface. Neighboring eNBs may have a meshed network structure that has the X2 interface. The eNBs 20 are connected to the EPC by means of an S1 interface. The eNBs 20 are connected to the MME by means of an S1-MME interface, and are connected to the S-GW by means of S1-U interface. The S1 interface supports a many-to-many relation between the eNB 20 and the MME/S-GW.

[0033] The eNB 20 may perform functions of selection for gateway 30, routing toward the gateway 30 during a radio resource control (RRC) activation, scheduling and

transmitting of paging messages, scheduling and transmitting of broadcast channel (BCH) information, dynamic allocation of resources to the UEs 10 in both UL and DL, configuration and provisioning of eNB measurements, radio bearer control, radio admission control (RAC), and connection mobility control in LTE_ACTIVE state. In the EPC, and as noted above, gateway 30 may perform functions of paging origination, LTE_IDLE state management, ciphering of the user plane, SAE bearer control, and ciphering and integrity protection of NAS signaling.

[0034] FIG. 2 shows a control plane of a radio interface protocol of an LTE system. FIG. 3 shows a user plane of a radio interface protocol of an LTE system.

[0035] Layers of a radio interface protocol between the UE and the E-UTRAN may be classified into a first layer (L1), a second layer (L2), and a third layer (L3) based on the lower three layers of the open system interconnection (OSI) model that is well-known in the communication system. The radio interface protocol between the UE and the E-UTRAN may be horizontally divided into a physical layer, a data link layer, and a network layer, and may be vertically divided into a control plane (C-plane) which is a protocol stack for control signal transmission and a user plane (U-plane) which is a protocol stack for data information transmission. The layers of the radio interface protocol exist in pairs at the UE and the E-UTRAN, and are in charge of data transmission of the Uu interface.

[0036] A physical (PHY) layer belongs to the L1. The PHY layer provides a higher layer with an information transfer service through a physical channel. The PHY layer is connected to a medium access control (MAC) layer, which is a higher layer of the PHY layer, through a transport channel. A physical channel is mapped to the transport channel. Data is transferred between the MAC layer and the PHY layer through the transport channel. Between different PHY layers, i.e., a PHY layer of a transmitter and a PHY layer of a receiver, data is transferred through the physical channel using radio resources. The physical channel is modulated using an orthogonal frequency division multiplexing (OFDM) scheme, and utilizes time and frequency as a radio resource.

[0037] The PHY layer uses several physical control channels. A physical downlink control channel (PDCCH) reports to a UE about resource allocation of a paging channel (PCH) and a downlink shared channel (DL-SCH), and hybrid automatic repeat request (HARQ) information related to the DL-SCH. The PDCCH may carry a UL grant for reporting to the UE about resource allocation of UL transmission. A physical control format indicator channel (PCFICH) reports the number of OFDM symbols used for PDCCHs to the UE, and is transmitted in every subframe. A physical hybrid ARQ indicator channel (PHICH) carries an HARQ acknowledgement (ACK)/non-acknowledgement (NACK) signal in response to UL transmission. A physical uplink control channel (PUCCH) carries UL control information such as HARQ ACK/NACK for DL transmission, scheduling request, and CQI. A physical uplink shared channel

(PUSCH) carries a UL-uplink shared channel (SCH).

[0038] A physical channel consists of a plurality of subframes in time domain and a plurality of subcarriers in frequency domain. One subframe consists of a plurality of symbols in the time domain. One subframe consists of a plurality of resource blocks (RBs). One RB consists of a plurality of symbols and a plurality of subcarriers. In addition, each subframe may use specific subcarriers of specific symbols of a corresponding subframe for a PDCCH. For example, a first symbol of the subframe may be used for the PDCCH. The PDCCH carries dynamic allocated resources, such as a physical resource block (PRB) and modulation and coding scheme (MCS). A transmission time interval (TTI) which is a unit time for data transmission may be equal to a length of one subframe. The length of one subframe may be 1 ms.

[0039] The transport channel is classified into a common transport channel and a dedicated transport channel according to whether the channel is shared or not. A DL transport channel for transmitting data from the network to the UE includes a broadcast channel (BCH) for transmitting system information, a paging channel (PCH) for transmitting a paging message, a DL-SCH for transmitting user traffic or control signals, etc. The DL-SCH supports HARQ, dynamic link adaptation by varying the modulation, coding and transmit power, and both dynamic and semi-static resource allocation. The DL-SCH also may enable broadcast in the entire cell and the use of beamforming. The system information carries one or more system information blocks. All system information blocks may be transmitted with the same periodicity. Traffic or control signals of a multimedia broadcast/multicast service (MBMS) may be transmitted through the DL-SCH or a multicast channel (MCH).

[0040] A UL transport channel for transmitting data from the UE to the network includes a random access channel (RACH) for transmitting an initial control message, a UL-SCH for transmitting user traffic or control signals, etc. The UL-SCH supports HARQ and dynamic link adaptation by varying the transmit power and potentially modulation and coding. The UL-SCH also may enable the use of beamforming. The RACH is normally used for initial access to a cell.

[0041] A MAC layer belongs to the L2. The MAC layer provides services to a radio link control (RLC) layer, which is a higher layer of the MAC layer, via a logical channel. The MAC layer provides a function of mapping multiple logical channels to multiple transport channels. The MAC layer also provides a function of logical channel multiplexing by mapping multiple logical channels to a single transport channel. A MAC sublayer provides data transfer services on logical channels.

[0042] The logical channels are classified into control channels for transferring control plane information and traffic channels for transferring user plane information, according to a type of transmitted information. That is, a set of logical channel types is defined for different data transfer services offered by the MAC layer. The logical

channels are located above the transport channel, and are mapped to the transport channels.

[0043] The control channels are used for transfer of control plane information only. The control channels provided by the MAC layer include a broadcast control channel (BCCH), a paging control channel (PCCH), a common control channel (CCCH), a multicast control channel (MCCH) and a dedicated control channel (DCCH). The BCCH is a downlink channel for broadcasting system control information. The PCCH is a downlink channel that transfers paging information and is used when the network does not know the location cell of a UE. The CCCH is used by UEs having no RRC connection with the network. The MCCH is a point-to-multipoint downlink channel used for transmitting MBMS control information from the network to a UE. The DCCH is a point-to-point bidirectional channel used by UEs having an RRC connection that transmits dedicated control information between a UE and the network.

[0044] Traffic channels are used for the transfer of user plane information only. The traffic channels provided by the MAC layer include a dedicated traffic channel (DTCH) and a multicast traffic channel (MTCH). The DTCH is a point-to-point channel, dedicated to one UE for the transfer of user information and can exist in both uplink and downlink. The MTCH is a point-to-multipoint downlink channel for transmitting traffic data from the network to the UE.

[0045] Uplink connections between logical channels and transport channels include the DCCH that can be mapped to the UL-SCH, the DTCH that can be mapped to the UL-SCH and the CCCH that can be mapped to the UL-SCH. Downlink connections between logical channels and transport channels include the BCCH that can be mapped to the BCH or DL-SCH, the PCCH that can be mapped to the PCH, the DCCH that can be mapped to the DL-SCH, and the DTCH that can be mapped to the DL-SCH, the MCCH that can be mapped to the MCH, and the MTCH that can be mapped to the MCH.

[0046] An RLC layer belongs to the L2. The RLC layer provides a function of adjusting a size of data, so as to be suitable for a lower layer to transmit the data, by concatenating and segmenting the data received from an upper layer in a radio section. In addition, to ensure a variety of quality of service (QoS) required by a radio bearer (RB), the RLC layer provides three operation modes, i.e., a transparent mode (TM), an unacknowledged mode (UM), and an acknowledged mode (AM). The AM RLC provides a retransmission function through an automatic repeat request (ARQ) for reliable data transmission. Meanwhile, a function of the RLC layer may be implemented with a functional block inside the MAC layer. In this case, the RLC layer may not exist.

[0047] A packet data convergence protocol (PDCP) layer belongs to the L2. The PDCP layer provides a function of header compression function that reduces unnecessary control information such that data being transmitted by employing IP packets, such as IPv4 or IPv6, can

be efficiently transmitted over a radio interface that has a relatively small bandwidth. The header compression increases transmission efficiency in the radio section by transmitting only necessary information in a header of the data. In addition, the PDCP layer provides a function of security. The function of security includes ciphering which prevents inspection of third parties, and integrity protection which prevents data manipulation of third parties.

[0048] A radio resource control (RRC) layer belongs to the L3. The RLC layer is located at the lowest portion of the L3, and is only defined in the control plane. The RRC layer takes a role of controlling a radio resource between the UE and the network. For this, the UE and the network exchange an RRC message through the RRC layer. The RRC layer controls logical channels, transport channels, and physical channels in relation to the configuration, reconfiguration, and release of RBs. An RB is a logical path provided by the L1 and L2 for data delivery between the UE and the network. That is, the RB signifies a service provided the L2 for data transmission between the UE and E-UTRAN. The configuration of the RB implies a process for specifying a radio protocol layer and channel properties to provide a particular service and for determining respective detailed parameters and operations. The RB is classified into two types, i.e., a signaling RB (SRB) and a data RB (DRB). The SRB is used as a path for transmitting an RRC message in the control plane. The DRB is used as a path for transmitting user data in the user plane.

[0049] A Non-Access Stratum (NAS) layer placed over the RRC layer performs functions, such as session management and mobility management.

[0050] Referring to FIG. 2, the RLC and MAC layers (terminated in the eNB on the network side) may perform functions such as scheduling, automatic repeat request (ARQ), and hybrid automatic repeat request (HARQ). The RRC layer (terminated in the eNB on the network side) may perform functions such as broadcasting, paging, RRC connection management, RB control, mobility functions, and UE measurement reporting and controlling. The NAS control protocol (terminated in the MME of gateway on the network side) may perform functions such as a SAE bearer management, authentication, LTE_IDLE mobility handling, paging origination in LTE_IDLE, and security control for the signaling between the gateway and UE.

[0051] Referring to FIG. 3, the RLC and MAC layers (terminated in the eNB on the network side) may perform the same functions for the control plane. The PDCP layer (terminated in the eNB on the network side) may perform the user plane functions such as header compression, integrity protection, and ciphering.

Hereinafter, system information will be described.

[0052] FIG. 4 shows an example of transmitting a master information block (MIB), system information block1

(SIB1), and other SIBs.

[0053] An LTE cell broadcasts basic parameters necessary for the operation of an IDLE_MODE UE and a CONNECTED_MODE UE via a plurality of separate information blocks. Examples of information blocks include an MIB, SIB1, SIB2, and other SIBs (SIBn).

[0054] The MIB includes the most essential parameters needed for a UE to access a cell. Referring to FIG. 4, an MIB message is broadcast through a BCH according to a periodicity of 40 ms, and MIB transmission is repeated in all radio frames within the periodicity of 40 ms. The UE receives an SIB message using the parameters received via the MIB.

[0055] There are different types of SIBs.

[0056] SIB1 includes pieces of information associated with cell access, and particularly includes scheduling information on other SIBs (SIB2 to SIBn) than SIB1. SIBs having the same transmission periodicity among the SIBs other than SIB1 are transferred via the same system information (SI) message. Thus, scheduling information includes a mapping relationship between each SIB and an SI message. An SI message is transmitted within an SI window in a time domain, and each SI message is associated with one SI window. Since SI windows for different pieces of SI do not overlap, only one SI message is transmitted within an SI window. Thus, scheduling information includes the duration of an SI window and an SI transmission periodicity. Time/frequency for transmitting an SI message is determined by dynamic scheduling by a BS. SIB1 is broadcast through a downlink shared channel (DL SCH) according to a periodicity of eight radio frames (that is, 80-ms periodicity), and SIB1 is repeatedly retransmitted on a fifth subframe of an SFN-mod-2 radio frame within the 80-ms periodicity.

[0057] SIB2 includes necessary information for a UE to access a cell. SIB2 includes information on an uplink cell bandwidth, a random access parameter, and an uplink power control parameter.

[0058] SIB3 includes cell reselection information. SIB4 includes frequency information on a serving cell and intra-frequency information on a neighboring cell for cell reselection. SIB5 includes frequency information on a different E-UTRA and inter-frequency information on a neighboring cell for cell reselection. SIB6 includes frequency information on a UTRA and information on a UTRA neighboring cell for cell reselection. SIB7 includes frequency information on a GERAN for cell reselection. SIB8 includes information on a neighboring cell.

[0059] SIB9 includes a Home eNodeB (HeNB) identifier (ID). SIB10 to SIB12 include a public warning message, for example, for earthquake warning. SIB14 is used to support enhanced access barring and controls UEs to access a cell. SIB15 includes information needed to receive an MBMS at contiguous carrier frequencies. SIB16 include GPS time and coordinated universal time (UTC)-related information. SIB17 includes RAN auxiliary information.

[0060] Not all SIBs are always required to be present.

For example, SIB9 is not needed in a mode where a wireless carrier establishes an HeNB, while SIB13 is not needed if a cell provides no MBMS.

[0061] System information is commonly applied to all UEs accessing a cell, and UEs need to always maintain up-to-date system information to perform an appropriate operation. When system information is changed, UEs need to know in advance the time the BS transmits new system information. In order that a BS and a UE mutually recognize a radio frame period for transmitting new system information, the concept of BCCH modification period is introduced in "3GPP TS 36.331 v9. 3.0," which is described in detail.

[0062] FIG. 5 shows an update of system information.

[0063] Referring to FIG. 5, a BS, which intends to update system information in an (n+1)th modification period, notifies in advance UEs of an update of system information in an nth modification period. A UE, which is notified the update of the system information in the nth modification period, receives and applies new system information at the very beginning of the (n+1)th modification period. When an update of system information is scheduled, the BS includes a system information modification indicator in a paging message. Generally, a paging message is a message received by an idle-mode UE. However, since an update of system information is notified through a paging message, a connected-mode UE also needs to receive a paging message at times and to identify an update of system information.

Hereinafter, random access will be described.

[0064] Random access is used by a UE to obtain uplink synchronization with a BS or to be allocated an uplink radio resource. After power is turned on, a UE obtains downlink synchronization with an initial cell and receives system information. Then, the UE acquires, from the system information, a set of available random access preambles and information about a radio resource used for transmission of a random access preamble. The radio resource used for transmission of the random access preamble may be specified as a radio frame and/or a combination of at least one or more subframes. The UE transmits a random access preamble randomly selected from the set of random access preambles, and the BS having received the random access preamble sends a timing alignment (TA) value for uplink synchronization to the UE through a random access response. Thus, the UE obtains uplink synchronization.

[0065] That is, the BS allocates a dedicated random access preamble to a specific UE, and the UE performs non-contention random access using the random access preamble. That is, there may be in a process of selecting a random access preamble, contention-based random access in which a UE randomly selects and uses one random access preamble from a particular set and non-contention random access in which only a specific UE is allocated a random access preamble by a BS. Non-con-

tion random access may be used for a handover procedure or upon a request by a BS's command.

[0066] FIG. 6 illustrates a contention-based random access procedure.

5 **[0067]** Referring to FIG. 6, a UE randomly selects one random access preamble from a random access preamble set indicated by system information or a handover command. The UE selects a radio resource for transmitting the random access preamble to transmit the selected random access preamble (S610). The radio resource may be a specific subframe, and selecting the radio resource may be selecting a physical random access channel (PRACH).

10 **[0068]** After transmitting the random access preamble, the UE attempts to receive a random access response within a random access response reception window indicated by the system information or the handover command and accordingly receives a random access response (S620). The random access response may be transmitted in an MAC PDU format, and the MAC PDU may be forwarded via a physical downlink shared channel (PDSCH). Further, a physical downlink control channel (PDCCH) is also forwarded so that the UE properly receives information forwarded via the PDSCH. That is, the PDCCH includes information on the UE receiving the PDSCH, frequency and time information on a radio resource for the PDSCH, and a transmission format for the PDSCH. Once successfully receiving the PDCCH forwarded to the UE, the UE properly receives the random access response transmitted via the PDSCH on the basis of the information in the PDCCH.

15 **[0069]** The random access response may include a random access preamble identifier (ID), an uplink radio resource (UL grant), a temporary cell-radio network temporary identifier (C-RNTI), and a time alignment command (TAC). Since one random access response may include random access response information for one or more UEs, a random access preamble ID may be included to indicate a UE for which a UL grant, a temporary C-RNTI, and a TAC are valid. The random access preamble ID may be an ID of the random access preamble received by a BS. The TAC may be included as information for the UE to adjust uplink synchronization. The random access response may be indicated by a random access ID on the PDCCH, that is, a random access-radio network temporary identifier (RA-RNTI).

20 **[0070]** When the UE receives the random access response valid therefor, the UE processes information included in the random access response and performs scheduled transmission to the BS (S630). That is, the UE applies the TAC and stores the temporary C-RNTI. Further, the UE transmits data stored in a buffer of the UE or newly generated data to the BS using the UL grant. In this case, information to identify the UE needs to be included, which is for identifying the UE in order to avoid a collision since the BS does not determine which UEs perform random access in a contention-based random access process.

[0071] There are two methods for including information for identifying a UE. When the UE has a valid cell ID already allocated by a corresponding cell before performing random access, the UE transmits the cell ID thereof through the UL grant. However, when the UE is not allocated a valid cell ID before the random access process, the UE transmits a unique ID thereof (e.g., S-TMSI or random ID). Generally, the unique ID is longer than the cell ID. When the UE transmits the data via the UL grant, the UE starts a contention resolution timer.

[0072] After transmitting the data including the ID of the UE through the UL grant allocated by receiving the random access response, the UE waits for an instruction from the BS to avoid a collision (S640). That is, the UE attempts to receive the PDCCH in order to receive a specific message. There are two proposed methods for receiving a PDCCH. As described above, when the ID of the UE transmitted via the UL grant is a cell ID, the UE may attempt to receive the PDCCH using the cell ID of the UE. In this case, when the UE receives the PDCCH through the cell ID of the UE before the contention resolution timer expires, the UE determines that random access has been normally performed and terminates random access. When the ID transmitted via the UL grant is the unique ID, the UE may attempt to receive the PDCCH using the temporary C-RNTI included in the random access response. In this case, when the UE receives the PDCCH through the temporary cell ID before the contention resolution timer expires, the UE identifies data forwarded by the PDSCH indicated by the PDCCH. When the data includes the unique ID of the UE, the UE may determine that random access has been normally performed and may terminate random access.

[0073] FIG. 7 illustrates a non-contention random access procedure.

[0074] Unlike contention-based random access, non-contention random access may be terminated when a UE receives a random access response.

[0075] Non-contention random access may be initiated by a request, such as a handover and/or a command from a BS. Here, in these two cases, contention-based random access may also be performed.

[0076] The UE is allocated by the BS a designated random access preamble having no possibility of a collision. The random access preamble may be allocated through a handover command and a PDCCH command (S710).

[0077] After being allocated the random access preamble designated for the UE, the UE transmits the random access preamble to the BS (S720).

[0078] Upon receiving the random access preamble, the BS transmits a random access response to the UE in response (S730). A procedure associated with the random access response has been mentioned above in S620 of FIG. 6.

Hereinafter, a method for contention resolution in random access will be described.

[0079] The reason why contention occurs in performing random access is basically because the number of random access preambles is finite. That is, since a BS cannot assign a UE-specific random access preamble to all UEs, a UE randomly selects and transmits one of common random access preambles. Accordingly, when two or more UEs select and transmit the same random access preamble through the same radio resource (PRACH resource), the BS determines the random access preamble as one random access preamble transmitted from one UE. As a result, it is expected that the BS transmits a random access response to the UE and that the random access response is received by one UE. However, since contention may occur as described above, the two or more UEs receive one access response, and each UE performs an operation in response to the receipt of the random access response. That is, the two or more UEs transmit different data via the same radio resource using one UL Grant included in the random access response. Accordingly, all of such data transmission may fail or the BS may receive only data from a particular UE depending on the location or transmission power of the UEs. In the latter case, since all of the two or more UEs assume that data thereof have been successfully transmitted, the BS needs to report information on the failure of contention to UEs that have failed in contention. That is, reporting the information on the failure or success of the contention is referred to as contention resolution.

[0080] There are two contention resolution methods, which includes one method using a contention resolution timer (hereinafter, referred to as a CR timer) and the other method of transmitting an identifier of a successful UE to UEs. The former method is used when a UE already has a unique cell identifier (C-RNTI) before a random access procedure. That is, a UE already having a cell identifier transmits data including a cell identifier thereof to a BS in response to a random access response and operates a CR timer. When PDCCH information including the cell identifier of the UE is received before the CR timer expires, the UE determines that the UE is successful in contention and normally terminates random access. However, when a PDCCH including the cell identifier of the UE is not received before the CR timer expires, the UE determines that the UE has failed in contention and may perform the random access procedure again or may notify a higher layer of the failure. The latter contention resolution method, that is, the method of transmitting the identifier of the successful UE, is used when a UE has no unique cell identifier before a random access procedure. That is, when a UE does not have a cell identifier thereof, the UE transmits data including a higher identifier (S-TMSI or random ID) than a cell identifier according to UL grant information included in a random access response and operates a CR timer. When the data including the higher identifier of the UE is transmitted via a DL-

SCH before the CR timer expires, the UE determines that the random access procedure is successful. However, when the data including the higher identifier of the UE is not transmitted via the DL-SCH before the CR timer expires, the UE determines that the random access procedure has failed.

[0081] The number of system information blocks is continuously increasing, and radio resources are required to broadcast a system information block. Thus, as the number of system information blocks increases, the quantity of radio resources required to broadcast a system information block also inevitably increases. To transmit continuously increasing system information to a UE, it is necessary to propose a method for efficiently utilizing radio resources. Hereinafter, a method for receiving an on-demand system information (OSI) block and a device supporting the same will be described according to an embodiment of the present invention.

[0082] According to an embodiment of the present invention, system information may be divided into two types of system information. One of the two types of system information may be normal system information (NSI) and the other may be on-demand system information (OSI).

[0083] The NSI may be a type of system information that is always broadcast. The NSI may also be referred to as minimum system information (MSI). For example, the NSI may include system information included in an MIB. Alternatively, the NSI may include system information included in an MIB and SIB1.

[0084] The OSI may be a type of system information that is broadcasted only when a UE requests the transmission of system information. Alternatively, the OSI may be a type of system information that is transmitted to a UE through dedicated signaling only when the UE requests the transmission of system information.

(1) Step 1: A UE may receive an OSI configuration from a network. The OSI configuration may be broadcast through a network slice instance (NSI).

The OSI configuration may include a mapping relationship between information on a system information request (SIR) preamble and an OSI block. The information on the SIR preamble may include at least one of a pattern of the SIR preamble, an ID of the SIR preamble, an index of the SIR preamble, or a resource for the SIR preamble. In the present specification, the SIR preamble may be a preamble used to request OSI.

Preferably, different OSI blocks may be mapped to different SIR preambles. For example, the OSI configuration may indicate that OSI block 1 is mapped to SIR preamble A and OSI block 2 is mapped to SIR preamble B. Alternatively, one SIR preamble may be mapped to a plurality of OSI blocks. For example, the OSI configuration may indicate that SIR preamble A is mapped to OSI block 1 and OSI block 2.

Preferably, an SIR preamble and a random access

(RA) preamble may use different preamble resources.

Further, the OSI configuration may include a set of resources for SIR preamble transmission.

Further, the OSI configuration may include a power-ramping factor for SIR preamble transmission.

Further, the OSI configuration may include an initial preamble power for SIR preamble transmission. Preferably, when the power-ramping factor and/or initial preamble power for SIR preamble transmission are not provided, the UE may use a power-ramping factor and/or initial preamble power for transmitting an RA preamble in order to determine transmission power for an SIR preamble.

Further, the OSI configuration may include the maximum number of SIR preamble transmissions. That is, the OSI configuration may include the maximum number of transmission times an SIR preamble is allowed to be transmitted.

Preferably, an SIR occasion configuration may be defined. When an SIR occasion is configured, the UE may transmit an SIR preamble to a serving cell only during the SIR occasion.

(2) Step 2: The UE may determine OSI of interest.

The UE may consider an OSI block as part of the OSI of interest when the following conditions are satisfied.

- Condition 1: The UE is interested in receiving an OSI block via broadcast signaling or dedicated signaling.
- Condition 2: The OSI block is not being broadcast by the serving cell.
- Condition 3: The UE does not have a valid OSI block.

(3) Step 3: The UE may transmit an SIR preamble corresponding to the OSI of interest to the serving cell. Preferably, the UE may transmit the SIR preamble corresponding to the OSI of interest only when the OSI of interest is not broadcast. The SIR preamble may be transmitted via a new physical channel. For example, the new physical channel may be an SIR preamble-specific physical channel. Alternatively, the SIR preamble may be transmitted via a physical random access channel (PRACH).

The UE may select an SIR preamble based on the received OSI configuration. When the UE is in an RRC-idle state, the UE may not initiate an RRC connection establishment procedure for acquiring OSI. The UE may set preamble received target power (PRTP) according to the OSI configuration. The PRTP may be a target received power for a BS to receive the SIR preamble. An MAC layer may instruct the physical layer to transmit the SIR preamble, a corresponding OSI-RNTI, an SIR preamble index, and the PRTP.

When the SIR preamble is transmitted, the UE may

monitor a PDCCH of the serving cell using the OSI-RNTI to check whether the system information of interest is transmitted.

(4) Step 4: The UE may receive the OSI of interest from the serving cell.

[0085] When the UE does not receive the system information of interest within an OSI window, the UE may retransmit the SIR preamble.

[0086] When the UE does not receive the system information of interest within the OSI window and the number of SIR preamble transmissions reaches the maximum number of SIR preamble transmissions, the UE may declare the failure of obtaining the system information. In this case, the UE may consider that the state of the serving cell is 'barred'. That is, the UE may consider the serving cell as a barred cell. Alternatively, the UE may initiate an RRC connection establishment procedure to request OSI via dedicated signaling.

[0087] According to the procedure proposed in the present invention, a UE may transmit an SIR preamble corresponding to OSI of interest to a serving cell on the basis of an OSI configuration, thereby selectively receiving only the OSI of interest. Therefore, the UE may efficiently use radio resources for receiving system information.

[0088] FIG. 8 is a block diagram illustrating a method for a UE to receive an OSI block according to an embodiment of the present invention.

[0089] Referring to FIG. 8, in step S810, the UE may receive, from a network, an OSI configuration including information on mapping between information on an SIR preamble and an OSI block.

[0090] The information on the SIR preamble may be a pattern of the SIR preamble. The information on the SIR preamble may be an ID of the SIR preamble. The information on the SIR preamble may be an index of the SIR preamble. The information on the SIR preamble may be a resource for the SIR preamble.

[0091] Different SIR preambles may be mapped to different OSI blocks. Alternatively, one SIR preamble may be mapped to a plurality of OSI blocks.

[0092] The OSI configuration may further include at least one of a set of resources for transmitting the SIR preamble, a power-ramping factor for transmitting the SIR preamble, or a maximum transmission value for the SIR preamble.

[0093] The OSI configuration may be broadcast through a network slice instance (NSI).

[0094] In step S820, the UE may determine an OSI block of interest. When the UE is interested in receiving a particular OSI block, the particular OSI block is not broadcast by a serving cell of the UE, and the UE does not have the particular OSI block that is valid, the particular OSI block may be determined as the OSI block of interest.

[0095] In step S830, the UE may select an SIR preamble corresponding to the OSI block of interest on the basis

of the OSI configuration.

[0096] In step S840, the UE may transmit the selected SIR preamble to the serving cell, thereby requesting the determined OSI block of interest. The selected SIR preamble may be transmitted to the serving cell only during an SIR occasion. The selected SIR preamble may be transmitted to the serving cell only when the OSI block of interest is not broadcast.

[0097] In step S850, the UE may receive the requested OSI block of interest.

[0098] When the OSI block of interest is not received within an OSI window, the UE may transmit the selected SIR preamble to the serving cell, thereby requesting the OSI block of interest again.

[0099] When the OSI block of interest is not received within the OSI window and the number of times the SIR preamble is transmitted to the serving cell reaches the maximum number of SIR preamble transmissions, the UE may consider that obtaining the system information has failed. In this case, the serving cell may be considered by the UE as a barred cell.

[0100] FIG. 9 is a block diagram illustrating a wireless communication system according to the embodiment of the present invention.

[0101] A BS 900 includes a processor 901, a memory 902 and a transceiver 903. The memory 902 is connected to the processor 901, and stores various information for driving the processor 901. The transceiver 903 is connected to the processor 901, and transmits and/or receives radio signals. The processor 901 implements proposed functions, processes and/or methods. In the above embodiment, an operation of the base station may be implemented by the processor 901.

[0102] A UE 910 includes a processor 911, a memory 912 and a transceiver 913. The memory 912 is connected to the processor 911, and stores various information for driving the processor 911. The transceiver 913 is connected to the processor 911, and transmits and/or receives radio signals. The processor 911 implements proposed functions, processes and/or methods. In the above embodiment, an operation of the UE may be implemented by the processor 911.

[0103] The processor may include an application-specific integrated circuit (ASIC), a separate chipset, a logic circuit, and/or a data processing unit. The memory may include a read-only memory (ROM), a random access memory (RAM), a flash memory, a memory card, a storage medium, and/or other equivalent storage devices. The transceiver may include a base-band circuit for processing a wireless signal. When the embodiment is implemented in software, the aforementioned methods can be implemented with a module (i.e., process, function, etc.) for performing the aforementioned functions. The module may be stored in the memory and may be performed by the processor. The memory may be located inside or outside the processor, and may be coupled to the processor by using various well-known means.

[0104] Various methods based on the present specifi-

cation have been described by referring to drawings and reference numerals given in the drawings on the basis of the aforementioned examples. Although each method describes multiple steps or blocks in a specific order for convenience of explanation, the invention disclosed in the claims is not limited to the order of the steps or blocks, and each step or block can be implemented in a different order, or can be performed simultaneously with other steps or blocks. In addition, those ordinarily skilled in the art can know that the invention is not limited to each of the steps or blocks, and at least one different step can be added or deleted without departing from the scope and spirit of the invention.

[0105] The aforementioned embodiment includes various examples. It should be noted that those ordinarily skilled in the art know that all possible combinations of examples cannot be explained, and also know that various combinations can be derived from the technique of the present specification. Therefore, the protection scope of the invention should be determined by combining various examples described in the detailed explanation, without departing from the scope of the following claims.

Claims

1. A method for receiving, by a user equipment (UE), an on-demand system information (OSI) block in a wireless communication system, the method comprising:
 - receiving, from a network, an OSI configuration including information on mapping between information on a system information request (SIR) preamble and an OSI block;
 - determining an OSI block of interest;
 - selecting an SIR preamble corresponding to the OSI block of interest on the basis of the OSI configuration;
 - requesting the determined OSI block of interest by transmitting the selected SIR preamble to a serving cell; and
 - receiving the requested OSI block of interest.
2. The method of claim 1, wherein the information on the SIR preamble is a pattern of the SIR preamble.
3. The method of claim 1, wherein the information on the SIR preamble is an identifier (ID) of the SIR preamble.
4. The method of claim 1, wherein the information on the SIR preamble is an index of the SIR preamble.
5. The method of claim 1, wherein the information on the SIR preamble is a resource for the SIR preamble.
6. The method of claim 1, wherein different SIR pream-

bles are mapped to different OSI blocks.

7. The method of claim 1, wherein one SIR preamble is mapped to a plurality of OSI blocks.
8. The method of claim 1, wherein when the UE is interested in receiving a particular OSI block, the particular OSI block is not broadcast by the serving cell of the UE, and the UE does not have the particular OSI block that is valid, the particular OSI block is determined as the OSI block of interest.
9. The method of claim 1, further comprising: requesting the OSI block of interest again by transmitting the selected SIR preamble to the serving cell when the OSI block of interest is not received within an OSI window.
10. The method of claim 1, further comprising: considering that obtaining system information fails when the OSI block of interest is not received within an OSI window and a number of times the SIR preamble is transmitted to the serving cell reaches a maximum number of SIR preamble transmissions.
11. The method of claim 10, wherein the serving cell is considered by the UE as a barred cell.
12. The method of claim 1, wherein the OSI configuration further includes at least one of a set of resources for transmitting the SIR preamble, a power-ramping factor for transmitting the SIR preamble, or a maximum transmission value for the SIR preamble.
13. The method of claim 1, wherein the selected SIR preamble is transmitted to the serving cell only during an SIR occasion.
14. The method of claim 1, wherein the selected SIR preamble is transmitted to the serving cell only when the OSI block of interest is not broadcast.
15. A user equipment (UE) for receiving an on-demand system information (OSI) block in a wireless communication system, the UE comprising:
 - a memory;
 - a transceiver; and
 - a processor to connect the memory and the transceiver,
 wherein the processor is configured to:
 - control the transceiver to receive, from a network, an OSI configuration including information on mapping between information on a system information request (SIR) preamble and an OSI block;

determine an OSI block of interest;
select an SIR preamble corresponding to the
OSI block of interest on the basis of the OSI
configuration;
control the transceiver to request the deter- 5
mined OSI block of interest by transmitting the
selected SIR preamble to a serving cell; and
control the transceiver to receive the requested
OSI block of interest.

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FIG. 1

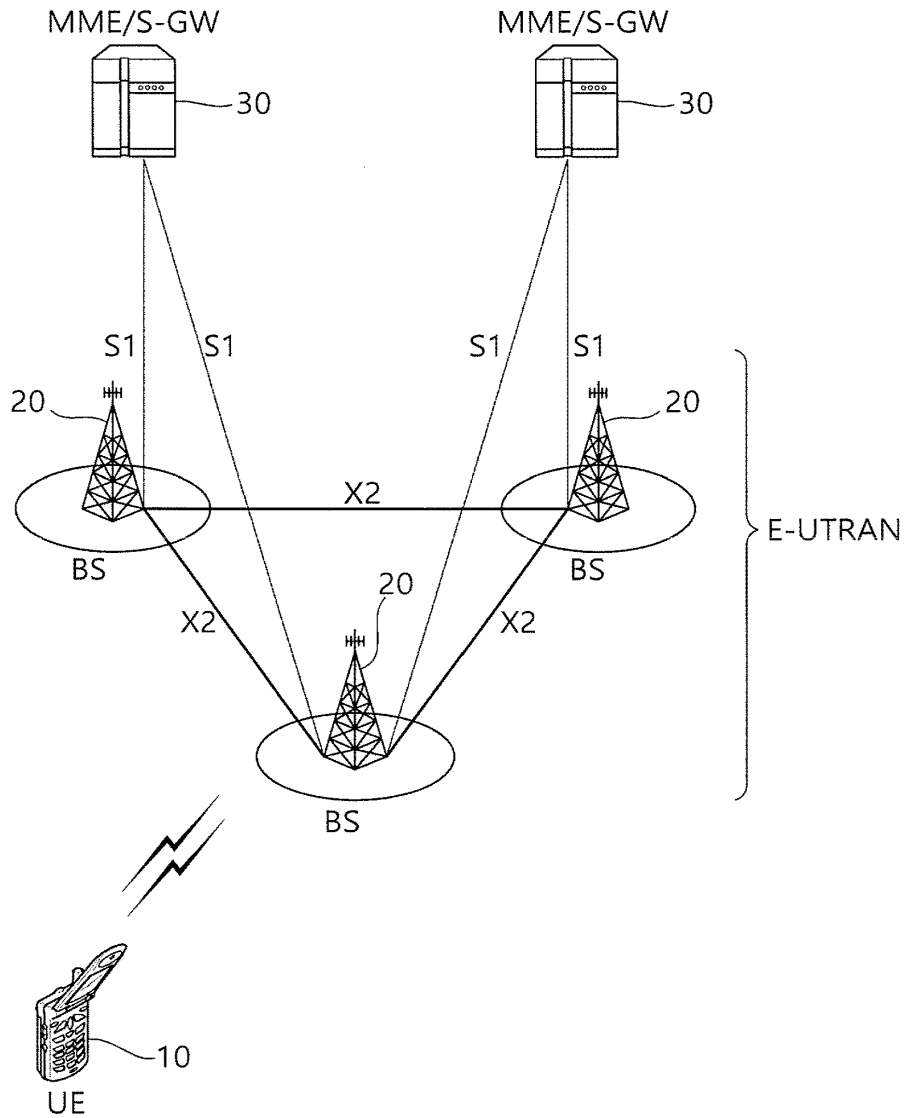


FIG. 2

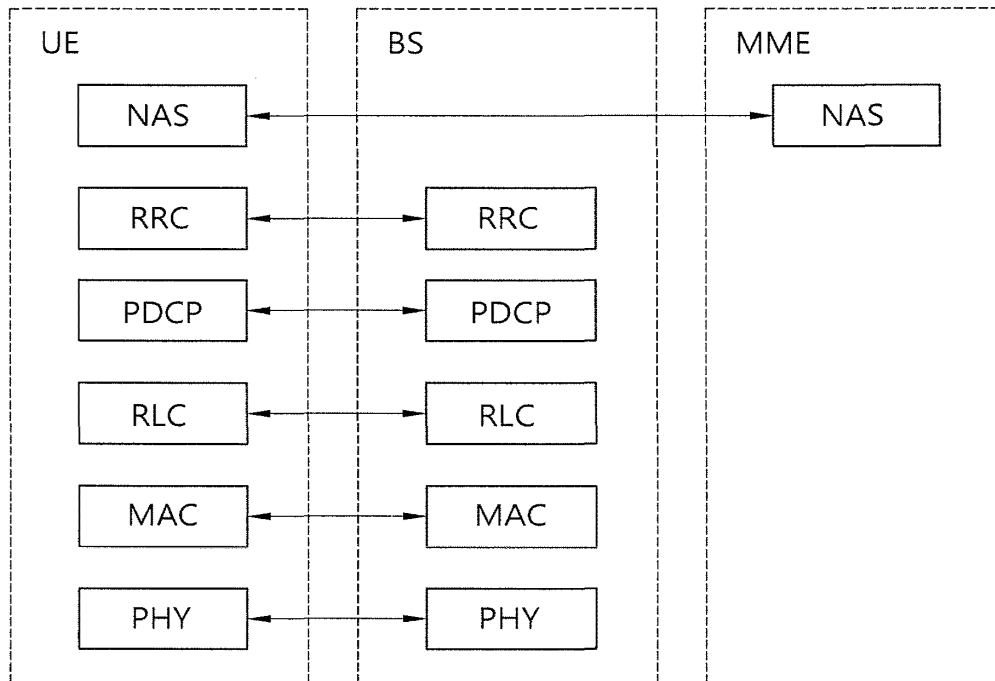


FIG. 3

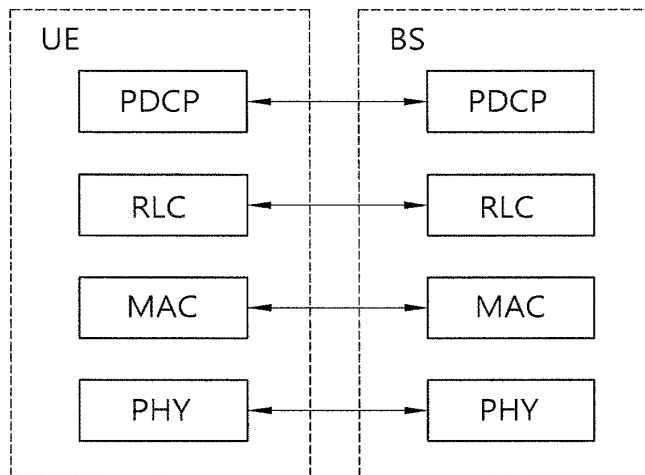


FIG. 4

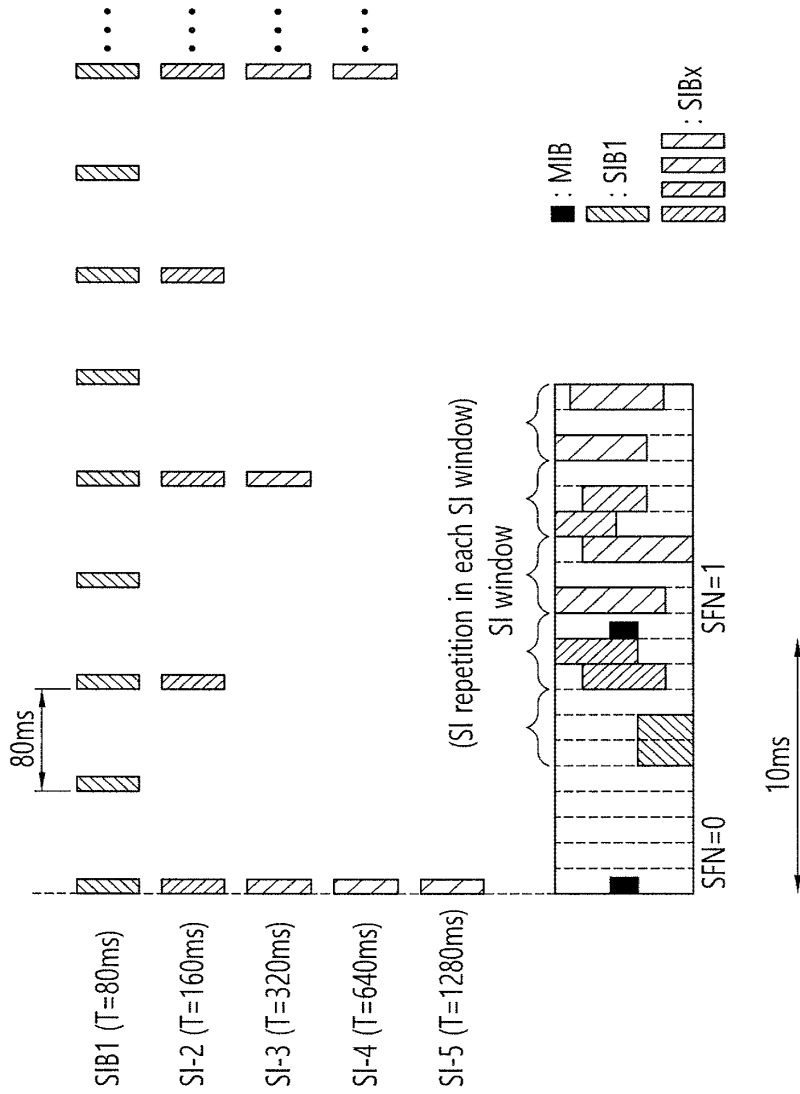


FIG. 5

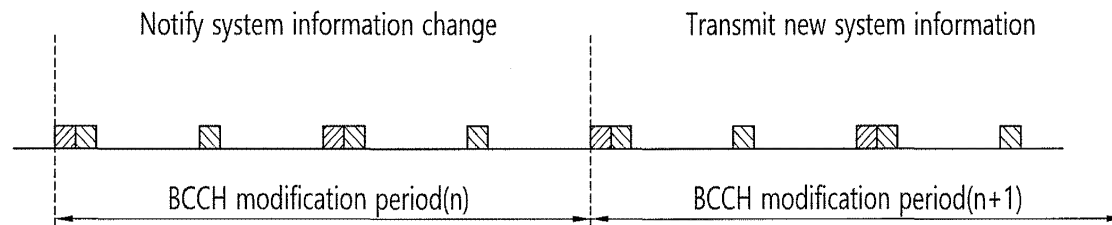


FIG. 6

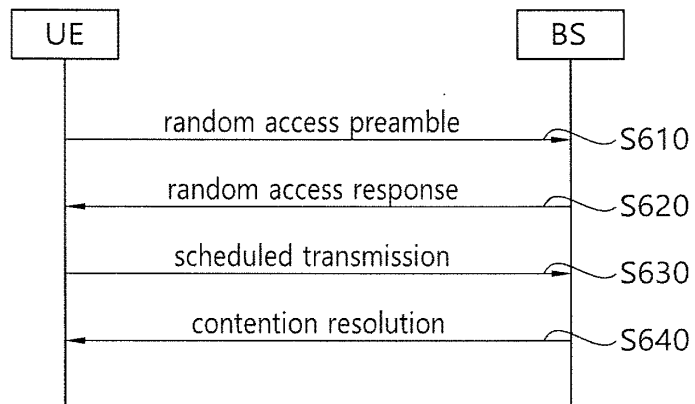


FIG. 7

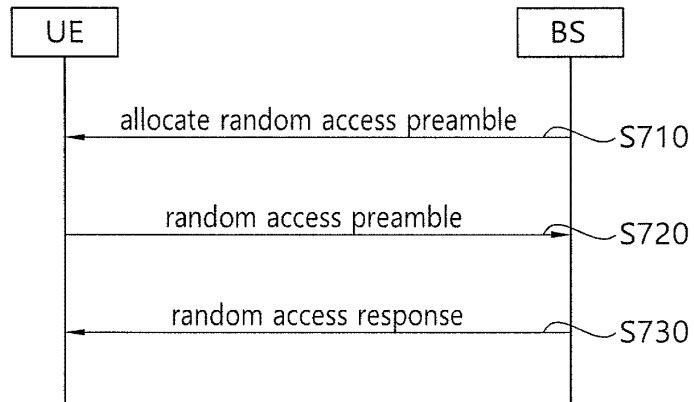


FIG. 8

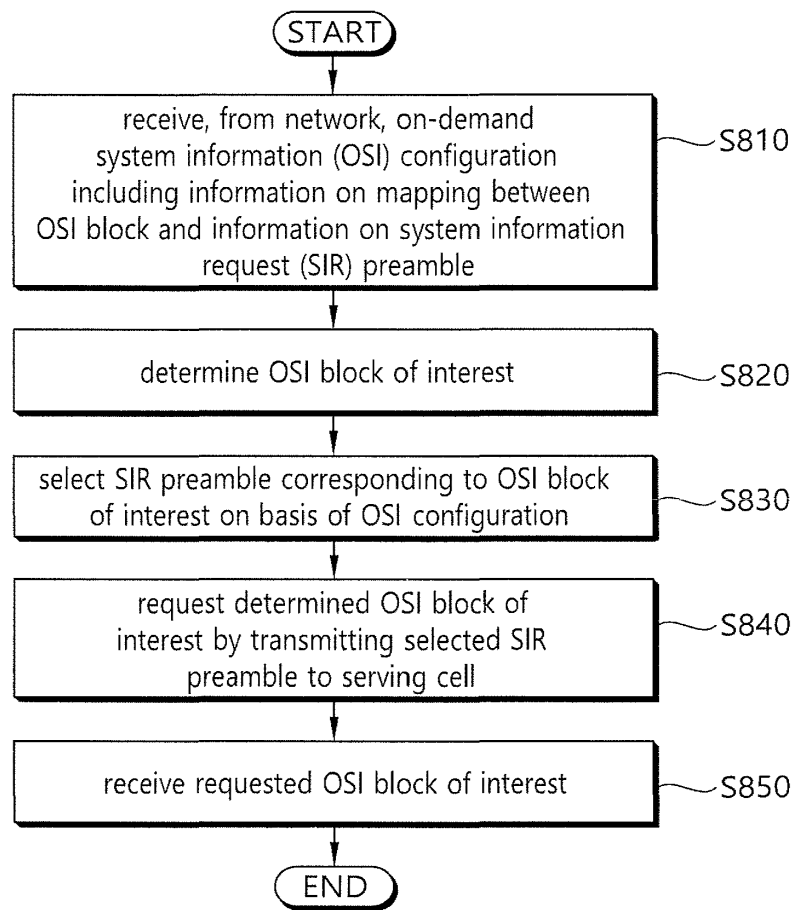
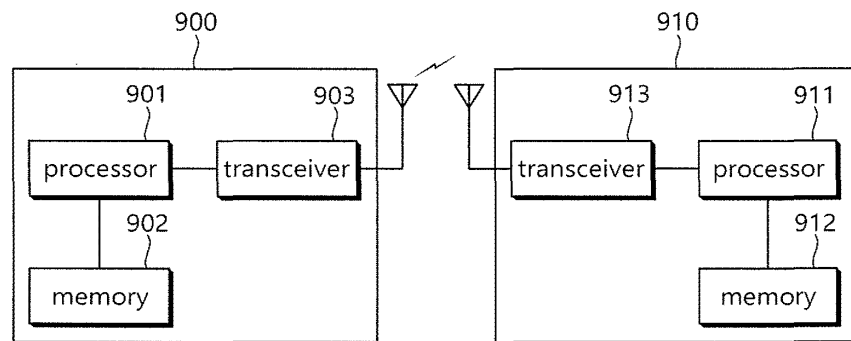


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2017/004674

5

A. CLASSIFICATION OF SUBJECT MATTER
H04W 74/00(2009.01)i, H04W 74/08(2009.01)i
According to International Patent Classification (IPC) or to both national classification and IPC

10

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
H04W 74/00; H04W 74/04; H04W 72/12; H04W 4/06; H04B 7/26; H04W 48/16; H04W 72/08; H04W 72/04; H04W 48/10; H04W 74/08

15

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS (KIPO internal) & Keywords: on-demand system information, eNB, UE, OSI block, system information request

20

C. DOCUMENTS CONSIDERED TO BE RELEVANT

25

30

35

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-1101457 B1 (NEC CORPORATION) 03 January 2012 See paragraphs [0007]-[0008], [0021]-[0023], [0065]; and claims 1-2.	1-15
A	KR 10-2011-0066972 A (ZTE CORPORATION) 17 June 2011 See paragraphs [0010]-[0034]; and figure 1.	1-15
A	WO 2009-082076 A1 (ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE et al.) 02 July 2009 See paragraphs [21]-[38]; and figures 3-5.	1-15
A	WO 2015-154248 A1 (HUAWEI TECHNOLOGIES CO., LTD.) 15 October 2015 See claims 1-2; and figures 5-6.	1-15
A	US 2015-0195774 A1 (LG ELECTRONICS INC.) 09 July 2015 See paragraphs [0100]-[0139]; and figures 11-14.	1-15

40

Further documents are listed in the continuation of Box C. See patent family annex.


45

* 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

50

Date of the actual completion of the international search 28 JULY 2017 (28.07.2017)	Date of mailing of the international search report 31 JULY 2017 (31.07.2017)
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Name and mailing address of the ISA/KR  Korean Intellectual Property Office Government Complex-Daedeon, 189 Seosasa-ro, Daedeon 302-701, Republic of Korea Facsimile No. +82-42-481-8578	Authorized officer Telephone No.
---	---

EP 3 454 620 A1

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2017/004674

Patent document cited in search report	Publication date	Patent family member	Publication date
KR 10-1101457 B1	03/01/2012	CN 101523957 A	02/09/2009
		CN 101523957 B	22/05/2013
		CN 102970729 A	13/03/2013
		CN 102970729 B	23/09/2015
		EP 2070366 A1	17/06/2009
		EP 2070366 B1	23/12/2015
		ES 2559414 T3	12/02/2016
		GB 0619614 D0	15/11/2006
		GB 2447878 A	01/10/2008
		JP 05168515 B2	21/03/2013
		JP 2010-506434 A	25/02/2010
		KR 10-2009-0095555 A	09/09/2009
		US 2010-0027466 A1	04/02/2010
		WO 2008-044664 A1	17/04/2008
KR 10-2011-0036972 A	17/06/2011	CN 101742572 A	16/06/2010
		CN 101742572 B	30/03/2016
		EP 2346218 A1	20/07/2011
		JP 2012-507179 A	22/03/2012
		KR 10-1281848 B1	03/07/2013
		MX 2011004836 A	06/06/2011
		US 2011-0205952 A1	25/08/2011
		US 8982872 B2	17/03/2015
		WO 2010-051725 A1	14/05/2010
WO 2009-082076 A1	02/07/2009	EP 2235850 A1	06/10/2010
		KR 10-0966179 B1	25/06/2010
		KR 10-2009-0066643 A	24/06/2009
		WO 2009-082076 A8	02/07/2009
WO 2015-154248 A1	15/10/2015	CN 105814961 A	27/07/2016
		EP 3091808 A1	09/11/2016
US 2015-0195774 A1	09/07/2015	CN 104641691 A	20/05/2015
		EP 2880919 A1	10/06/2015
		WO 2014-021610 A1	06/02/2014

Form PCT/ISA/210 (patent family annex) (January 2015)

Electronic Patent Application Fee Transmittal

Application Number:	15568431			
Filing Date:	20-Oct-2017			
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION			
First Named Inventor/Applicant Name:	Rui FAN			
Filer:	William W. Kidd/BlackBox IP			
Attorney Docket Number:	4906P51954US1			
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	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt

EFS ID:	37479916
Application Number:	15568431
International Application Number:	
Confirmation Number:	2730
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
First Named Inventor/Applicant Name:	Rui FAN
Customer Number:	131247
Filer:	William W. Kidd/Julie Farrar
Filer Authorized By:	William W. Kidd
Attorney Docket Number:	4906P51954US1
Receipt Date:	17-OCT-2019
Filing Date:	20-OCT-2017
Time Stamp:	00:59:15
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$240
RAM confirmation Number	E20190G159461987
Deposit Account	506674
Authorized User	Julie Farrar

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

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)
 37 CFR 1.21 (Miscellaneous fees and charges)
 37 CFR 1.492 (National application filing, search, and examination fees)

37 CFR 1.492(a) (Basic national fee only)

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)	IDS_15568431_1.pdf	628302	no	4
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Warnings:					
Information:					
2	Non Patent Literature	1_177841558_EPOA__323496.pdf	217221	no	4
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Warnings:					
Information:					
3	Non Patent Literature	2_PCTCN2017101576_323497.pdf	225147	no	6
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Warnings:					
Information:					
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Warnings:					
Information:					
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Information:					
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Warnings:					
Information:					

7	Fee Worksheet (SB06)	fee-info.pdf	30797 ae5d39688ab51811e065ba0c0f40760171599ee5	no	2
Warnings:					
Information:					
Total Files Size (in bytes):				3306309	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
15568431	20-Oct-2017	Rui FAN	4906P51954US1	2730

TITLE OF INVENTION :

ON-DEMAND REQUEST FOR SYSTEM INFORMATION

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Regular Undiscounted	U.S. National Stage under 35 USC 371	2463	254000	MELVIN MARCELO
Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
\$1000	\$0	\$1000	30-Oct-2019	\$0

1. Change of Correspondence Address and/or Indication Of Fee Address (37 CFR 1.33 & 1.363)

Current Correspondence Address:	Current Indicated Fee Address :
131247 NDWE LLP/Ericsson 99 Almaden Boulevard, Suite 710 San Jose CA 95113 UNITED STATES 408-675-0441 ndwe_docketing@cardinal-ip.com	
<input type="checkbox"/> Change of correspondence address requested, system generated AIA/122-EFS form attached	<input type="checkbox"/> Fee Address indication requested, system generated SB/47-EFS form attached

2. Entity Status

Change in Entity Status

Applicant certifying micro entity status; system generated Micro Entity certification form attached. See 37 CFR 1.29.

Note: Absent a valid certification of micro entity status, issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. If this box is checked, you will be prompted to choose a micro entity status on the gross income basis (37 CFR 1.29(a)) or the institution of higher education basis (37 CFR 1.29(d)), and make the applicable certification online.

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.

Document Description: Issue Fee Payment (PTO-85B)

3.The Following Fee(s) Are Submitted:

Issue Fee

I authorize USPTO to apply my previously paid issue fee to the current fees due

Publication Fee

The Director is hereby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number _____

Advance Order - # of copies _____

If **in addition** to the payment of the issue fee amount submitted with this form, there are any discrepancies in any amount(s) due, the Director is authorized to charge any deficiency, or credit any overpayment, to Deposit Account Number 506674.
 The issue fee must be submitted with this form. If payment of the issue fee does not accompany this form, checking this box and providing a deposit account number will NOT be effective to satisfy full payment of the fee(s) due.

4.Firm and/or Attorney Names To Be Printed

NOTE: If no name is listed, no name will be printed
For printing on the patent front page, list to be displayed as entered

1. NDWE LLP

2.

3.

5.Assignee Name(s) and Residence Data To Be Printed

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.

Name	City	State	Country	Category
Telefonaktiebolaget LM Ericsson (publ)	Stockholm		sweden	corporation

6.Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/William W. Kidd/	Date	10-30-2019
Name	William W. Kidd	Registration Number	31772

Electronic Patent Application Fee Transmittal

Application Number:	15568431			
Filing Date:	20-Oct-2017			
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION			
First Named Inventor/Applicant Name:	Rui FAN			
Filer:	William W. Kidd/Julie Farrar			
Attorney Docket Number:	4906P51954US1			
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:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1000

Electronic Acknowledgement Receipt

EFS ID:	37612438
Application Number:	15568431
International Application Number:	
Confirmation Number:	2730
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
First Named Inventor/Applicant Name:	Rui FAN
Customer Number:	131247
Filer:	William W. Kidd/Julie Farrar
Filer Authorized By:	William W. Kidd
Attorney Docket Number:	4906P51954US1
Receipt Date:	30-OCT-2019
Filing Date:	20-OCT-2017
Time Stamp:	18:59:56
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$1000
RAM confirmation Number	E20190TI59544816
Deposit Account	506674
Authorized User	Julie Farrar

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

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)
 37 CFR 1.21 (Miscellaneous fees and charges)
 37 CFR 1.492 (National application filing, search, and examination fees)

37 CFR 1.492(a) (Basic national fee only)

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)	Web85b.pdf	45985 d1ebba4a7ca85fd023f11a7c972317d3f029c3b	no	2

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	32002 7fd3539d3c5057d9a243f6e3c475b2ce079d6567	no	2
---	----------------------	--------------	---	----	---

Warnings:

Information:

Total Files Size (in bytes): 77987

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/568,431	10/20/2017	Rui FAN	4906P51954US1	2730
131247	7590	11/08/2019	EXAMINER	
NDWE LLP/Ericsson 99 Almaden Boulevard, Suite 710 San Jose, CA 95113			MARCELO, MELVIN C	
			ART UNIT	PAPER NUMBER
			2463	
			NOTIFICATION DATE	DELIVERY MODE
			11/08/2019	ELECTRONIC

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

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

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

ndwe_docketing@cardinal-ip.com
patent@ndwe.com

Corrected Notice of Allowability	Application No. 15/568,431	Applicant(s) FAN et al.	
	Examiner MELVIN C MARCELO	Art Unit 2463	AIA (FITF) Status Yes

-- 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 IDS filed 10-17-2019.
 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 1,3-12,14-22 and 24 . 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. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Examiner's Amendment/Comment |
| 2. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____. | 6. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material _____. | 7. <input type="checkbox"/> Other _____. |
| 4. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date. _____. | |

/MELVIN C MARCELO/
Primary Examiner, Art Unit 2463

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)

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

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

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15568431
	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	2463
	Examiner Name	MARCELO, MELVIN C
	Attorney Docket Number	4906P51954US1

U.S.PATENTS								Remove
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If you wish to add additional U.S. Patent citation information please click the Add button.								Add
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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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	3413632	EP	A1	2018-12-12	SHARP KK	English Abstract Submitted	
	2	3454620	EP	A1	2019-03-13	LG ELECTRONICS INC	English Abstract Submitted	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15568431
	Filing Date		2017-10-20
	First Named Inventor	Rui FAN	
	Art Unit	2463	
	Examiner Name	MARCELO, MELVIN C	
	Attorney Docket Number	4906P51954US1	

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	Communication pursuant to Article 94(3) EPC received for European Patent Application No. 17784155.8 (Attorney Docket No. 4906P51954EP), mailed on July 22, 2019, 4 pages.	
	2	International Preliminary Report on Patentability received for PCT Patent Application No. PCT/CN2017/101576 (Attorney Docket No. 4906P51954PCT), mailed on July 18, 2019, 6 pages.	
	3	Preliminary Search Report received for Moroccan Patent Application No. 46151 (Attorney Docket No. 4906P51954MA), completed on October 02, 2019, 4 pages of Original Document Only.	

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

EXAMINER SIGNATURE

Examiner Signature	/MELVIN C MARCELO/	Date Considered	11/05/2019
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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	15568431
	Filing Date	2017-10-20
	First Named Inventor	Rui FAN
	Art Unit	2463
	Examiner Name	MARCELO, MELVIN C
	Attorney Docket Number	4906P51954US1

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	/William W. Kidd/	Date (YYYY-MM-DD)	2019-10-16
Name/Print	William W. Kidd	Registration Number	31772

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

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

~~ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.C.M/~~



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/568,431	12/17/2019	10512027	4906P51954US1	2730

131247 7590 11/26/2019
NDWE LLP/Ericsson
99 Almaden Boulevard, Suite 710
San Jose, CA 95113

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 55 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):

Rui FAN, Beijing, CHINA;
Telefonaktiebolaget LM Ericsson (publ), Stockholm, SWEDEN;
Jinhua LIU, Beijing, CHINA;
Pål FRENGER, Linköping, SWEDEN;

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

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: U.S. Patent No. 10,512,027

USPTO CONFIRMATION CODE: 2730

APPLICATION NO.: 15/568,431

PCT FILED: September 13, 2017

U.S. FILED: October 20, 2017

EXAMINER: Melvin C Marcelo

GROUP ART UNIT: 2463

FOR: ON-DEMAND REQUEST FOR SYSTEM INFORMATION

37 CFR 1.322 & 37 CFR 1.323 REQUEST FOR CERTIFICATE OF CORRECTION
FOR USPTO AND/OR APPLICANT MISTAKE

HONORABLE COMMISSIONER OF PATENTS & TRADEMARKS

SIR:

The following is a request for a certificate of correction in Serial Number 15/568,431, now Patent Number 10,512,027.

A certificate of correction under 35 USC 254 is respectfully requested in the above-identified patent.

The errors were the fault of both the applicant and USPTO and, accordingly, please charge **\$150.00** to our Deposit Account No. 50-1379. In the event that a further fee is required, please charge the amount to the same Deposit Account.

The exact locations where the errors appear in the patent and patent application are as follows:

In Column 7, Line 50, delete “one more” and insert - - one or more - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED OCTOBER 20, 2017,
PAGE 13 (PAGE 326 OF FW), PARAGRAPH [0054], LINE 6)

In Column 14, Line 2, in Claim 15, delete “program” and
insert - - program code - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 27, 2019, PAGE 4/7,
CLAIM 17, LINE 2)

In Column 14, Line 14, in Claim 18, delete “program” and
insert - - program code - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 27, 2019, PAGE 5/7,
CLAIM 20, LINE 2)

The requested corrections are attached on Form PTO 1050.

Respectfully Submitted

, 2020

DATE

/Ronald J. Ward, Reg#54870/

Ronald J. Ward
Registration No. 54,870
Attorney of Record

**UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION**

Page 1 of 1

PATENT NO. : 10,512,027 B2
APPLICATION NO. : 15/568,431
ISSUE DATE : December 17, 2019
INVENTOR(S) : Fan, et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In Column 7, Line 50, delete "one more" and insert - - one or more - -, therefor.

In Column 14, Line 2, in Claim 15, delete "program" and insert - - program code - -, therefor.

In Column 14, Line 14, in Claim 18, delete "program" and insert - - program code - -, therefor.

MAILING ADDRESS OF SENDER (Please do not use customer number below):

6300 Legacy, MS EVR 1-C-11
Plano, TX 75024
972-583-8656

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. 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 1.0 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: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Privacy Act Statement

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

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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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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
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8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	15568431			
Filing Date:	20-Oct-2017			
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION			
First Named Inventor/Applicant Name:	Rui FAN			
Filer:	Brian Michael Kearns/Amber Rodgers			
Attorney Docket Number:	4906P51954US1			
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:				
CERTIFICATE OF CORRECTION	1811	1	150	150

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				150

Electronic Acknowledgement Receipt

EFS ID:	38999638
Application Number:	15568431
International Application Number:	
Confirmation Number:	2730
Title of Invention:	ON-DEMAND REQUEST FOR SYSTEM INFORMATION
First Named Inventor/Applicant Name:	Rui FAN
Customer Number:	131247
Filer:	Brian Michael Kearns/Amber Rodgers
Filer Authorized By:	Brian Michael Kearns
Attorney Docket Number:	4906P51954US1
Receipt Date:	29-MAR-2020
Filing Date:	20-OCT-2017
Time Stamp:	18:53:10
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$150
RAM confirmation Number	E20203SI53214837
Deposit Account	
Authorized User	

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

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Certificate of Correction	P51954-US1_2020-03-29_CoC_Request_Letter.pdf	153002 6f678276b4c34b13f349ed89620471464c63901	no	3

Warnings:

Information:

2	Request for Certificate of Correction	P51954-US1_2020-03-29_CoC_PTO-1050.pdf	128620 bc6e3b6072f62af1e6318b4cf80fb14cc4c2fbfb	no	2
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Warnings:

Information:

3	Fee Worksheet (SB06)	fee-info.pdf	30538 e3b94dd6495a544006f9fb73afa5fa12db60f7fa	no	2
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Warnings:

Information:

Total Files Size (in bytes):	312160
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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
CERTIFICATE OF CORRECTION

PATENT NO. : 10,512,027 B2
APPLICATION NO. : 15/568431
DATED : December 17, 2019
INVENTOR(S) : Fan et al.

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Specification

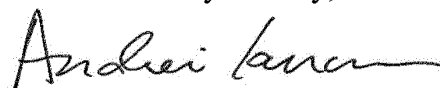
In Column 7, Line 50, delete "one more" and insert -- one or more --, therefor.

In the Claims

In Column 14, Line 2, in Claim 15, delete "program" and insert -- program code --, therefor.

In Column 14, Line 14, in Claim 18, delete "program" and insert -- program code --, therefor.

Signed and Sealed this
Twelfth Day of May, 2020



Andrei Iancu

Director of the United States Patent and Trademark Office