



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
61/501,310	06/27/2011		220	P34743-US1		

27045
ERICSSON INC.
6300 LEGACY DRIVE
M/S EVR 1-C-11
PLANO, TX 75024

CONFIRMATION NO. 1445

CORRECTED FILING RECEIPT



OC000000053487744

Date Mailed: 04/03/2012

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Anders Wallen, Ystad, SWEDEN;
Leif Wilhelmsson, Dalby, SWEDEN;
Erik Eriksson, Linkoping, SWEDEN;
Bengt Lindoff, Bjarred, SWEDEN;
Joakim Axmon, Kavlinge, SWEDEN;

Power of Attorney:

Ronald Liu--64170

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 07/01/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 61/501,310**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

MTC Support via Virtual Cells

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

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

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

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The

date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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

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

NOT GRANTED

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

SelectUSA

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
	)	
Anders WALLÉN et al.	)	Group Art Unit: Unassigned
	)	
Application No: 61/501,310	)	Examiner: Unassigned
	)	
Filed: June 27, 2011	)	Confirmation No.: 1445
	)	
For: MTC SUPPORT VIA VIRTUAL	)	
CELLS	)	

REQUEST FOR CORRECTED FILING RECEIPT

Commissioner for Patents
Alexandria, VA 22313-1450

Sir:

Upon review of the Filing Receipt for the above-identified provisional application, Applicants note that the spelling of Inventor Bengt LINDOFF's name is incorrect. Although the filing receipt spells the name "Bengt LINDO**TT**" The correct spelling should be **LINDOFF** (i.e., the two "tees" at the end of his last name should be two "effs"). A copy of the Filing Receipt with the correction noted is attached.

It is respectfully requested that the Patent Office revise their records and issue a corrected Filing Receipt.

Respectfully submitted,

POTOMAC PATENT GROUP PLLC

By: /Kenneth B. Leffler, Reg. No. 36,075/
Kenneth B. Leffler
Registration No. 36,075

Date: March 30, 2012

Potomac Patent Group, PLLC
P.O. Box 270
Fredericksburg, VA 22404
(703) 848-2332



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY DOCKET NO	TOT CLAIMS	IND CLAIMS
61/501,310	06/27/2011		220	P34743-US1		

CONFIRMATION NO. 1445

FILING RECEIPT



0000000048571074

27045
ERICSSON INC.
6300 LEGACY DRIVE
M/S EVR 1-C-11
PLANO, TX 75024

Date Mailed: 07/06/2011

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections

Applicant(s)

Anders Wallen, Ystad, SWEDEN;
Leif Wilhelmsson, Dalby, SWEDEN;
Erik Eriksson, Linkoping, SWEDEN;
Bengt Lindoff, Bjarred, SWEDEN;
Joakim Axmon, Kavlinge, SWEDEN;

Lindoff

Power of Attorney:

Ronald Liu--64170

Permission to Access - A proper Authorization to Permit Access to Application by Participating Offices (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 07/01/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 61/501,310**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Electronic Acknowledgement Receipt	
EFS ID:	12438601
Application Number:	61501310
International Application Number:	
Confirmation Number:	1445
Title of Invention:	MTC Support via Virtual Cells
First Named Inventor/Applicant Name:	Anders Wallen
Customer Number:	27045
Filer:	kenneth B. Leffler
Filer Authorized By:	
Attorney Docket Number:	P34743-US1
Receipt Date:	30-MAR-2012
Filing Date:	27-JUN-2011
Time Stamp:	16:39:29
Application Type:	Provisional

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Corrected Filing Receipt	2012-03-30_0110-745_Request_for_Corrected_Provisional_Filing_Rcpt.pdf	623146 7d4c072bd2fcc16c986b87f9c5de77b463632b78	no	2

Warnings:

Information:

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 NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
61/501,310	06/27/2011		220	P34743-US1		

CONFIRMATION NO. 1445

FILING RECEIPT



OC000000048571074

27045
ERICSSON INC.
6300 LEGACY DRIVE
M/S EVR 1-C-11
PLANO, TX 75024

Date Mailed: 07/06/2011

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Anders Wallen, Ystad, SWEDEN;
Leif Wilhelmsson, Dalby, SWEDEN;
Erik Eriksson, Linkoping, SWEDEN;
Bengt Lindott, Bjarred, SWEDEN;
Joakim Axmon, Kavlinge, SWEDEN;

Power of Attorney:

Ronald Liu--64170

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 07/01/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 61/501,310**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

MTC Support via Virtual Cells

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

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

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

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The

date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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

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

NOT GRANTED

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

Doc Code: PD.TO.AUTH

Document Description: Authorization to access Appl. by Trilateral Office

PTO/SB/39 (07-09)

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

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

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

AUTHORIZATION TO PERMIT ACCESS TO APPLICATION BY PARTICIPATING OFFICES

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

COMPLETE IF KNOWN

Application Number	
Filing Date	
First Named Inventor	Wallen
Attorney Docket Number	P34743-US1
Title (Required)	MTC Support via Virtual Cells

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

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

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

This written authorization should be submitted prior to the filing of a subsequent foreign application, in which priority is claimed to the above-identified patent application, with any intellectual property office (e.g., the EPO, JPO, KIPO, or DAS Accessing Office). However, if applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the above-identified patent application is filed to have access to the above-identified patent application, this written authorization should not be filed.

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

This form must be signed by an authorized party in accordance with 37 CFR 1.14(c).

/Ronald S. Liu, Reg No 64,170/

Signature

Ronald S. Liu

Printed or Typed Name

Intellectual Property Counsel

Title

June 27, 2011

Date

972-583-8512

Telephone Number

64,170

Registration Number, if applicable

This collection of information is required by 37 CFR 1.14(h). 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 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Privacy Act Statement

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

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

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

MTC Support via Virtual Cells

1 Background

1.1 Technical Background/Existing Technology

Machine type communication (MTC) over LTE is increasingly gaining attention as operators are planning for replacement of e.g. GSM by LTE networks. Connected sensors, alarms, remote control devices etc are common in GSM networks where they co-exist with more conventional UEs. Such devices are generally characterized by a modest bit rate and sparse communication. The number of MTC devices is expected to increase dramatically during the next few years.

In release 8/9 versions of LTE, the supported cell bandwidth is within the range of 6 and 100 resource blocks (RBs), about 1.4 to 20 MHz. Legacy control channel PDCCH extends over the full cell bandwidth, meaning that all UEs have to support reception over the full cell bandwidth in order to receive control information. The control channel carries information on where in frequency the UE can receive information on the data channel PDSCH, if any such information is transmitted to the UE or broadcasted to multiple UEs in the subframe (1 ms period).

LTE supports time-domain multiplexing on subframe basis between unicast and multicast; signaling of subframes used for MBSFN (multimedia broadcast via single frequency network) is included already from Release 8 in order to allow MBSFN to be introduced in later releases without negatively impacting legacy terminals. A legacy terminal does not support MBSFN but is aware of that subframes signaled as MBSFN subframes contains nothing for the terminal to receive, and hence reception can be avoided in those subframes. One exception is the first OFDM symbol in the subframe which carries CRS (cell-specific reference signals) which may be used e.g. for channel estimation or for measurements (e.g. RLM or RSRP) – particularly when adjacent to normal subframes. MBSFN subframes are not only planned for multicast, but are also discussed in the context of relaying and improved measurements in heterogeneous network deployment scenarios along with ABS (almost blank subframes).

1.2 Problems with Existing Solutions

Machine type communication (MTC) devices utilizing a cellular system for communication has become increasingly popular. MTC typically requires only low data rate for signaling of small amount of data. One example of an MTC device is sensors. An important requirement of such devices is that they should have low cost as well as low power consumption. Examples of cellular system parameters that typically drive cost and power consumption are the system bandwidth as well as response time. Using LTE as defined according to current standardization releases requires support of up to 20 MHz system bandwidth. Such large BW support increases the cost for LTE MTC devices. Furthermore, MTC devices supporting low data rates only need a small system bandwidth (up to some few MHz). LTE has furthermore short response times, in terms of short time for HARQ response, as well as short time between the control signaling and data information (PDCCH pointing out data in the PDSCH is included in the same sub frame). This puts requirements on the processing speed (which drives power) and the need for parallel processing (increasing baseband chip area and thereby the cost). MTC devices supporting low data rates and with low power requirements optimally should use long response time (for example longer time for decoding of control and data) in order to reduce the required clocking speed or parallel processing requirements.

According to the arguments above, it is beneficial to restrict MTC devices to operate at lower system bandwidths than 20 MHz. At the same time, it may be too restrictive to require that all cellular networks supporting power and cost efficient MTC devices need to use only small bandwidths. Instead it may be beneficial to make MTC Devices supporting only low bandwidth being able to operate in an LTE network with larger system bandwidth. Similar arguments can be used for MTC devices with restrictions in decoding performance, for instance requirements of a delay between the PDCCH and possible data in the PDSCH staggering needed, which will fail to connect to an LTE system according to current 3GPP standard already in the connection phase. Cell search and MIB could be received assuming only 1.4 MHz bandwidth. However, for being able to camp on a (prior art) LTE cell, reception of further broadcast information (SIBs) in order to be able to e.g. do a random access via the RACH requires that full bandwidth is supported as well as the possibility to decode PDCCH and PDSCH without any additional delay restrictions compared to the current standard.

In order to overcome this problem in the prior art, there is a need for a new cell definition concept in LTE taking the above shortcomings into account.

2 Basic Concept of the Invention

The invention proposes that the eNB ("host cell") sets up one or more virtual cells. The virtual cells are configured to have a smaller system bandwidth than the host cell, e.g. 6 RBs, and are serving MTC devices. In these virtual cells, a new set of entities are defined, such as physical channels and system information, targeting communication with MTC devices. These new entities as described herein correspond to entities in legacy LTE systems, and are characterized with a prefix MTC- added. Accordingly, the virtual cells may also be referred to as MTC-cells or MTC virtual cells.

The virtual cell(s) may be created either by reserving RB (resource block) pairs that are adjacent in frequency in an ordinary subframe, and transmitting an MTC-PDCCH at another OFDM symbol position than the host cell PDCCH, or by reserving particular subframes by which MTC-PDCCHs can be transmitted at an OFDM symbol where otherwise the host cell PDCCH would be transmitted. The MTC-PDCCH may carry the same type of information as the legacy PDCCH, including resource block allocation, transport format and HARQ information necessary to demodulate the downlink data channel, as well as uplink related control information such as scheduling grants and power control commands. However, the MTC-PDCCH may also contain less or more information, and be encoded differently than the PDCCH.

Mobility can still be based on the central 6 RBs of the host cell in order to avoid repetition of signaling. Moreover MTC-SI (system information) can be transmitted in a coordinated fashion, again avoiding repetition of signaling.

3 Detailed description

3.1 Detailed Technical Description of the Invention

Embodiment 1 (virtual cell):

In particular subframes, the eNB creates one or more virtual cells by reserving one or more blocks of RB pairs adjacent in frequency. A normal PDCCH spanning over the entire host cell system bandwidth is transmitted in 1, 2 or 3 of the first OFDM symbols. An MTC-PDCCH, which may correspond to a time-shifted legacy PDCCH spanning the bandwidth of the reserved RBs, but is not restricted to do so, is transmitted in any of the other symbols (prior known or blindly detected). The time shift may be signaled, standardized or detected blindly. The MTC-PDCCH may point out an MTC-PDSCH allocation time-wise following immediately after the MTC-PDCCH in the same subframe, but the control signaling may also be staggered such that the actual allocation pointed out by the MTC-PDCCH follows in a later subframe carrying virtual cell(s). The exact location in time of this later subframe may be signaled by the MPC-PDCCH, known a priori, or detected blindly.

See Figure 1 for legacy radio frame layout and Figure 3(a) and Figure 4 for illustration of Embodiment 1.

Embodiment 2 (virtual cells – dedicated subframes):

The eNB reserves particular subframes for virtual cells. In each such subframe, the virtual cells are stacked on top of each other frequency-wise. Each virtual cell has an MTC-PDCCH which may span the virtual cell's system bandwidth (which is smaller than the host cell's system bandwidth). This MTC-PDCCH may correspond to a legacy PDCCH for bandwidth spanned by the virtual cell, but is not restricted to do so. Similarly to embodiment 1, the MTC-PDCCH may point out an MTC-PDSCH allocation time-wise following immediately after the MTC-PDCCH in the same subframe, but the control signaling may also be staggered such that the actual allocation pointed out by the MTC-PDCCH follows in a later subframe carrying virtual cell(s). Moreover the MTC-PDCCH may carry e.g. grant(s) and power control commands (TPC) for transmissions on the uplink (UL).

The subframes may be pointed out as restricted subframes or MBSFN subframes in the host cell system information in order to prevent legacy terminals from trying to decode PDCCH (which inevitably will fail) but is not limited to doing so. The MTC-PDCCH of the virtual cell may be added or punctured into the symbols carrying PDCCH in the host cell. Special care may then be taken to not let the virtual cell overlap crucial and static information on the host cell PDCCH, such as PCFICH.

The virtual cells may have the same CRS as would result had the subframe been an ordinary host cell subframe.

See Figure 1 for legacy radio frame layout and Figure 2, Figure 3(b) and Figure 5 for illustration of Embodiment 2.

Embodiment 3 (co-existence of virtual cells according to previous embodiments):

A standardized solution may allow both for Embodiments 1 and 2 to co-exist as different modes or types of MTC in the same network.

Embodiment 4 (signaling of MTC system information):

The eNB may transmit MTC-SI (system information) that contains e.g.

- Random access parameters, i.e., information of what random access sequence and what time-frequency positions to use and/or
- Subframe pattern of virtual cells, and/or
- Subframe pattern of host cell (subframes with CRS) – or information that allows this to be deduced.

either in prior determined time-frequency positions according to an MTC standard, at a position pointed out by other signaling (e.g. by MIB – see related invention disclosure titled MIB for MTC), or at a position that is revealed by an MTC-PDCCH that is to be blindly detected the first time the MTC device is accessing the host cell. The MTC-SI is transmitted over a limited bandwidth, e.g. 6 RBs. The MTC-SI may be transmitted in a virtual cell that is centered around the carrier frequency of the host cell, but is not restricted to be so. If transmitted around the host cell carrier frequency over a bandwidth of 6 RBs, the MTC device can carry out cell search, MIB acquisition and SI acquisition over a bandwidth of 6 RBs and without re-tuning the radio.

Please see Figure 6 for illustration related to Embodiment 4.

Embodiment 5 (random access):

The first time the MTC device connects to a virtual cell under the host cell, it may do so by carrying out random access towards a virtual “attractor” cell that is centered around the host cell carrier frequency. This may be the same cell as the one transmitting MTC-SI. The random access resources may be the same as the ones used in the host cell. In response to the random access procedure, the MTC device gets a message that directs it to one of the virtual cells, should it not be suitable to have it connected to this cell. The MTC device then remembers the target virtual cell to which it has been directed through state transitions between RRC_IDLE and RRC_CONNECTED until signaled otherwise.

Alternatively the UE determines the target virtual cell itself based on a standardized formula which may take e.g. IMSI (international mobile subscriber identity), host cell bandwidth, and information from MTC-SI into account. In this approach, the UE reads MIB and MTC-SI and thereafter carries out random access directly towards the target virtual cell. A mechanism to redirect the MTC device may still be supported in order to allow further load-balancing by the eNB.

Please see Figure 6 for illustration related to Embodiment 5.

Embodiment 6 (mobility, frequency hopping, etc):

In order not to waste resources, cell detection is based on host cell carrier frequency. Similarly MTC-SI may be transmitted only in one of the virtual cells, or one of the virtual cells at a time. The MTC device supports hopping – i.e. re-tuning of carrier frequency – between the serving and other virtual cells. In order to improve frequency diversity, the actual RBs allocated to a virtual cell may vary in time using a predefined frequency hopping sequence. The actual frequency hopping pattern may be different in downlink and uplink.

Please see Figure 7 for illustration related to Embodiment 6.

Embodiment 7 (reference signals in virtual cells):

The virtual cells may use the same CRS as would have been transmitted in case the subframe was an ordinary host cell subframe. This approach allows the MTC device to use additional subframes for channel estimation, RRM (radio resource management) and RLM (radio link monitoring) measurements. The MTC device supports such CRS by taking frequency offsets between virtual cell and host cell into account.

The virtual cells may use other reference symbols than the CRS transmitted by the host cell. In that case the MTC device may still consider the resources occupied by the host cell CRS, based on the host cell configuration, into account in the resource mapping and/or decoding.

The MTC device may deduce which subframes it can use in addition to the virtual cell subframes by analyzing the MTC-SI described in Embodiment 4.

Embodiment 8 (reception and transmission)

The roundtrip time for HARQ (hybrid automatic repeat request) is adapted to take virtual cell subframe pattern into account. Moreover if MTC-PDCCH staggering is supported, the roundtrip time is further modified taking this into account, too.

All reception of unicast traffic and all transmissions after the initial random access are carried out in the serving virtual cell.

Embodiment 9 (capabilities)

The eNB may reveal virtual cell capabilities via the MIB, or via some other signal that can be embedded at a prior known time-frequency position. The latter may include the MTC device blindly trying to decode an MTC-PDCCH for MTC-SI using a prior known MTC-SI-RNTI.

3.2

Advantages of the Invention

The invention presents solutions to the problem stated in Section 1.2 namely that a UE supporting only low bandwidths is not able to connect to and operate in a network with higher bandwidth. The concepts are applicable both for FDD and TDD operation.

One benefit of the virtual cell concept is that the system may dynamically adjust the number of virtual cells in order to match the current balance between the number of served legacy devices and MTC devices. Embodiment 1 enables the system to add virtual cells one by one, providing maximum flexibility. In embodiment 2, whole subframes are allocated to virtual cells, which provides less granularity, but at the same time potentially enables higher efficiency since no resource elements need to be reserved for legacy PDCCH transmission. A system using a combination of embodiment 1 and 2 may take advantage of the merits of both embodiments.

4 Example Implementations

Although the described solutions may be implemented in any appropriate type of telecommunication system supporting any suitable communication standards and using any suitable components, particular embodiments of the described solutions may be implemented in a network, such as that illustrated in Figure 8.

As shown in Figure 8, the example network may include one or more instances of user equipment (UEs) and one or more base stations capable of communicating with these UEs, along with any additional elements suitable to support communication between UEs or between a UE and another communication device (such as a landline telephone). Although the illustrated UEs may represent communication devices that include any suitable combination of hardware and/or software, these UEs may, in particular embodiments, represent devices such as the example UE illustrated in greater detail by Figure 9. Similarly, although the illustrated base stations may represent network nodes that include any suitable combination of hardware and/or software, these base stations may, in particular embodiments, represent devices such as the example base station illustrated in greater detail by Figure 10.

As shown in Figure 9, the example UE includes a processor, a memory, a transceiver, and an antenna. In particular embodiments, some or all of the functionality described above as being provided by mobile communication devices or other forms of UE may be provided by the UE processor executing instructions stored on a computer-readable medium, such as the memory shown in Figure 9. Alternative embodiments of the UE may include additional components beyond those shown in Figure 9 that may be responsible for providing certain aspects of the UE's functionality, including any of the functionality described above and/or any functionality necessary to support the solution described above.

As shown in Figure 10, the example base station includes a processor, a memory, a transceiver, and an antenna. In particular embodiments, some or all of the functionality described above as being provided by a mobile base station, a base station controller, a node B, an enhanced node B, and/or any other type of mobile communications node may be provided by the base station processor executing instructions stored on a computer-readable medium, such as the memory shown in Figure 10. Alternative embodiments of the base station may include additional components responsible for providing additional functionality, including any of the functionality identified above and/or any functionality necessary to support the solution described above.

5 Figures

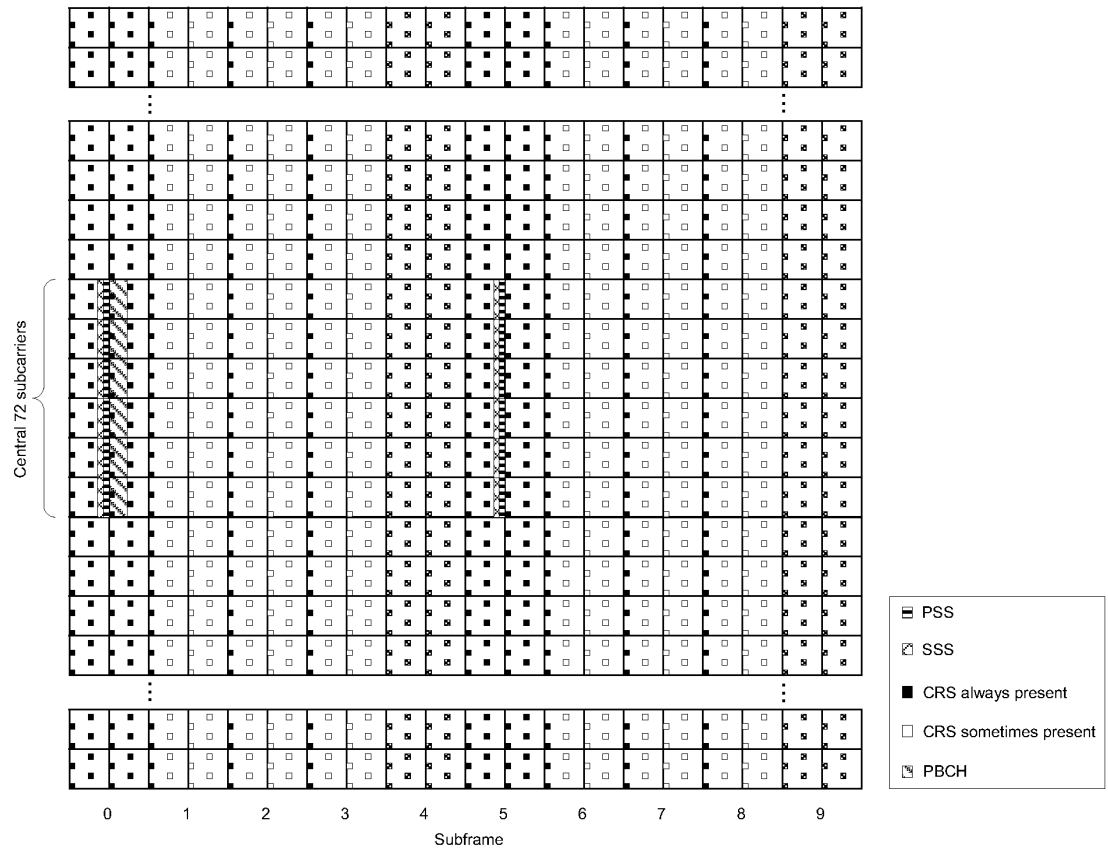


Figure 1: Time –frequency grid of a legacy LTE FDD cell which is wider than the smallest DL system bandwidth of 1.4 MHz (72 subcarriers or 6 RBs). Subframes 1-3 and 6-8 may be used for MBSFN or may be signaled to do so for other purposes, by which a UE cannot expect reference signals in more than the first OFDM symbol. PBCH (carrying MIB) and synchronization signals are transmitted at prior known OFDM symbol positions over the central 72 subcarriers.

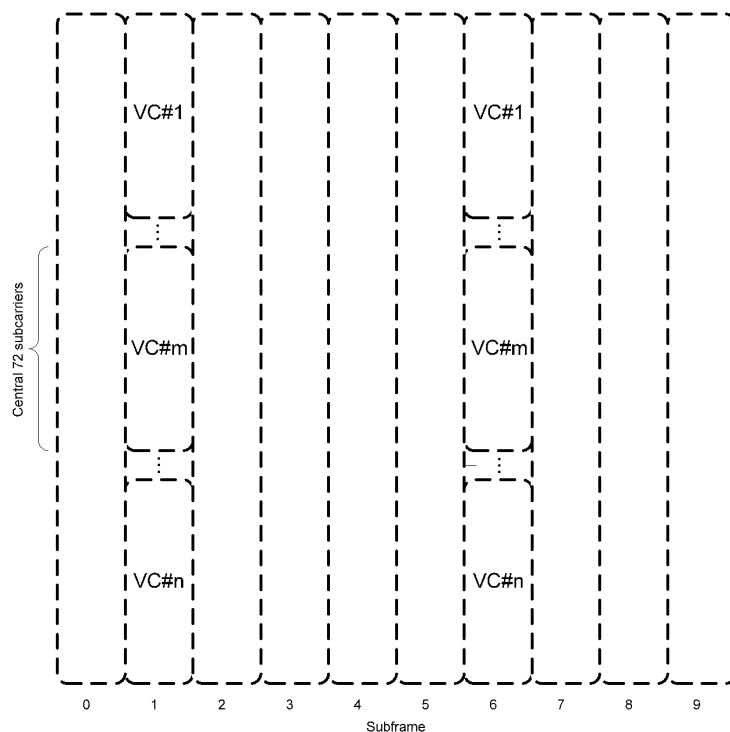


Figure 2: (Embodiment 2) Sketch of a host cell for which particular subframes are used for virtual cells.

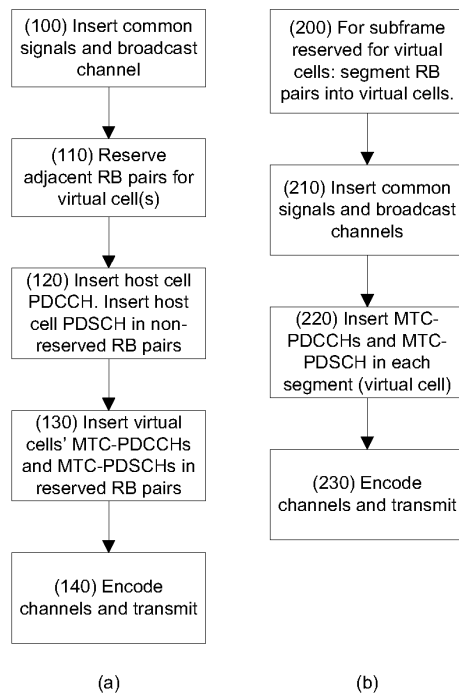


Figure 3: Flow charts for Embodiments 1 and 2, panels (a) and (b) respectively.

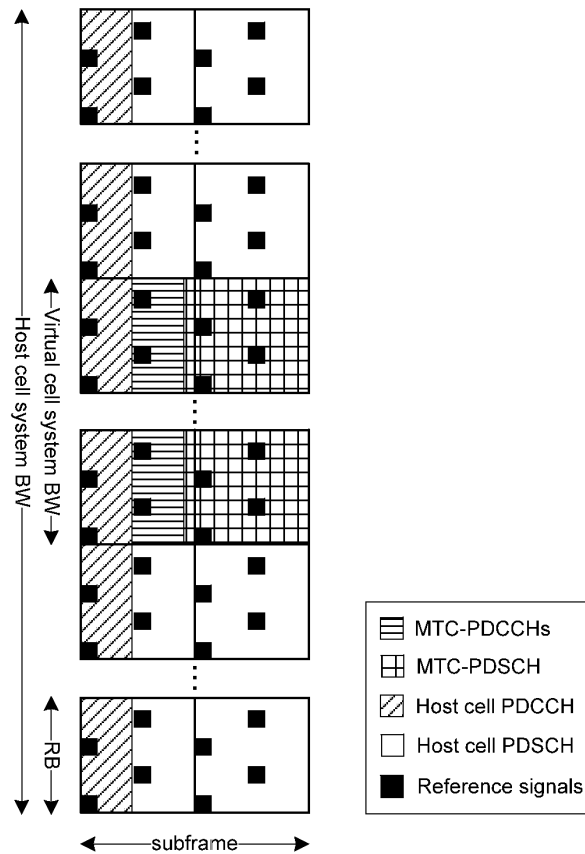


Figure 4: (Embodiment 1) Sketch of a subframe where the host cell has created a virtual cell by reserving some RB pairs. The first OFDM symbols carry legacy PDCCH (which spans over the full DL system bandwidth). In the reserved RB pairs, some of the following OFDM symbols carry MTC-PDCCH which spans e.g. over 6 RBs in frequency direction. The remaining REs in the reserved RBs may carry MTC-PDSCH.

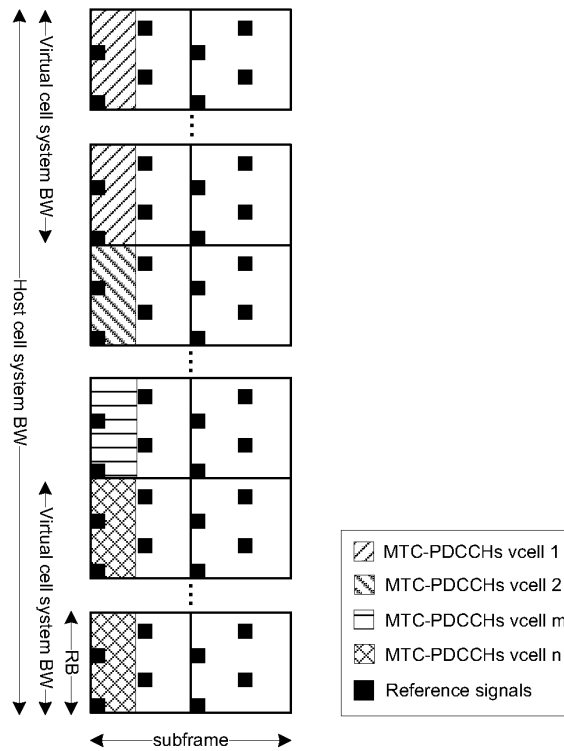


Figure 5: (Embodiment 2) Sketch of subframe where the host cell has allocated the whole subframe with virtual cells. No legacy PDCCH needs to be transmitted. Thus, the MTC-PDCCHs transmitted in each virtual cell can start at the first OFDM symbol. Remaining REs in each virtual cell are used for MTC-PDSCHs.

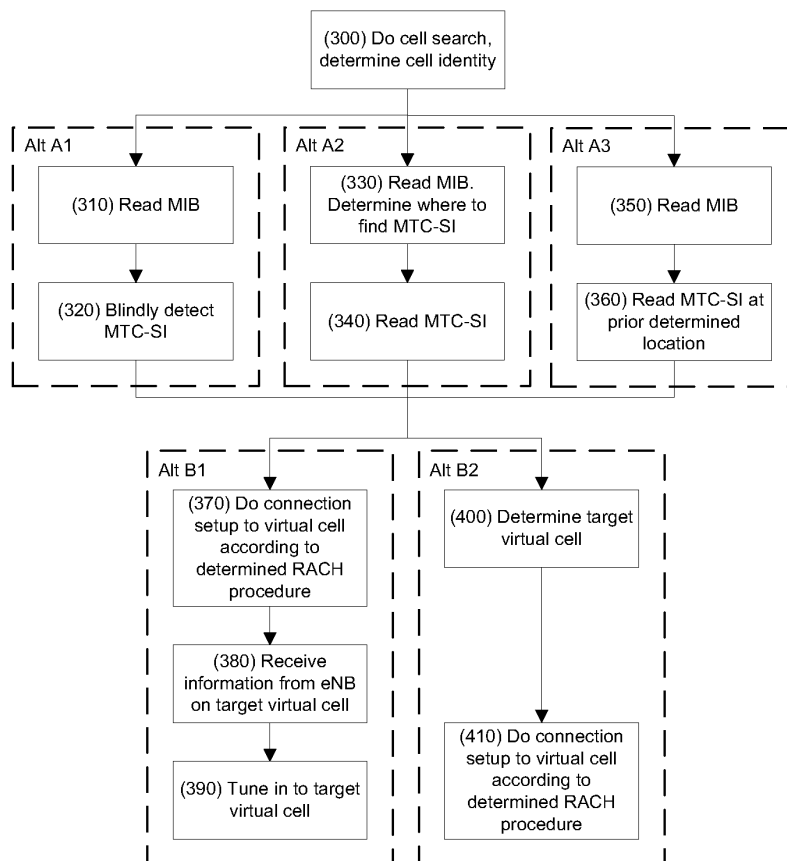


Figure 6: (Embodiments 4 and 5) The MTC device carries out cell search, and then acquires system information according to one of three exemplary alternatives (Alt A1-A3). After having received the system information, the MTC device carries out random access according to one out of two exemplary alternatives (Alt B1-B2).

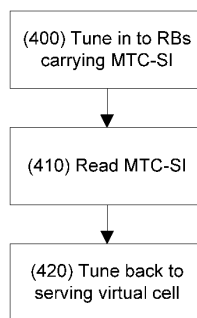


Figure 7: (Embodiment 6) When system information expires or the MTC device gets notified on that SI information has changed, it tunes in to the RBs (virtual cell) where the MTC-SI is transmitted, and then tunes back to the serving virtual cell again. Note that in some scenarios the serving virtual cell and the virtual cell transmitting the MTC-SI are the same cell.

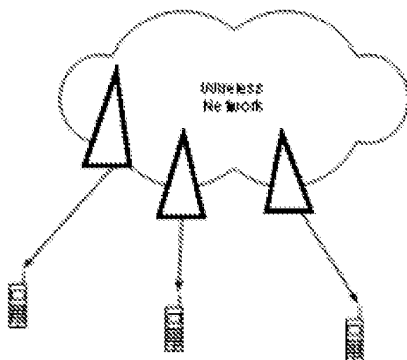


Figure 8: Example Communication System

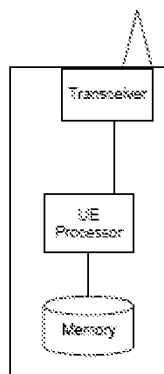


Figure 9: Example User Equipment (UE)

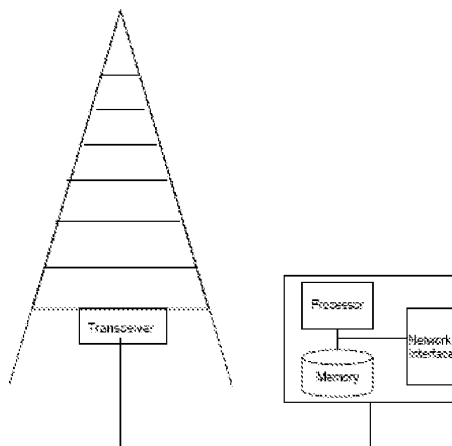


Figure 10: Example Base Station

6 Abbreviations

3GPP	Third generation partnership project
ABS	Almost blank subframes
Alt	Alternative
BW	Bandwidth
CRS	Cell-specific reference signals
DL	Downlink
eNB	Evolved node B (base station)
E-UTRA(N)	Evolved universal terrestrial radio access (network)
FDD	Frequency division duplex
GSM	Global system for mobile communication
HARQ	Hybrid automatic repeat request
IMSI	International mobile subscriber identity
LTE	Long term evolution (see E-UTRAN)
MBSFN	Multimedia broadcast over single frequency network
MIB	Master information block
MTC	Machine type communication
OFDM	Orthogonal frequency-division multiplexing
PBCH	Physical broadcast channel (on which MIB is transmitted)
PCFICH	Physical control format indicator channel
PDCCH	Physical downlink control channel
PDSCH	Physical downlink shared channel
RACH	Random access channel
RB	Resource block
RE	Resource element
RLM	Radio link monitoring
RNTI	Radio network temporary identifier
RRC	Radio resource control
RRM	Radio resource management
RSRP	Reference signal received power
SI	System information
SIB	System information block
SIB1	System information block 1
TDD	Time division duplex
TPC	Transmit power control
UE	User equipment
UL	Uplink
VC	Virtual cell

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		MTC Support via Virtual Cells		
First Named Inventor/Applicant Name:		Anders Wallen		
Filer:		Steven Ware Smith/Jennifer Hardin		
Attorney Docket Number:		P34743-US1		
Filed as Large Entity				
Provisional Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Provisional application filing	1005	1	220	220
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:				
Total in USD (\$)				220

Electronic Acknowledgement Receipt	
EFS ID:	10389741
Application Number:	61501310
International Application Number:	
Confirmation Number:	1445
Title of Invention:	MTC Support via Virtual Cells
First Named Inventor/Applicant Name:	Anders Wallen
Customer Number:	27045
Filer:	Steven Ware Smith/Jennifer Hardin
Filer Authorized By:	Steven Ware Smith
Attorney Docket Number:	P34743-US1
Receipt Date:	27-JUN-2011
Filing Date:	
Time Stamp:	11:08:58
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$220
RAM confirmation Number	9700
Deposit Account	501379
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)					
Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)					
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		P34743-US1_2011-06-27_11-3689_Provisional_Application_Transmittal_Letter.pdf	90299 b71ba36f961fcd7087f8ac5d70b7740636732ace	yes	4
Multipart Description/PDF files in .zip description					
	Document Description	Start	End		
	Provisional Cover Sheet (SB16)	1	2		
	Authorization to access Appl. by Trilateral Office	3	4		
Warnings:					
Information:					
2	Specification	P34743-US1_2011-06-27_11-3689_Provisional_Application.pdf	125239 95a4206eb2070d33b862cc84315f7dfb5808bde4	no	15
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	29132 2c47e171bd3706225426342bcf749abee36b228a	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			244670		
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. <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. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

PROVISIONAL APPLICATION FOR PATENT COVER SHEET – Page 1 of 2

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. Transmitted Via EFS-Web

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Anders	Wallen	Ystad, Sweden
Leif	Wilhelmsson	Dalby, Sweden
Erik	Eriksson	Linkoping, Sweden
Bengt	Lindoff	Bjarred, Sweden
Joakim	Axmon	Kavlinge, Sweden
<i>Additional inventors are being named on the _____ separately numbered sheets attached hereto</i>		
TITLE OF THE INVENTION (500 characters max):		
MTC Support via Virtual Cells		
Direct all correspondence to: CORRESPONDENCE ADDRESS		
☒ The address corresponding to Customer Number: 27045		
OR ☐ Firm or Individual Name		
Address		
City	State	Zip
Country	Telephone	Email
ENCLOSED APPLICATION PARTS (check all that apply)		
☐ Application Data Sheet. See 37 CFR 1.76		
☐ Drawing(s) Number of Sheets _____		
☒ Specification (e.g. description of the invention) Number of Pages <u>12</u>		
☐ CD(s), Number of CDs _____		
☐ Other (specify) _____		
Fees Due: Filing Fee of \$220 (\$105 for small entity). If the specification and drawings exceed 100 sheets of paper, an application size fee is also due, which is \$270 (\$130 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).		
METHOD OF PAYMENT OF THE FILING FEE AND APPLICATION SIZE FEE FOR THIS PROVISIONAL APPLICATION FOR PATENT		
☐ Applicant claims small entity status. See 37 CFR 1.27.		
☐ A check or money order is enclosed to cover the filing fee and application size fee (if applicable).		
☐ Payment by credit card. Form PTO-2038 is attached		
☒ The Director is hereby authorized to charge the filing fee and application size fee (if applicable) or credit any overpayment to Deposit		
Account Number: <u>50-1379</u> A duplicative copy of this form is enclosed for fee processing.		

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. 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 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

PROVISIONAL APPLICATION COVER SHEET

Page 2 of 2

PTO/SB/16 (10-07)

Approved for use through 06/30/2010. OMB 0651-0032

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

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

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.



No.



Yes, the name of the U.S. Government agency and the Government contract number are: _____

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

SIGNATURE /Ronald S. Liu, Reg No 64,170/

Date June 27, 2011

TYPED or PRINTED NAME Ronald S. Liu

REGISTRATION NO. 64,170
(if appropriate)

TELEPHONE 972-583-8512

Docket Number: **P34743-US1**