Claim 3

The Examiner stated that with regards to applicant's feature of stripping location information from the signal:

> "both Jo et al. and Zellner et al. disclose the stripping away location information. Zellner was added only to show another reference that blocks or strips or removes location information."
> (Office Action, page 5)

The added reference of Zellner does not show applicant's invention of claim 3. Applicant's claims 3 include features that depend on one another.

Applicant's claim 3 includes receiving a cell phone burst signal at a device from a first wireless telephonic device that includes location information. Accordingly, with respect to Zellner and the other references, any reference that discusses location on the device itself is not relevant as applicant's claim includes receiving a phone burst signal from a first wireless telephonic device that includes location information.

Applicant's claim 3 includes storing the location information in a storage device – which also removes the relevancy of systems on the wireless device providing the burst -- stripping the location information from the burst signal and providing the signal from the device to a second wireless telephonic device without the location information.

Zellner does not show or suggest storing and stripping. Blocking location does not show or suggest storing and stripping. Blocking merely alleges blocking. Blocking location merely shows blocking location.

Applicant had previously amended claim 3 without prejudice and solely in order to expedite prosecution.

The Examiner now provides a seven reference rejection to applicant's claim 3 – with one of the references is applicant's specification itself.

Wireless communication technology has been around for over a century. Wireless communication technology may be one of the most active areas of technology. Accordingly, applicant submits that the need for seven references is, in itself, evidence of patentability of applicant's invention of claim 3.

The Examiner's directed applicant to paragraph 60 of Jo, which states:

> "The location area update request signal 5Ab is transmitted to the HLR 16a of the home network via the VLR_B1, GLR_B 19 and GLR_A 19a. The HLR 16a transmits the location information cancel request signal about the terminal MS_A to the VLR_A1 22 of the home network. The VLR_A1 22 cancels the location information about the terminal MS_A and then transmits a location information cancel acknowledgement request signal 4Ae. Then, a line subscriber information transmission message 4Af is transmitted to the VLR_B114 of the visitor network via the GLR_A 19a and GLR_B 19." (Jo, paragraph 60)

Jo, however, is irrelevant to applicant's claim 3. Jo merely discusses the management of location registration between home and visitor networks as a mobile station travels around the world. Jo alleges manages a cancel request message so that a consumer can travel between home and visitor networks.

Jo, neither used alone or in combination with other references, does not show or suggest applicant's

claims 3 of receiving a signal from a first wireless telephonic device that includes location information, stripping said location information from said signal, and providing said signal to a second wireless telephonic device.

As can be seen in Jo's paragraph 60, Jo does not show or suggest receiving a signal from a first wireless telephonic device, stripping the location information from that signal, and then providing that signal to a second wireless telephonic device. The communication to handle roaming between home and visitor networks via a cancel request signal discussed by Jo does not show or suggest these features between the first and second wireless telephonic device.

Zellner does not correct for the deficiencies of Jo. Zeller does not show or suggest applicant's features of claim 3 hat include storing and stripping.

Applicant respectfully submits that none of the references, used either individually or in combination, show or suggest applicant's features of claim 3. In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 3, and any claims dependent therefrom, be withdrawn.

Claim 4

As shown above, claim 3 is patentable. Applicant has amended claim 4 without prejudice and solely in order to expedite prosecution. Claim 4 includes patentable features similar to patentable features included in claims 3. None of the references, used either alone or in combination, show or suggest

applicant's invention of claim 4 of providing a phone burst signal from a wireless device, receiving a signal at a device from a first wireless telephonic device that includes location information, and providing the signal from the device to a second wireless telephonic device without said location information.

In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 4, and any claims dependent therefrom, be withdrawn.

Claim 15

As shown above, claims 3 and 4 are patentable. Applicant has amended claim 15 without prejudice and solely in order to expedite prosecution. Claim 15 includes patentable features similar to patentable features included in claims 15. None of the references, used either alone or in combination, show or suggest applicant's invention of claim 15 of a base station for routing a signal between said first wireless telephonic device and said second wireless telephonic device, the wireless device provides the signal as a burst signal, the base station receives the signal with data representative of the location of said first wireless telephonic device and provides the signal to said second wireless telephonic device without the data representative of the location of said first wireless telephonic device.

In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 15, and any claims dependent therefrom, be withdrawn.

The Dependent Claim Rejections

The Examiner rejected claims 5-14 and 16-25 under 35 103(a) as being unpatentable over Barclay and Rosen and further in view of Matsumoto and Puckette. As shown above, claims 3, 4, and 15 are patentable. Claims 5-14 and 16-25 depend from claim 3, 4, or 15. Accordingly, claims 5-14 and 16-25 are patentable for depending from a patentable base claim.

In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claims 5-14 and 16-25 be withdrawn.

The Official Notice Rejection

It appears that the Examiner may have made rejections in view of Official Notice.

For rejections under 35 U.S.C. § 103(a), the Examiner has the burden of showing each and every element of applicant's invention in the prior art combination. MPEP § 2144.03 requires that the facts of which notice are being taken be capable of instant and unquestionable demonstration as being well known in the art. *See In re Ahlert*, 424 F.2d 1088, 1091, 165 USPQ 418, 420 (CCPA 1970). Applicant believes that the "facts" of which the Examiner may have taken Official Notice do not meet that standard, and invoke his right under MPEP § 2144.03 to have the Examiner provide documentary proof that those facts are actually well known.

The Examiner "cannot simply reach conclusions based on its own understanding or experience – or on its assessment of what would be basic knowledge or common sense. Rather, ... [the Examiner] ... must point to some concrete evidence in the record in support of these findings." *In re Zurko*, 258 F.3d at 1385, 59 USPQ2d at 1697 (Fed. Cir. 2001). If the Examiner is relying on

personal knowledge to support the finding of what is known in the art, the examiner must provide an affidavit or declaration setting forth factual statements and explanation to such a finding. *See* MPEP 2144.03(c). Accordingly, for any rejection in view of Official Notice, applicant requests that the Examiner provide a specific reference.

For at least the above reasons, applicant respectfully requests that the any Examiner rejection in view of Official Notice be withdrawn.

Conclusion

Applicant respectfully submits that this application, including the pending claims, is in condition for allowance.

Reconsideration and prompt allowance of this application are respectfully requested.

The Director is hereby authorized to charge any fees associated with this filing, or credit any overpayments thereon, to Deposit Account No. 50-3855, Order No. JDM/002 CON7.

Respectfully Submitted,

/Jeffrey D. Mullen/

Jeffrey D. Mullen
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Electronic Patent Application Fee Transmittal

Application Number:	11841765
Filing Date:	20-Aug-2007
Title of Invention:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
First Named Inventor/Applicant Name:	Jeffrey David Mullen
Filer:	Jeffrey David Mullen
Attorney Docket Number:	JDM/002 CON7

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

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($)
Extension - 3 months with $0 paid	2253	1	700	700
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	2820	1	950	950
		Total in USD ($)		**1650**

Electronic Acknowledgement Receipt

EFS ID:	36645287
Application Number:	11841765
International Application Number:	
Confirmation Number:	2475
Title of Invention:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
First Named Inventor/Applicant Name:	Jeffrey David Mullen
Customer Number:	32733
Filer:	Jeffrey David Mullen
Filer Authorized By:	
Attorney Docket Number:	JDM/002 CON7
Receipt Date:	22-JUL-2019
Filing Date:	20-AUG-2007
Time Stamp:	09:14:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1650
RAM confirmation Number	072219INTEFSW00011810503855
Deposit Account	503855
Authorized User	Jeffrey Mullen

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

37 CFR 1.16 (National application filing, search, and examination fees)

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)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	JDM-002CON7--RCE.pdf	697863 c9869a9a8029e5b4df6123920a0d97b06c04e830	no	3
Warnings:					
Information:					
2		JDM-002CON7--Reply.pdf	119794 f1dc55b4e1c260133bafc81e590ffce88afa996b	yes	13

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment Submitted/Entered with Filing of CPA/RCE	1	1
Claims	2	6
Applicant Arguments/Remarks Made in an Amendment	7	13

Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32708 23f54221bb75fbb53890960a32a0c6eb662f7f58	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	850365		

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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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/841,765	08/20/2007	Jeffrey David Mullen	JDM/002 CON7	2475

32733 7590 10/17/2019

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EXAMINER	
DEANE JR, WILLIAM J	

ART UNIT	PAPER NUMBER
2652	

MAIL DATE	DELIVERY MODE
10/17/2019	PAPER

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

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

Office Action Summary	Application No. 11/841,765	Applicant(s) Mullen, Jeffrey David	
	Examiner WILLIAM J DEANE JR	Art Unit 2652	AIA (FITF) Status No

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☑ Responsive to communication(s) filed on 07/22/2019.

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

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

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

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

Disposition of Claims*

5) ☐ Claim(s) 3-25 is/are pending in the application.

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

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 3-25 is/are rejected.

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

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

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

Application Papers

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

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

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

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

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

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

DETAILED ACTION

The examiner strongly suggest that Applicant setup a telephonic interview with the examiner to iron out any misunderstandings rather than continuing with just paper responses. If Applicant would prefer another person also be in on the interview, the examiner can request his supervisor to set in on the interview. If Applicant believes that such an interview would be helpful, Applicant can contact the examiner at 571 272-7484 or at William.deane@uspto.gov in order to setup an amicable date and time.

Claim Rejections - 35 USC §103

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

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

Claims 3 - 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application No. 20030119522 (Barclay et al.) in view of U.S. Patent No. 7,324, 832 (Rosen et al.) and further in view of U.S. Patent No. 6,078,578

(Matsumoto) and Puckette IV and in view of Applicant's own printed publication No. 2007/0281671 (hereinafter, the printed publication) and further in view of U.S. Patent No. 20020061746 (Jo et al.) or U.S. Patent Application No. 2010/0151815 (Zellner et al.) and U.S. Patent No. 5,889,474 (LaDue).

With respect to claims 3 and 23 note paragraphs 0012, 0015 - 0017, 0023 (inherently the location information is stored, at least for some time, at the service provider or elsewhere on the communication network) if this is not agreed, then it would have been obvious to one of ordinary skill in the art, in light of Barclay et al., to store the information wherever it was deemed necessary ; and providing the signal from the device to a second wireless device without the location information (see Fig. 4 and 0018). It is believed that the signal in Barclay carries the location information (see Fig. 1). If this is not agreed, note Col. 2, lines 23 - 63 of Rosen et al. It would have been obvious to one of ordinary skill in the art to have incorporated such a signal carrying the location information as disclosed by Rosen et al. into the Barclay et al. system as just another means of getting the location information to the next platform.

With respect to the burst signal and synchronization information, Rosen et al. do not teach burst signals. First TDMA and CDMA are notoriously old in the art and it would have been obvious to have incorporated such whenever or wherever it was deemed necessary. In addition, note that Matsumoto teaches burst signals in Fig. 3. This is a TDMA signal (see Abstract) and as stated above, it would have been obvious to one of ordinary skill in the art to have incorporated TDMA or CDMA wherever

it was deemed necessary. It is noted that such TDMA and CDMA are cell burst standards. Therefore, it would have been obvious to have incorporated such burst signals as taught by Matsumoto into the Barclay et al./Rosen et al. system as such would only entail the substitution or addition of one signal type for another.

In addition, note paragraph 0089 from Applicant's printed publication 2007/0281671.

Both TDMA and CDMA are cell burst standards having data locations that can contain whatever data that will fit in the slot of the frame including location information. The frames contained in the references are analogous to the frame in Applicant's Fig.18. The examiner also points to paragraph 0089 in Applicant's printed publication No. 2007/0281671. Here Applicant states. "Persons skilled in the art will appreciate that some cell phone burst standards (e.q., TDMA and CDMA) have signal portions that are reserved for future technologies." So here Applicant has a frame with places already reserved for some data, which is known to persons of ordinary skill in the art. Applicant decides to insert at least location data in these reserved slots. In light of the above, it would have been obvious to one of ordinary skill in the art to have incorporated the teachings in the 2007/0281671 printed publication into the Matsumoto/Barclay et al./Rosen et al. system as an obvious design choice.

With respect to the ability to have location information and additional data portion, note Fig. 1 of Puckette, IV. Note the sync, data, sync, data portions

and compare to applicant's Fig. 18. Note the use of location data throughout Puckette, IV and in Rosen et al. Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated such additional data as disclosed by Puckette, IV into the Barclay et al./Rosen et al./ Matsumoto/the printed publication system as such would only entail the substitution of one data portion for another.

With respect to the claim language:

"stripping said location information from said signal;"

Please note paragraph 0060 of Jo et al. It would have been obvious to one of ordinary skill in the art to have incorporated the teachings of Jo et al. into the Barclay et al./Rosen et al./Mansanto/ Puckette, IV et al./the printed publication in order to ensure privacy for a user.

If this is argued, note paragraph 0016 of Zellner et al. It would have been obvious to one of ordinary skill in the art to have incorporated the teachings of Zellner et al. into the Barclay et al./Rosen et al./Mansanto/ Puckette, IV et al./the printed publication in order to ensure privacy for a user.

With respect to claims 4, 20 and 24, note the above and paragraph 0018.

With respect to claims 5, 8, 10, 13 note T/R 111 (base station); again it would have been obvious to one of ordinary skill in the art to have stored the information wherever it was deemed necessary.

With respect to claims 6, 7, 11, 12, 16, 17 both TDMA and CDMA are notoriously well-known in the art and it would have been obvious to one of ordinary skill in the art to have incorporated such TDMA or CDMA wherever it was deemed necessary.

With respect to the new claim language of a data portion and a reserve portion, note at least Col. 10, line 65 - Col. 11, line 59 of LaDue. It would have been obvious to one of ordinary skill in the art to have incorporated the teachings of LaDue into the Barclay et al./Rosen et al./Mansanto/ Puckette, IV et al./the printed publication/Jo et al. system and method as this is how it appears things are done. Also, it would have been obvious to one of ordinary skill in the art to put the location information in either the reserved portion or the data portion since both the data portion and reserve portion accepts data, which is what location information is.

With respect to claims 9, 14,18 and 19 note the use of wireless phones which include speakers, microphone and a display. In addition, note paragraphs 0017 and 0022.

With respect to claims 15 and 25, note the rejections above.

With respect to claims 21 and 22, note the above and element 109.

Response to Arguments

Applicant's arguments filed 10/01/2018have been fully considered but are not deemed persuasive to any error in the rejection above.

In addition, both Jo et al. and Zellner et al. disclose the stripping away location information. Zellner was added only to show that another reference that blocks or strips or removes location information from a signal and to continue to transmit the signal farther without the location information and therefore, such is old in the art. Note also, paragraphs 0033, 0037, 0046 and 0049 of Zellner.

Applicant argues as though this was a 102 rejection rather than a 103 rejection.

In addition, note Patent No. 6,983,313 (Korkea-Aho), Cols. 4 – 5, lines 35 – 9 (using CDMA and removing location information).

In response to applicant's argument that the examiner has combined an excessive number of references, reliance on a large number of references in a rejection does not, without more, weigh against the obviousness of the claimed invention. See *In re Gorman*, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William Deane whose telephone number is 571 -272-7484. The examiner can normally be reached on Monday - FRIDAY from 9:00 A.M. to 5:00 P.M. If attempts to reach the examiner by telephone are unsuccessful, the

examiner's supervisor, Ahmad Matar, can be reached on 571-272-7488. The official fax phone number for the organization where this application or proceeding is assigned is 571 -273-8300. However, unofficial faxes can be direct to the examiners computer at 571 273 -7484.

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).

15Oct2019

/WILLIAM J DEANE JR/
Primary Examiner, Art Unit 2652

Notice of References Cited	Application/Control No. 11/841,765	Applicant(s)/Patent Under Reexamination Mullen, Jeffrey David	
	Examiner WILLIAM J DEANE JR	Art Unit 2652	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-6983313-B1	01-2006	Korkea-Aho; Mari	G06F16/9537	709/219
*	B	US-6583716-B2	06-2003	Rangarajan; Jayanthi	G06F16/29	340/7.56
*	C	US-5500887-A	03-1996	Jeon; Hak-Seong	H04W60/00	455/456.2
*	D	US-7532894-B1	05-2009	Muhonen; Ahti	H04W8/10	455/404.2
*	E	US-20030154243-A1	08-2003	Crockett, Douglas M.	H04L63/08	709/203
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

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	
	V	
	W	
	X	

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

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11/841,765	Mullen, Jeffrey David
	Examiner	Art Unit
	WILLIAM J DEANE JR	2652

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

CLAIMS

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

CLAIM		DATE								
Final	Original	08/26/2008	06/19/2009	03/15/2010	03/28/2011	12/02/2011	08/24/2012	06/30/2013	02/16/2014	10/15/2019
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	✓	✓	✓	✓	✓	✓	✓	✓	✓
	4	✓	✓	✓	✓	✓	✓	✓	✓	✓
	5	✓	✓	✓	✓	✓	✓	✓	✓	✓
	6	✓	✓	✓	✓	✓	✓	✓	✓	✓
	7	✓	✓	✓	✓	✓	✓	✓	✓	✓
	8	✓	✓	✓	✓	✓	✓	✓	✓	✓
	9	✓	✓	✓	✓	✓	✓	✓	✓	✓
	10	✓	✓	✓	✓	✓	✓	✓	✓	✓
	11	✓	✓	✓	✓	✓	✓	✓	✓	✓
	12	✓	✓	✓	✓	✓	✓	✓	✓	✓
	13	✓	✓	✓	✓	✓	✓	✓	✓	✓
	14	✓	✓	✓	✓	✓	✓	✓	✓	✓
	15	✓	✓	✓	✓	✓	✓	✓	✓	✓
	16	✓	✓	✓	✓	✓	✓	✓	✓	✓
	17	✓	✓	✓	✓	✓	✓	✓	✓	✓
	18	✓	✓	✓	✓	✓	✓	✓	✓	✓
	19	✓	✓	✓	✓	✓	✓	✓	✓	✓
	20	✓	✓	✓	✓	✓	✓	✓	✓	✓
	21	✓	✓	✓	✓	✓	✓	✓	✓	✓
	22	✓	✓	✓	✓	✓	✓	✓	✓	✓
	23					✓	✓	✓	✓	✓
	24					✓	✓	✓	✓	✓
	25					✓	✓	✓	✓	✓

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11/841,765	Mullen, Jeffrey David
	Examiner	Art Unit
	WILLIAM J DEANE JR	2652

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
	Updated the prior search.	26Aug2008	WJD
	Updated the prior search.	19Jun2009	WJD
	Updated the prior search	15Mar2010	WJD
	Updated the above search	27Mar2011	WJD
	Updated the search above	02Dec2011	WJD
	Updated the prior search above	24Aug2012	WJD
	Updated the prior search	30Jun2013	WJD
	updated the search	16Feb2014	WJD
	Updated the search above	21Sep2014	WJD
	Updated the search above	19Apr2015	WJD
	Updated the search	20Jan2016	WJD
	Updated the search dated 01/02/2008	24Oct2016	WJD
	Updated the search above	26Apr2017	WJD
	Updated the searches above	28Mar2018	WJD
	Updated the searches above	01/19/2019	WJD
	Updated the searches above	10/15/2019	WJD

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/WILLIAM J DEANE JR/ Primary Examiner, Art Unit 2652	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11/841,765	Mullen, Jeffrey David
	Examiner	Art Unit
	WILLIAM J DEANE JR	2652

Search Notes		
Search Notes	Date	Examiner

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/WILLIAM J DEANE JR/ Primary Examiner, Art Unit 2652	

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 11/841,765	Filing Date 08/20/2007	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $25 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $ 100 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	04/17/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 23	Minus	** 23	= 0		x $ 50 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $ 230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

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

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

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Jeffrey D. Mullen
Application No.	:	11/841,765
Confirmation No.	:	2475
Filed	:	August 20, 2007
For	:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
Group Art Unit	:	2614
Examiner	:	William J. Deane Jr.

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

Pittsburgh, PA 15116
April 17, 2020

REPLY TO OFFICE ACTION

Sir:

This is in response to the Office Action dated October 17, 2020. A three-month extension of time and is applicable hereto and is being submitted herewith. In response to the Office Action, applicant amends the application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 7 of this paper.

Amendments to the Claims:

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

Listing of Claims:

1-2. (cancelled).

3. (currently amended) A system ~~method~~ comprising:

~~receiving a signal at~~ a device operable to receive a signal from a first wireless telephonic device, wherein said signal includes location information for said first wireless telephonic device, ~~wherein~~ said signal is operable to be provided by said first wireless telephonic device as a phone burst signal that includes an additional data portion, ~~portion; storing by~~ said device is operable to store said location information in a storage device, ~~device; stripping~~ said location information is operable to be stripped from said signal, ~~signal;~~ and ~~providing~~ said signal is operable to be provided from said device to a second wireless telephonic device without said location information.

4. (currently amended) A system ~~method~~ comprising:

~~receiving a signal at~~ a device operable to receive a signal from a first wireless telephonic device, wherein said signal includes location information for said first wireless telephonic device and said signal is provided by said first wireless telephonic device as a phone burst signal that includes an additional data portion, ~~portion;~~ ~~storing by~~ said device operable to store said location information in a storage device,

~~device;~~ ~~stripping~~ said location information is operable to be stripped from said signal, ~~signal; providing~~ said signal is operable to be provided from said device to a second wireless telephonic device without said location information, ~~information;~~ ~~receiving~~ a request is operable to be received for said location information from a third wireless telephonic device, ~~wherein~~ access rights are operable to be assigned by said first wireless telephonic device for said third wireless telephonic device are obtained and said location information is operable to be provided to said third wireless telephonic device based on said access rights.

5. (currently amended) The system ~~method~~ of claim 3, wherein said device comprises a base station.

6. (currently amended) The system ~~method~~ of claim 3, wherein said signal includes a data portion and a reserved portion, wherein said location information is provided in said data portion.

7. (currently amended) The system ~~method~~ of claim 3, wherein said signal includes a data portion and a reserved portion, wherein said location information is provided in said reserved portion.

8. (currently amended) The system ~~method~~ of claim 3, wherein said device comprises a base station and said base station stores said location information in a database.

9. (currently amended) The system ~~method~~ of claim 3, wherein said third wireless telephonic device includes a display, a speaker, and a microphone and said

display displays a map that includes an area associated with said location information.

10. (currently amended) The system ~~method~~ of claim 4, wherein said device comprises a base station.

11. (currently amended) The system ~~method~~ of claim 4, wherein said signal includes a portion of a TDMA signal.

12. (currently amended) The system ~~method~~ of claim 4, wherein said signal includes a portion of a CDMA signal.

13. (currently amended) The system ~~method~~ of claim 4, wherein said device comprises a base station and said storage device comprises a database.

14. (currently amended) The system ~~method~~ of claim 4, wherein said second wireless telephonic device includes a display, a speaker, and a microphone and said display displays a map that includes an area associated with said location information.

15. (previously presented) A system comprising:

a first wireless telephonic device;

a second wireless telephonic device; and

a base station for routing a signal between said first wireless telephonic device and said second wireless telephonic device, wherein said first wireless telephonic device provides said signal as a phone burst signal that includes an additional data portion, said base station receives said signal with data

representative of the location of said first wireless telephonic device, said data representative of the location of said first wireless telephonic device is stripped from said signal, and said base station provides said signal to said second wireless telephonic device without said data representative of the location of said first wireless telephonic device, said base station stores said data representation of the location of said first wireless telephonic device to a storage device, said location is requested by said second wireless telephonic device, location access rights are assigned by said first wireless telephonic device for said second device, and said data representative of the location of the first wireless telephonic device is provided to said second wireless telephonic device based on said location access rights.

16. (previously presented) The system of claim 15, wherein said signal includes a portion of a TDMA signal.

17. (previously presented) The system of claim 15, wherein said signal includes a portion of a CDMA signal.

18. (previously presented) The system of claim 15, wherein said second wireless telephonic device includes a display, a speaker, and a microphone and said display displays a map that includes an area associated with the location of said first wireless telephonic device.

19. (previously presented) The system of claim 15, wherein said second wireless telephonic device

is associated with a second location, said second wireless telephonic device includes a display, a speaker, and a microphone and said display displays distance information associated with the distance between the location associated with said first wireless telephonic device and a second location.

20. (previously presented) The system of claim 15, wherein the location associated with said first wireless telephonic device is provided to a third wireless device.

21. (previously presented) The system of claim 15, wherein a second location is determined for said second telephonic wireless device and said first wireless telephonic devices receives said second location.

22. (previously presented) The system of claim 15, wherein said location comprises information retrieved from a positioning system located on said first wireless device.

23. (currently amended) The system ~~method~~ of claim 3, wherein said signal includes synchronization information.

24. (currently amended) The system ~~method~~ of claim 4, wherein said signal includes synchronization information.

25. (previously presented) The system of claim 15, wherein said signal includes synchronization

information.

REMARKS/ARGUMENTS

Summary of Office Action

Claims 3-22 are pending.

The Examiner rejected claims 3-25 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application No. 20030119522 (hereinafter "Barclay") in view of Rosen et al. U.S. Patent No. 7,324,832 (hereinafter "Rosen") and further in in view of U.S. Patent No. 6,078,578 (hereinafter "Matsumoto") and Puckette U.S. Patent No. 6,377,565 (hereinafter "Puckette") in view of Applicant's own printed publication No. 2007/0281671 (hereinafter "the printed publication") and further in view of Joe et al. U.S. Patent No. 2002/0061746 (hereinafter "Jo") or Zellner U.S. Patent Application Publication No. 2010/0151815 (hereinafter "Zellner") and LaDue U.S. Patent No. 5,889,474 (hereinafter ("LaDue").

Summary of Applicant's Amendments

Without prejudice, and solely in order to expedite prosecution, applicant has amended claims 3, 4, 5-14, 23, and 24.

Applicant respectfully traverses the Examiner's rejections. Applicant reserves the right to file any number of continuation or divisional claims directed to any of the subject matter contained in applicant's specification.

The Printed Publication.

The Printed Publication is not a prior art reference to the present application. Applicant respectfully requests that the Examiner remove the Printed Publication as a prior art reference.

Applicant's Reply to the 103(a) Rejections

The Examiner rejected claims 3-25 under 35 103(a) as being unpatentable by Barclay, Rosen, Matsumoto, Puckette, the publication, Joe or Zellner, and LaDue.

Claim 3

The Examiner stated that with regards to applicant's feature of stripping location information from the signal:

> "It would have been obvious to one of ordinary skill in the art to have incorporated the teachings of Jo et al … in order to ensure privacy of a user.
>
> … It would have bene obvious to one of ordinary skill in the art to have incorporated the teachings of Zellner … in order to provide privacy to a user…"
> (Office Action, page 7)

In Order To Ensure Privacy

It would not be obvious to strip out location information to ensure privacy just like it would not be obvious to stripe out voice information to ensure privacy. Like voice information, location information is utilized. Accordingly, the Examiner must provide evidence of stripping out location information. The fact that there is an abundance of references that the Examiner alleges includes stripping but not applicant's stripping is evidence of the patentability of applicant's claims.

Claim 3 Includes Both Storage And Stripping

Applicant's claim 3 includes storing the location information in a storage device – which also

removes the relevancy of systems on the wireless device providing the burst -- stripping the location information from the burst signal and providing the signal from the device to a second wireless telephonic device without the location information.

Accordingly, the Examiner's references must not just show stripping of location information but then storage of that location information and associated features.

Jo

The Examiner's directed applicant to paragraph 60 of Jo, which states:

> "The location area update request signal 5Ab is transmitted to the HLR 16a of the home network via the VLR_B1, GLR_B 19 and GLR_A 19a. The HLR 16a transmits the location information cancel request signal about the terminal MS_A to the VLR_A1 22 of the home network. The VLR_A1 22 cancels the location information about the terminal MS_A and then transmits a location information cancel acknowledgement request signal 4Ae. Then, a line subscriber information transmission message 4Af is transmitted to the VLR_B114 of the visitor network via the GLR_A 19a and GLR_B 19." (Jo, paragraph 60)

Jo, however, is irrelevant. Jo merely discusses the management of location registration between home and visitor networks as a mobile station travels around the world by alleging a cancel request message so that a consumer can travel between home and visitor networks. As can be seen in Jo's paragraph 60, Jo does not show or suggest applicant's invention of claim 3 of receiving a signal from a first wireless telephonic device, stripping the location information from that signal, and then providing that signal to a second wireless telephonic device.

Zellner

Zellner does not show or suggest storing and stripping. Blocking location does not show or suggest storing and stripping. Blocking merely alleges blocking. Blocking location merely shows blocking location.

Patentability of Claim 3

As shown above, neither reference, used either alone or in combination show or suggest applicant's claim 3. In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 3, and any claims dependent therefrom, be withdrawn.

Claim 4

As shown above, claim 3 is patentable. Applicant has amended claim 4 without prejudice and solely in order to expedite prosecution. Claim 4 includes patentable features similar to patentable features included in claims 3. None of the references, used either alone or in combination, show or suggest applicant's invention of claim 4 of providing a phone burst signal from a wireless device, receiving a signal at a device from a first wireless telephonic device that includes location information, and providing the signal from the device to a second wireless telephonic device without said location information.

In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 4, and any claims dependent therefrom, be withdrawn.

Claim 15

As shown above, claims 3 and 4 are patentable. Applicant has amended claim 15 without prejudice and

solely in order to expedite prosecution. Claim 15 includes patentable features similar to patentable features included in claims 15. None of the references, used either alone or in combination, show or suggest applicant's invention of claim 15 of a base station for routing a signal between said first wireless telephonic device and said second wireless telephonic device, the wireless device provides the signal as a burst signal, the base station receives the signal with data representative of the location of said first wireless telephonic device and provides the signal to said second wireless telephonic device without the data representative of the location of said first wireless telephonic device.

In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 15, and any claims dependent therefrom, be withdrawn.

Conclusion

Applicant respectfully submits that this application, including the pending claims, is in condition for allowance. Reconsideration and prompt allowance of this application are respectfully requested.

The Director is hereby authorized to charge any fees associated with this filing, or credit any overpayments thereon, to Deposit Account No. 50-3855, Order No. JDM/002 CON7.

Respectfully Submitted,

/Jeffrey D. Mullen/
Jeffrey D. Mullen
Applicant (Reg. No. 52,056)
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2212 Hassinger Lane
Glenshaw, PA 15116
Tel.: (914) 837-7741

Electronic Patent Application Fee Transmittal

Application Number:	11841765
Filing Date:	20-Aug-2007
Title of Invention:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
First Named Inventor/Applicant Name:	Jeffrey David Mullen
Filer:	Jeffrey David Mullen
Attorney Docket Number:	JDM/002 CON7

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

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($)
Extension - 3 months with $0 paid	2253	1	700	700
Miscellaneous:				
			Total in USD ($)	**700**

Electronic Acknowledgement Receipt

EFS ID:	39197103
Application Number:	11841765
International Application Number:	
Confirmation Number:	2475
Title of Invention:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
First Named Inventor/Applicant Name:	Jeffrey David Mullen
Customer Number:	32733
Filer:	Jeffrey David Mullen
Filer Authorized By:	
Attorney Docket Number:	JDM/002 CON7
Receipt Date:	17-APR-2020
Filing Date:	20-AUG-2007
Time Stamp:	19:24:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$700
RAM confirmation Number	E20204GJ24489553
Deposit Account	503855
Authorized User	Jeffrey Mullen
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 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)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		JDM-002CON7--Reply.pdf	99392 b1bbbdad7d516f43c3665cd2f0aca5527c694e29	yes	12

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Claims	2	7
Applicant Arguments/Remarks Made in an Amendment	8	12

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30736 1eba6e62d75c8f03b702deb1743754fdabe0a211	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	130128	

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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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/841,765	08/20/2007	Jeffrey David Mullen	JDM/002 CON7	2475

32733 7590 08/04/2020

JEFFREY D. MULLEN
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Glenshaw, PA 15116

EXAMINER
DEANE JR, WILLIAM J

ART UNIT	PAPER NUMBER
2652	

MAIL DATE	DELIVERY MODE
08/04/2020	PAPER

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

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

Office Action Summary	Application No. 11/841,765	Applicant(s) Mullen, Jeffrey David	
	Examiner WILLIAM J DEANE JR	Art Unit 2652	AIA (FITF) Status No

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☑ Responsive to communication(s) filed on 04/17/2020.

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

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

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

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

Disposition of Claims*

5) ☑ Claim(s) 3-25 is/are pending in the application.

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

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 3-25 is/are rejected.

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

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

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

Application Papers

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

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

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

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

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

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

DETAILED ACTION

Claim Rejections - 35 USC §103

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

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

Claims 3 - 25 are rejected under 35 U.S.C. 103(a) as being unpatentable ever U.S. Patent Applicatcn Nc. 20030119522 (Barclay et al.) in view cf U.S. Patent Nc. 7,324, 832 (Rcsen et al.) and further in view cf U.S. Patent Nc. 6,078,578 (Matsumoto) and Puckette IV and in view of Applicant's own printed publication No. 2007/0281671 (hereinafter, the printed publication) and further in view of U.S. Patent No. 20020061746 (Jo et al.) or U.S. Patent Application No. 2010/0151815 (Zellner et al.) and U.S. Patent No. 5,889,474 (LaDue).

With respect to claims 3 and 23 note paragraphs 0012, 0015 - 0017, 0023 (inherently the location information is stored, at least for some time, at the service provider or elsewhere on the communication network) if this is not agreed, then it would have been obvious to one of ordinary skill in the art, in light of Barclay et al., to store the information wherever it was deemed necessary ; and providing the signal from the device to a second wireless device without the location information (see Fig. 4 and 0018). It is believed that the signal in Barclay carries the location information (see Fig.1). If this is not agreed, note Col. 2, lines 23 - 63 of Rosen et al. It would have been obvious to one of ordinary skill in the art to have incorporated such a signal carrying the location information as disclosed by Rosen et al. into the Barclay et al. system as just another means of getting the location information to the next platform.

With respect to the burst signal and synchronization information, Rosen et al. do not teach burst signals. First TDMA and CDMA are notoriously old in the art and it would have been obvious to have incorporated such whenever or wherever it was deemed necessary. In addition, note that Matsumoto teaches burst signals in Fig. 3. This is a TDMA signal (see Abstract) and as stated above, it would have been obvious to one of ordinary skill in the art to have incorporated TDMA or CDMA wherever it was deemed necessary. It is noted that such TDMA and CDMA are cell burst standards. Therefore, it would have been obvious to have incorporated such burst signals as taught by Matsumoto into the Barclay et al./Rosen et al. system as such would only entail the substitution or addition of one signal type for another.

In addition, note paragraph 0089 from Applicant's printed publication 2007/0281671.

Both TDMA and CDMA are cell burst standards having data locations that can contain whatever data that will fit in the slot of the frame including location information. The frames contained in the references are analogous to the frame in Applicant's Fig.18. The examiner also points to paragraph 0089 in Applicant's printed publication No. 2007/0281671. Here Applicant states. "Persons skilled in the art will appreciate that some cell phone burst standards (e.q., TDMA and CDMA) have signal portions that are reserved for future technologies." So here Applicant has a frame with places already reserved for some data, which is known to persons of ordinary skill in the art. Applicant decides to insert at least location data in these reserved slots. In light of the above, it would have been obvious to one of ordinary skill in the art to have incorporated the teachings in the 2007/0281671 printed publication into the Matsumoto/Barclay et al./Rosen et al. system as an obvious design choice.

With respect to the ability to have location information and additional data portion, note Fig. 1 of Puckette, IV. Note the sync, data, sync, data portions and compare to applicant's Fig. 18. Note the use of location data throughout Puckette, IV and in Rosen et al. Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated such additional data as disclosed by Puckette, IV into the Barclay et al./Rosen et al./ Matsumoto/the printed publication system as such would only entail the substitution of one data portion for another.

With respect to the claim language:

"stripping said location information from said signal;"

Please note paragraph 0060 of Jo et al. It would have been obvious to one of ordinary skill in the art to have incorporated the teachings of Jo et al. into the Barclay et al./Rosen et al./Mansanto/ Puckette, IV et al./the printed publication in order to ensure privacy for a user.

If this is argued, note paragraph 0016 of Zellner et al. It would have been obvious to one of ordinary skill in the art to have incorporated the teachings of Zellner et al. into the Barclay et al./Rosen et al./Mansanto/ Puckette, IV et al./the printed publication in order to ensure privacy for a user.

With respect to claims 4, 20 and 24, note the above and paragraph 0018.

With respect to claims 5, 8, 10, 13 note T/R 111 (base station); again it would have been obvious to one of ordinary skill in the art to have stored the information wherever it was deemed necessary.

With respect to claims 6, 7, 11, 12, 16, 17 both TDMA and CDMA are notoriously well-known in the art and it would have been obvious to one of ordinary skill in the art to have incorporated such TDMA or CDMA wherever it was deemed necessary.

With respect to the new claim language of a data portion and a reserve portion, note at least Col. 10, line 65 - Col. 11, line 59 of LaDue. It would have been obvious to one of ordinary skill in the art to have incorporated the teachings of LaDue into the Barclay et al./Rosen et al./Mansanto/ Puckette, IV et al./the printed publication/Jo et al. system and method as this is how it appears things are done. Also, it would have been obvious to one of ordinary skill in the art to put the location information in either the reserved portion or the data portion since both the data portion and reserve portion accepts data, which is what location information is.

With respect to claims 9, 14,18 and 19 note the use of wireless phones which include speakers, microphone and a display. In addition, note paragraphs 0017 and 0022.

With respect to claims 15 and 25, note the rejections above.

With respect to claims 21 and 22, note the above and element 109.

Response to Arguments

Applicant's amendment did not contain significant changes from Applicant's previous presented claims. Mainly small word changes and additions for clarity. Therefore, the Rejection above has not changed, nor the arguments below.

Applicant's arguments filed 04/17/2020 have been fully considered but are not deemed persuasive to any error in the rejection above.

In addition, both Jo et al. and Zellner et al. disclose the stripping away location information. Zellner was added only to show that another reference that blocks or strips or removes location information from a signal and to continue to transmit the signal farther without the location information and therefore, such is old in the art. Note also, paragraphs 0033, 0037, 0046 and 0049 of Zellner.

Applicant argues as though this was a 102 rejection rather than a 103 rejection.

In addition, note Patent No. 6,983,313 (Korkea-Aho), Cols. 4-5, lines 35-9 (using CDMA and removing location information).

In response to applicant's argument that the examiner has combined an excessive number of references, reliance on a large number of references in a rejection does not, without more, weigh against the obviousness of the claimed invention. See In re Gorman, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William Deane whose telephone number is 571 -272-7484. The examiner can normally be reached on Monday - FRIDAY from 9:00 A.M. to 5:00 P.M. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ahmad Matar, can be reached on 571-272-7488. The official fax phone number for the organization where this application or proceeding is assigned is 571 -273-8300. However, unofficial faxes can be direct to the examiners computer at 571 273 -7484.

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).

O2Aug2020

/WILLIAM J DEANE JR/
Primary Examiner, Art Unit 2652

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11/841,765	Mullen, Jeffrey David
	Examiner	Art Unit
	WILLIAM J DEANE JR	2652

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

CLAIMS

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

CLAIM		DATE								
Final	Original	08/26/2008	06/19/2009	03/15/2010	03/28/2011	12/02/2011	08/24/2012	06/30/2013	02/16/2014	08/02/2020
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	✓	✓	✓	✓	✓	✓	✓	✓	✓
	4	✓	✓	✓	✓	✓	✓	✓	✓	✓
	5	✓	✓	✓	✓	✓	✓	✓	✓	✓
	6	✓	✓	✓	✓	✓	✓	✓	✓	✓
	7	✓	✓	✓	✓	✓	✓	✓	✓	✓
	8	✓	✓	✓	✓	✓	✓	✓	✓	✓
	9	✓	✓	✓	✓	✓	✓	✓	✓	✓
	10	✓	✓	✓	✓	✓	✓	✓	✓	✓
	11	✓	✓	✓	✓	✓	✓	✓	✓	✓
	12	✓	✓	✓	✓	✓	✓	✓	✓	✓
	13	✓	✓	✓	✓	✓	✓	✓	✓	✓
	14	✓	✓	✓	✓	✓	✓	✓	✓	✓
	15	✓	✓	✓	✓	✓	✓	✓	✓	✓
	16	✓	✓	✓	✓	✓	✓	✓	✓	✓
	17	✓	✓	✓	✓	✓	✓	✓	✓	✓
	18	✓	✓	✓	✓	✓	✓	✓	✓	✓
	19	✓	✓	✓	✓	✓	✓	✓	✓	✓
	20	✓	✓	✓	✓	✓	✓	✓	✓	✓
	21	✓	✓	✓	✓	✓	✓	✓	✓	✓
	22	✓	✓	✓	✓	✓	✓	✓	✓	✓
	23					✓	✓	✓	✓	✓
	24					✓	✓	✓	✓	✓
	25					✓	✓	✓	✓	✓

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11/841,765	Mullen, Jeffrey David
	Examiner	Art Unit
	WILLIAM J DEANE JR	2652

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
	Updated the prior search.	26Aug2008	WJD
	Updated the prior search.	19Jun2009	WJD
	Updated the prior search	15Mar2010	WJD
	Updated the above search	27Mar2011	WJD
	Updated the search above	02Dec2011	WJD
	Updated the prior search above	24Aug2012	WJD
	Updated the prior search	30Jun2013	WJD
	updated the search	16Feb2014	WJD
	Updated the search above	21Sep2014	WJD
	Updated the search above	19Apr2015	WJD
	Updated the search	20Jan2016	WJD
	Updated the search dated 01/02/2008	24Oct2016	WJD
	Updated the search above	26Apr2017	WJD
	Updated the searches above	28Mar2018	WJD
	Updated the searches above	01/19/2019	WJD
	Updated the searches above	10/15/2019	WJD
	Updated the searches above	08/02/2020	WJD

/WILLIAM J DEANE JR/ Primary Examiner, Art Unit 2652	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11/841,765	Mullen, Jeffrey David
	Examiner	Art Unit
	WILLIAM J DEANE JR	2652

* 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**

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

/WILLIAM J DEANE JR/ Primary Examiner, Art Unit 2652	

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 11/841,765	Filing Date 08/20/2007	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $200 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	02/04/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 23	Minus	** 23	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

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

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

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

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

PTO/SB/30EFS (10-08)
Approved for use through 11/30/2008. OMB 0651-0031
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	11841765	Filing Date	2007-08-20	Docket Number (if applicable)	JDM/002 CON7	Art Unit	2614
First Named Inventor	Jeffrey D. Mullen			Examiner Name	William J. Deane Jr.		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 503855

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Patent Practitioner Signature

X Applicant Signature

PTO/SB/30EFS (10-08)
Approved for use through 11/30/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Applicant Signature			
Applicant 1		Remove	
Signature	/Jeffrey D. Mullen/	Date (YYYY-MM-DD)	2021-02-04
Name	Jeffrey D. Mullen		
Click ADD for additional Applicant Signature		Add	

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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 record s.

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

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

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

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

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

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

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Jeffrey D. Mullen
Application No.	:	11/841,765
Confirmation No.	:	2475
Filed	:	August 20, 2007
For	:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
Group Art Unit	:	2614
Examiner	:	William J. Deane Jr.

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

Pittsburgh, PA 15116
February 4, 2021

REPLY TO OFFICE ACTION

Sir:

This is in response to the Office Action dated August 4, 2020. A three-month extension of time and a Request for Continued Examination is applicable hereto and is being submitted herewith. In response to the Office Action, applicant amends the application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 7 of this paper.

Amendments to the Claims:

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

Listing of Claims:

1-2. (cancelled).

3. (currently amended) A system comprising:

a device operable to receive a signal from a first wireless telephonic device, wherein said signal includes location information for said first wireless telephonic device, said signal is operable to be provided by said first wireless telephonic device as a phone burst signal that includes an additional data portion, said device is operable to store said location information in a storage device, said location information is operable to be stripped from said signal, and said signal is operable to be provided from said device to a second wireless telephonic device without said location information based on location access rights associated with said location information operable to be assigned by said first wireless telephonic device and stored remotely from said first wireless telephonic device.

4. (currently amended) A system comprising:

a device operable to receive a signal from a first wireless telephonic device, wherein said signal includes location information for said first wireless telephonic device and said signal is provided by said first wireless telephonic device as a phone burst signal that includes an additional data portion, said device operable to store said location information in a storage device, said location information is operable to be

stripped from said signal, said signal is operable to be provided from said device to a second wireless telephonic device without said location information, a request is operable to be received for said location information from a third wireless telephonic device, access rights are operable to be assigned by said first wireless telephonic device for said third wireless telephonic device are obtained and stored remote from said first wireless telephonic device, and said location information is operable to be provided to said third wireless telephonic device based on said access rights.

5. (previously presented) The system of claim 3, wherein said device comprises a base station.

6. (previously presented) The system of claim 3, wherein said signal includes a data portion and a reserved portion, wherein said location information is provided in said data portion.

7. (previously presented) The system of claim 3, wherein said signal includes a data portion and a reserved portion, wherein said location information is provided in said reserved portion.

8. (previously presented) The system of claim 3, wherein said device comprises a base station and said base station stores said location information in a database.

9. (previously presented) The system of claim 3, wherein said third wireless telephonic device includes a display, a speaker, and a microphone and said display

displays a map that includes an area associated with said location information.

10. (previously presented) The system of claim 4, wherein said device comprises a base station.

11. (previously presented) The system of claim 4, wherein said signal includes a portion of a TDMA signal.

12. (previously presented) The system of claim 4, wherein said signal includes a portion of a CDMA signal.

13. (previously presented) The system of claim 4, wherein said device comprises a base station and said storage device comprises a database.

14. (previously presented) The system of claim 4, wherein said second wireless telephonic device includes a display, a speaker, and a microphone and said display displays a map that includes an area associated with said location information.

15. (currently amended) A system comprising:

a first wireless telephonic device;

a second wireless telephonic device; and

a base station for routing a signal between said first wireless telephonic device and said second wireless telephonic device, wherein said first wireless telephonic device provides said signal as a phone burst signal that includes an additional data portion, said base station receives said signal with data representative of the location of said first wireless

telephonic device, said data representative of the location of said first wireless telephonic device is stripped from said signal, and said base station provides said signal to said second wireless telephonic device without said data representative of the location of said first wireless telephonic device, said base station stores said data representation of the location of said first wireless telephonic device to a storage device, said location is requested by said second wireless telephonic device, location access rights are assigned by said first wireless telephonic device for said second device and said location access rights are stored remotely from said first wireless telephonic device, and said data representative of the location of the first wireless telephonic device is provided to said second wireless telephonic device based on said location access rights.

16. (previously presented) The system of claim 15, wherein said signal includes a portion of a TDMA signal.

17. (previously presented) The system of claim 15, wherein said signal includes a portion of a CDMA signal.

18. (previously presented) The system of claim 15, wherein said second wireless telephonic device includes a display, a speaker, and a microphone and said display displays a map that includes an area associated with the location of said first wireless telephonic device.

19. (previously presented) The system of claim 15, wherein said second wireless telephonic device is associated with a second location, said second wireless telephonic device includes a display, a speaker, and a microphone and said display displays distance information associated with the distance between the location associated with said first wireless telephonic device and a second location.

20. (previously presented) The system of claim 15, wherein the location associated with said first wireless telephonic device is provided to a third wireless device.

21. (previously presented) The system of claim 15, wherein a second location is determined for said second telephonic wireless device and said first wireless telephonic devices receives said second location.

22. (previously presented) The system of claim 15, wherein said location comprises information retrieved from a positioning system located on said first wireless device.

23. (previously presented) The system of claim 3, wherein said signal includes synchronization information.

24. (previously presented) The system of claim 4, wherein said signal includes synchronization information.

25. (previously presented) The system of claim 15, wherein said signal includes synchronization information.

REMARKS/ARGUMENTS

Summary of Office Action

Claims 3-22 are pending.

The Examiner rejected claims 3-25 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application No. 20030119522 (hereinafter "Barclay") in view of Rosen et al. U.S. Patent No. 7,324,832 (hereinafter "Rosen") and further in in view of U.S. Patent No. 6,078,578 (hereinafter "Matsumoto") and Puckette U.S. Patent No. 6,377,565 (hereinafter "Puckette") in view of Applicant's own printed publication No. 2007/0281671 (hereinafter "the printed publication") and further in view of Joe et al. U.S. Patent No. 2002/0061746 (hereinafter "Jo") or Zellner U.S. Patent Application Publication No. 2010/0151815 (hereinafter "Zellner") and LaDue U.S. Patent No. 5,889,474 (hereinafter ("LaDue").

Summary of Applicant's Amendments

Without prejudice and solely in order to expedite prosecution, applicant has amended claims 3, 4, and 15.

Applicant respectfully traverses the Examiner's rejections. Applicant reserves the right to file any number of continuation or divisional claims directed to any of the subject matter contained in applicant's specification.

Applicant's Reply to the 103(a) Rejections

The Examiner rejected claims 3-25 under 35 103(a) as being unpatentable by Barclay, Rosen, Matsumoto, Puckette, the publication, Joe or Zellner, and LaDue.

Claim 3

Applicant's amended claim 3 includes the remote storage of access rights. Applicant's claim 3 also includes storing the location information in a storage device and stripping the location information from the burst signal and providing the signal from the device to a second wireless telephonic device without the location information. Accordingly, a reference must not just show stripping of location information but then storage of that location information and associated features. Else, the reference does not store the location information – let alone also the remote storage of associated access rights.

Jo, however, is irrelevant. Jo merely discusses the management of location registration between home and visitor networks as a mobile station travels around the world by alleging a cancel request message so that a consumer can travel between home and visitor networks. Jo does not show or suggest applicant's invention of claim 3 of receiving a signal from a first wireless telephonic device, stripping the location information from that signal, and then providing that signal to a second wireless telephonic device. Zellner does not show or suggest storing and stripping. Blocking location does not show or suggest storing and stripping. Blocking merely alleges blocking. Blocking location merely shows blocking location. Accordingly, none of the references, used either alone or in combination show or suggest applicant's claim 3. In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 3, and any claims dependent therefrom, be withdrawn.

Claim 4

As shown above, claim 3 is patentable. Applicant has amended claim 4 without prejudice and solely in order to expedite prosecution. Claim 4 includes patentable features similar to patentable features included in claims 3. None of the references, used either alone or in combination, show or suggest applicant's invention of claim 4 of providing a phone burst signal from a wireless device, receiving a signal at a device from a first wireless telephonic device that includes location information, and providing the signal from the device to a second wireless telephonic device without said location information and the remote storage of access rights.

In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 4, and any claims dependent therefrom, be withdrawn.

Claim 15

As shown above, claims 3 and 4 are patentable. Applicant has amended claim 15 without prejudice and solely in order to expedite prosecution. Claim 15 includes patentable features similar to patentable features included in claims 15. None of the references, used either alone or in combination, show or suggest applicant's invention of claim 15 of a base station for routing a signal between said first wireless telephonic device and said second wireless telephonic device, the wireless device provides the signal as a burst signal, the base station receives the signal with data representative of the location of said first wireless telephonic device and provides the signal to said second

wireless telephonic device without the data representative of the location of said first wireless telephonic device and the remote storage of access rights.

In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 15, and any claims dependent therefrom, be withdrawn.

Conclusion

Applicant respectfully submits that this application, including the pending claims, is in condition for allowance. Reconsideration and prompt allowance of this application are respectfully requested.

The Director is hereby authorized to charge any fees associated with this filing, or credit any overpayments thereon, to Deposit Account No. 50-3855, Order No. JDM/002 CON7.

Respectfully Submitted,

/Jeffrey D. Mullen/

Jeffrey D. Mullen
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Electronic Patent Application Fee Transmittal

Application Number:	11841765
Filing Date:	20-Aug-2007
Title of Invention:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
First Named Inventor/Applicant Name:	Jeffrey David Mullen
Filer:	Jeffrey David Mullen
Attorney Docket Number:	JDM/002 CON7

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

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($)
Extension - 3 months with $0 paid	2253	1	740	740
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	2820	1	1000	1000
		Total in USD ($)		**1740**

Electronic Acknowledgement Receipt

EFS ID:	41843340
Application Number:	11841765
International Application Number:	
Confirmation Number:	2475
Title of Invention:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
First Named Inventor/Applicant Name:	Jeffrey David Mullen
Customer Number:	32733
Filer:	Jeffrey David Mullen
Filer Authorized By:	
Attorney Docket Number:	JDM/002 CON7
Receipt Date:	04-FEB-2021
Filing Date:	20-AUG-2007
Time Stamp:	20:19:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1740
RAM confirmation Number	E202124K20170344
Deposit Account	503855
Authorized User	Jeffrey Mullen

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

37 CFR 1.16 (National application filing, search, and examination fees)

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)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	JDM-002CON7--RCE.pdf	697800 3732a6cc0795c0663938874909a12df3b8d b769c	no	3
Warnings:					
Information:					
2		JDM-002CON7--Reply.pdf	95727 017573e112262370f0288f94956d7d42dc9 285dc	yes	11

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment Submitted/Entered with Filing of CPA/RCE	1	1
Claims	2	7
Applicant Arguments/Remarks Made in an Amendment	8	11

Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32575 da9502fae0cad18295cc2c9c708f64d3b069 0cd4	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	826102		

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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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/841,765	08/20/2007	Jeffrey David Mullen	JDM/002 CON7	2475

32733 7590 03/15/2021

JEFFREY D. MULLEN
2212 Hassinger Lane
Glenshaw, PA 15116

EXAMINER
DEANE JR, WILLIAM J

ART UNIT	PAPER NUMBER
2652	

MAIL DATE	DELIVERY MODE
03/15/2021	PAPER

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

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

Office Action Summary	Application No. 11/841,765	Applicant(s) Mullen, Jeffrey David	
	Examiner WILLIAM J DEANE JR	Art Unit 2652	AIA (FITF) Status No

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☑ Responsive to communication(s) filed on 02/04/2021.

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

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

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

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

Disposition of Claims*

5) ☑ Claim(s) 3-25 is/are pending in the application.

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

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 3-25 is/are rejected.

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

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

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

Application Papers

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

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

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

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

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

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

DETAILED ACTION

Claim Rejections - 35 USC §103

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

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

Claims 3 - 25 are rejected under 35 U.S.C. 103(a) as being unpatentable ever U.S. Patent Applicatcn No. 20030119522 (Barclay et al.) in view of U.S. Patent No. 7,324, 832 (Rosen et al.) and further in view of U.S. Patent No. 6,078,578 (Matsumoto) and Puckette IV and in view of Applicant's own printed publication No. 2007/0281671 (hereinafter, the printed publication) and further in view of U.S. Patent No. 20020061746 (Jo et al.) or U.S. Patent Application No. 2010/0151815 (Zellner et al.) and U.S. Patent No. 5,889,474 (LaDue).

With respect to claims 3, 4, 15 and 23 note paragraphs 0012, 0015 - 0018, 0023 (inherently the location information is stored, at least for some time, at the service provider or elsewhere on the communication network). If this is not agreed, then it would have been obvious to one of ordinary skill in the art, in light of Barclay et al., to store the information wherever it was deemed necessary ; and providing the signal from the device to a second wireless device without the location information (see Fig. 4 and 0018). It is believed that the signal in Barclay carries the location information (see Fig. 1). If this is not agreed, note Col. 2, lines 23 - 63 of Rosen et al. It would have been obvious to one of ordinary skill in the art to have incorporated such a signal carrying the location information as disclosed by Rosen et al. into the Barclay et al. system as just another means of getting the location information to the next platform.

With respect to the burst signal and synchronization information, Rosen et al. do not teach burst signals. First TDMA and CDMA are notoriously old in the art and it would have been obvious to have incorporated such whenever or wherever it was deemed necessary. In addition, note that Matsumoto teaches burst signals in Fig. 3. This is a TDMA signal (see Abstract) and as stated above, it would have been obvious to one of ordinary skill in the art to have incorporated TDMA or CDMA wherever it was deemed necessary. It is noted that such TDMA and CDMA are cell burst standards. Therefore, it would have been obvious to have incorporated such burst signals as taught by Matsumoto into the Barclay et al./Rosen et al. system as such would only entail the substitution or addition of one signal type for another.

In addition, note paragraph 0089 from Applicant's printed publication 2007/0281671.

Both TDMA and CDMA are cell burst standards having data locations that can contain whatever data that will fit in the slot of the frame including location information. The frames contained in the references are analogous to the frame in Applicant's Fig. 18. The examiner also points to paragraph 0089 in Applicant's printed publication No. 2007/0281671. Here Applicant states. "Persons skilled in the art will appreciate that some cell phone burst standards (e.q., TDMA and CDMA) have signal portions that are reserved for future technologies." So here Applicant has a frame with places already reserved for some data, which is known to persons of ordinary skill in the art. Applicant decides to insert at least location data in these reserved slots. In light of the above, it would have been obvious to one of ordinary skill in the art to have incorporated the teachings in the 2007/0281671 printed publication into the Matsumoto/Barclay et al./Rosen et al. system as an obvious design choice.

With respect to the ability to have location information and additional data portion, note Fig. 1 of Puckette, IV. Note the sync, data, sync, data portions and compare to applicant's Fig. 18. Note the use of location data throughout Puckette, IV and in Rosen et al. Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated such additional data as disclosed by Puckette, IV into the Barclay et al./Rosen et al./ Matsumoto/the printed publication system as such would only entail the substitution of one data portion for another.

With respect to the claim language:

"stripping said location information from said signal;"

Please note paragraph 0060 of Jo et al. It would have been obvious to one of ordinary skill in the art to have incorporated the teachings of Jo et al. into the Barclay et al./Rosen et al./Mansanto/ Puckette, IV et al./the printed publication in order to ensure privacy for a user.

If this is argued, note paragraph 0016 of Zellner et al. It would have been obvious to one of ordinary skill in the art to have incorporated the teachings of Zellner et al. into the Barclay et al./Rosen et al./Mansanto/ Puckette, IV et al./the printed publication in order to ensure privacy for a user.

With respect to claims 4, 20 and 24, note the above and paragraph 0018.

With respect to claims 5, 8, 10, 13 note T/R 111 (base station); again it would have been obvious to one of ordinary skill in the art to have stored the information wherever it was deemed necessary.

With respect to claims 6, 7, 11, 12, 16, 17 both TDMA and CDMA are notoriously well-known in the art and it would have been obvious to one of ordinary skill in the art to have incorporated such TDMA or CDMA wherever it was deemed necessary.

With respect to the new claim language of a data portion and a reserve portion, note at least Col. 10, line 65 - Col. 11, line 59 of LaDue. It would have been obvious to one of ordinary skill in the art to have incorporated the teachings of LaDue into the Barclay et al./Rosen et al./Mansanto/ Puckette, IV et al./the printed publication/Jo et al. system and method as this is how it appears things are done. Also, it would have

been obvious to one of ordinary skill in the art to put the location information in either the reserved portion or the data portion since both the data portion and reserve portion accepts data, which is what location information is.

With respect to claims 9, 14, 18 and 19 note the use of wireless phones which include speakers, microphone and a display. In addition, note paragraphs 0017 and 0022.

With respect to claims 15 and 25, note the rejections above.

With respect to claims 21 and 22, note the above and element 109.

Response to Arguments

Applicant's arguments filed 02/04/2021 have been fully considered but are not deemed persuasive to any error in the rejection above.

The new claim language in claims 3 – 4 and 15 is storing the access rights and location information remotely from the wireless telephonic device.

However, note at least paragraphs 0016 – 0018 of Barclay et al. These paragraphs teach that such information can be stored on the wireless device or at the service provider (remote location).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William Deane whose telephone number is 571 -272-7484. The examiner can normally be reached on Monday - FRIDAY from 9:00 A.M. to 5:00 P.M. If attempts to reach the examiner by telephone are unsuccessful,

the examiner's supervisor, Ahmad Matar, can be reached on 571 -272-7488. The official fax phone number for the organization where this application or proceeding is assigned is 571 -273-8300. However, unofficial faxes can be direct to the examiners computer at 571 273 -7484.

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).

12Mar2021

/WILLIAM J DEANE JR/
Primary Examiner, Art Unit 2652

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11/841,765	Mullen, Jeffrey David
	Examiner	Art Unit
	WILLIAM J DEANE JR	2652

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

/WILLIAM J DEANE JR/ Primary Examiner, Art Unit 2652	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11/841,765	Mullen, Jeffrey David
	Examiner	Art Unit
	WILLIAM J DEANE JR	2652

US Classification - Searched*			
Class	Subclass	Date	Examiner
	Updated the prior search.	26Aug2008	WJD
	Updated the prior search.	19Jun2009	WJD
	Updated the prior search	15Mar2010	WJD
	Updated the above search	27Mar2011	WJD
	Updated the search above	02Dec2011	WJD
	Updated the prior search above	24Aug2012	WJD
	Updated the prior search	30Jun2013	WJD
	updated the search	16Feb2014	WJD
	Updated the search above	21Sep2014	WJD
	Updated the search above	19Apr2015	WJD
	Updated the search	20Jan2016	WJD
	Updated the search dated 01/02/2008	24Oct2016	WJD
	Updated the search above	26Apr2017	WJD
	Updated the searches above	28Mar2018	WJD
	Updated the searches above	01/19/2019	WJD
	Updated the searches above	10/15/2019	WJD
	Updated the searches above	08/02/2020	WJD
	Updated the searches above	03/12/2021	WJD

* 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

/WILLIAM J DEANE JR/ Primary Examiner, Art Unit 2652	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11/841,765	Mullen, Jeffrey David
	Examiner	Art Unit
	WILLIAM J DEANE JR	2652

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/WILLIAM J DEANE JR/ Primary Examiner, Art Unit 2652	

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11/841,765	Mullen, Jeffrey David
	Examiner	Art Unit
	WILLIAM J DEANE JR	2652

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

CLAIMS

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

CLAIM		DATE								
Final	Original	08/26/2008	06/19/2009	03/15/2010	03/28/2011	12/02/2011	08/24/2012	06/30/2013	02/16/2014	03/12/2021
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	✓	✓	✓	✓	✓	✓	✓	✓	✓
	4	✓	✓	✓	✓	✓	✓	✓	✓	✓
	5	✓	✓	✓	✓	✓	✓	✓	✓	✓
	6	✓	✓	✓	✓	✓	✓	✓	✓	✓
	7	✓	✓	✓	✓	✓	✓	✓	✓	✓
	8	✓	✓	✓	✓	✓	✓	✓	✓	✓
	9	✓	✓	✓	✓	✓	✓	✓	✓	✓
	10	✓	✓	✓	✓	✓	✓	✓	✓	✓
	11	✓	✓	✓	✓	✓	✓	✓	✓	✓
	12	✓	✓	✓	✓	✓	✓	✓	✓	✓
	13	✓	✓	✓	✓	✓	✓	✓	✓	✓
	14	✓	✓	✓	✓	✓	✓	✓	✓	✓
	15	✓	✓	✓	✓	✓	✓	✓	✓	✓
	16	✓	✓	✓	✓	✓	✓	✓	✓	✓
	17	✓	✓	✓	✓	✓	✓	✓	✓	✓
	18	✓	✓	✓	✓	✓	✓	✓	✓	✓
	19	✓	✓	✓	✓	✓	✓	✓	✓	✓
	20	✓	✓	✓	✓	✓	✓	✓	✓	✓
	21	✓	✓	✓	✓	✓	✓	✓	✓	✓
	22	✓	✓	✓	✓	✓	✓	✓	✓	✓
	23					✓	✓	✓	✓	✓
	24					✓	✓	✓	✓	✓
	25					✓	✓	✓	✓	✓

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 11/841,765	Filing Date 08/20/2007	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $25 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $ 100 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/15/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 23	Minus	** 23	= 0		x $ 50 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $ 240 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

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

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

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Jeffrey D. Mullen
Application No.	:	11/841,765
Confirmation No.	:	2475
Filed	:	August 20, 2007
For	:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
Group Art Unit	:	2614
Examiner	:	William J. Deane Jr.

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

Pittsburgh, PA 15116
September 15, 2021

REPLY TO OFFICE ACTION

Sir:

This is in response to the Office Action dated March 15, 2021. A three-month extension of time is applicable hereto and is being submitted herewith. In response to the Office Action, applicant amends the application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 7 of this paper.

Amendments to the Claims:

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

Listing of Claims:

1-2. (cancelled).

3. (previously amended) A system comprising:

a device operable to receive a signal from a first wireless telephonic device, wherein said signal includes location information for said first wireless telephonic device, said signal is operable to be provided by said first wireless telephonic device as a phone burst signal that includes an additional data portion, said device is operable to store said location information in a storage device, said location information is operable to be stripped from said signal, and said signal is operable to be provided from said device to a second wireless telephonic device without said location information based on location access rights associated with said location information operable to be assigned by said first wireless telephonic device and stored remotely from said first wireless telephonic device.

4. (previously amended) A system comprising:

a device operable to receive a signal from a first wireless telephonic device, wherein said signal includes location information for said first wireless telephonic device and said signal is provided by said first wireless telephonic device as a phone burst signal that includes an additional data portion, said device operable to store said location information in a storage device, said location information is operable to be

stripped from said signal, said signal is operable to be provided from said device to a second wireless telephonic device without said location information, a request is operable to be received for said location information from a third wireless telephonic device, access rights are operable to be assigned by said first wireless telephonic device for said third wireless telephonic device are obtained and stored remote from said first wireless telephonic device, and said location information is operable to be provided to said third wireless telephonic device based on said access rights.

5. (previously presented) The system of claim 3, wherein said device comprises a base station.

6. (previously presented) The system of claim 3, wherein said signal includes a data portion and a reserved portion, wherein said location information is provided in said data portion.

7. (previously presented) The system of claim 3, wherein said signal includes a data portion and a reserved portion, wherein said location information is provided in said reserved portion.

8. (previously presented) The system of claim 3, wherein said device comprises a base station and said base station stores said location information in a database.

9. (previously presented) The system of claim 3, wherein said third wireless telephonic device includes a display, a speaker, and a microphone and said display

displays a map that includes an area associated with said location information.

10. (previously presented) The system of claim 4, wherein said device comprises a base station.

11. (previously presented) The system of claim 4, wherein said signal includes a portion of a TDMA signal.

12. (previously presented) The system of claim 4, wherein said signal includes a portion of a CDMA signal.

13. (previously presented) The system of claim 4, wherein said device comprises a base station and said storage device comprises a database.

14. (previously presented) The system of claim 4, wherein said second wireless telephonic device includes a display, a speaker, and a microphone and said display displays a map that includes an area associated with said location information.

15. (previously presented) A system comprising:

a first wireless telephonic device;

a second wireless telephonic device; and

a base station for routing a signal between said first wireless telephonic device and said second wireless telephonic device, wherein said first wireless telephonic device provides said signal as a phone burst signal that includes an additional data portion, said base station receives said signal with data

representative of the location of said first wireless telephonic device, said data representative of the location of said first wireless telephonic device is stripped from said signal, and said base station provides said signal to said second wireless telephonic device without said data representative of the location of said first wireless telephonic device, said base station stores said data representation of the location of said first wireless telephonic device to a storage device, said location is requested by said second wireless telephonic device, location access rights are assigned by said first wireless telephonic device for said second device and said location access rights are stored remotely from said first wireless telephonic device, and said data representative of the location of the first wireless telephonic device is provided to said second wireless telephonic device based on said location access rights.

16. (previously presented) The system of claim 15, wherein said signal includes a portion of a TDMA signal.

17. (previously presented) The system of claim 15, wherein said signal includes a portion of a CDMA signal.

18. (previously presented) The system of claim 15, wherein said second wireless telephonic device includes a display, a speaker, and a microphone and said display displays a map that includes an area associated with the location of said first wireless telephonic device.

19. (previously presented) The system of claim 15, wherein said second wireless telephonic device is associated with a second location, said second wireless telephonic device includes a display, a speaker, and a microphone and said display displays distance information associated with the distance between the location associated with said first wireless telephonic device and a second location.

20. (previously presented) The system of claim 15, wherein the location associated with said first wireless telephonic device is provided to a third wireless device.

21. (previously presented) The system of claim 15, wherein a second location is determined for said second telephonic wireless device and said first wireless telephonic devices receives said second location.

22. (previously presented) The system of claim 15, wherein said location comprises information retrieved from a positioning system located on said first wireless device.

23. (previously presented) The system of claim 3, wherein said signal includes synchronization information.

24. (previously presented) The system of claim 4, wherein said signal includes synchronization information.

25. (previously presented) The system of claim 15, wherein said signal includes synchronization information.

REMARKS/ARGUMENTS

Summary of Office Action

Claims 3-22 are pending.

The Examiner rejected claims 3-25 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application No. 20030119522 (hereinafter "Barclay") in view of Rosen et al. U.S. Patent No. 7,324,832 (hereinafter "Rosen") and further in in view of U.S. Patent No. 6,078,578 (hereinafter "Matsumoto") and Puckette U.S. Patent No. 6,377,565 (hereinafter "Puckette") in view of Applicant's own printed publication No. 2007/0281671 (hereinafter "the printed publication") and further in view of Joe et al. U.S. Patent No. 2002/0061746 (hereinafter "Jo") or Zellner U.S. Patent Application Publication No. 2010/0151815 (hereinafter "Zellner") and LaDue U.S. Patent No. 5,889,474 (hereinafter ("LaDue").

Summary of Applicant's Amendments

Without prejudice and solely in order to expedite prosecution, applicant has amended claims 3, 4, and 15.

Applicant respectfully traverses the Examiner's rejections. Applicant reserves the right to file any number of continuation or divisional claims directed to any of the subject matter contained in applicant's specification.

Applicant's Reply to the 103(a) Rejections

The Examiner rejected claims 3-25 under 35 103(a) as being unpatentable by Barclay, Rosen, Matsumoto, Puckette, the publication, Joe or Zellner, and LaDue.

Claim 3

Applicant's previously amended claim 3 includes the remote storage of access rights. The Examiner stated:

> "it would have been obvious to store the information wherever it is deemed necessary." (Office Action, page 3)

Applicant's claim 3 also includes storing the location information in a storage. In 2021, we cannot land a human on mars. In 2021, we cannot remove all of the data a phone needs to operate and put all of the data on a remote storage system. Before applicant's invention, and at the time of Barclay, no referenced, used either alone or in combination, shows or suggests applicant's invention of claim 3.

That said, applicant's claim 3 is not just storing data. Applicant's claim 3 includes location information operable to be assigned by said first wireless telephonic device and stored remotely from said first wireless telephonic device.

Barclay's does not assign and cannot assign and cannot be made operable to assign location information assigned by the first wireless telephone to be stored remotely from the first wireless telephone. As a result, for example, Barclay's location information cannot is not able to and cannot be able to, for example, retrieved by a separate device after Barclay's device is turned OFF. The claimed structural and functional differences are not shown nor suggested in any prior art, used either in combination or individually. Any discussion outside references is 2021 hindsight reconstruction. Accordingly, none of the references, used either alone or in combination show or suggest applicant's claim 3. In light of the foregoing, applicant respectfully submits

that the Examiner's rejection of claim 3, and any claims dependent therefrom, be withdrawn.

Claim 4

As shown above, claim 3 is patentable. Applicant has amended claim 4 without prejudice and solely in order to expedite prosecution. Claim 4 includes patentable features similar to patentable features included in claims 3. None of the references, used either alone or in combination, show or suggest applicant's invention of claim 4 of providing a phone burst signal from a wireless device, receiving a signal at a device from a first wireless telephonic device that includes location information, and providing the signal from the device to a second wireless telephonic device without said location information and the remote storage of access rights.

In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 4, and any claims dependent therefrom, be withdrawn.

Claim 15

As shown above, claims 3 and 4 are patentable. Applicant previously amended claim 15 without prejudice and solely in order to expedite prosecution. Claim 15 includes patentable features similar to patentable features included in claims 15. None of the references, used either alone or in combination, show or suggest applicant's invention of claim 15 of a base station for routing a signal between said first wireless telephonic device and said second wireless telephonic device, the wireless device provides the signal as a burst signal, the base station receives the signal with data

representative of the location of said first wireless telephonic device and provides the signal to said second wireless telephonic device without the data representative of the location of said first wireless telephonic device and the remote storage of access rights.

In light of the foregoing, applicant respectfully submits that the Examiner's rejection of claim 15, and any claims dependent therefrom, be withdrawn.

Conclusion

Applicant respectfully submits that this application, including the pending claims, is in condition for allowance. Reconsideration and prompt allowance of this application are respectfully requested.

The Director is hereby authorized to charge any fees associated with this filing, or credit any overpayments thereon, to Deposit Account No. 50-3855, Order No. JDM/002 CON7.

Respectfully Submitted,

/Jeffrey D. Mullen/

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Electronic Patent Application Fee Transmittal

Application Number:	11841765
Filing Date:	20-Aug-2007
Title of Invention:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
First Named Inventor/Applicant Name:	Jeffrey David Mullen
Filer:	Jeffrey David Mullen
Attorney Docket Number:	JDM/002 CON7

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

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($)
Extension - 3 months with $0 paid	2253	1	740	740
Miscellaneous:				
			Total in USD ($)	**740**

Electronic Acknowledgement Receipt

EFS ID:	43778083
Application Number:	11841765
International Application Number:	
Confirmation Number:	2475
Title of Invention:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
First Named Inventor/Applicant Name:	Jeffrey David Mullen
Customer Number:	32733
Filer:	Jeffrey David Mullen
Filer Authorized By:	
Attorney Docket Number:	JDM/002 CON7
Receipt Date:	15-SEP-2021
Filing Date:	20-AUG-2007
Time Stamp:	19:29:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$740
RAM confirmation Number	E20219EJ30094677
Deposit Account	503855
Authorized User	Jeffrey Mullen
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges) 37 CFR 1.20 (Post Issuance fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.16 (National application filing, search, and examination fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		JDM-002CON7--Reply.pdf	96343 e898f33f0d10ee31f8ed0737a4d55ab5c1db6abd	yes	11

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

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	38329 cfa82058e69a5d7646e035ef0efa5480d6c7deb3	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	134672	

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.

JDM/002 CON7

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Jeffrey D. Mullen
Application No.	:	11/841,765
Confirmation No.	:	2475
Filed	:	August 20, 2007
For	:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
Group Art Unit	:	2614
Examiner	:	William J. Deane Jr.

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

Pittsburgh, PA 15116
October 30, 2021

SUPPLEMENTAL AMENDMENT

Sir:

This is in furtherance to response to the Office Action dated March 15, 2021 previously submitted. In response to the Office Action, applicant amends the application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 18 of this paper.

Amendments to the Claims:

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

Listing of Claims:

1-25. (cancelled).

26. (new) A system comprising:

a remote system comprising a server, the remote system capable of communicating with wireless telephones over a communications network and further capable of:

obtaining a location of a first wireless telephone;

changing, at the direction of said first wireless telephone, a list of users for a profile associated with said first wireless telephone that are allowed to access said location, wherein each user of said list of users is representative of one of a plurality of wireless telephones;

transmitting said location to at least one of said users of said list of users over said communications network;

determining a second location associated with one of said plurality of wireless telephones; and

providing directional information to said one of said plurality of wireless telephones, wherein said directional information is representative of directions between said second location and said location.

27. (new) The system of claim 26, wherein said changing comprises adding an additional user to said list of users.

28. (new) The system of claim 26, where said remote system is further capable of transmitting the address of said location to said at least one of said users of said list of users.

29. (new) The system of claim 26, where said remote system is further capable of determining a third location associated with one of said plurality of wireless telephones.

30. (new) The system of claim 26, where said remote system is further capable of determining the distance between said first wireless telephone and at least one of said plurality of wireless telephones.

31. (new) The system of claim 26, wherein said remote system is further capable of storing access rights that allow at least one of said list of users to access said location of said first wireless telephone for an indefinite period of time.

32. (new) The system of claim 26, wherein said remote system is further capable of storing access rights that allow at least one of said list of users to access said location of said first wireless telephone for only a specific period of time.

33. (new) The system of claim 32, wherein said remote system is further capable of receiving an indication of said specific period of time from said first wireless telephone.

34. (new) The system of claim 26, wherein said remote system is further capable of transmitting an alert

to said one of said plurality of wireless telephones based on said location of said first wireless telephone.

35. (new) The system of claim 34, wherein said remote system is further capable of receiving a request for said alert from said one of said plurality of wireless telephones.

36. (new) The system of claim 35, wherein said alert is geographic area-based and said remote system is further capable of alerting said one of said plurality of wireless telephones when said location of said first wireless telephone is within a geographic area specified by said one of said plurality of wireless telephones.

37. (new) The system of claim 26, wherein said remote system is further capable of transmitting an alert to said first wireless telephone when said one of said plurality of wireless telephones locates said first wireless telephone.

38. (new) The system of claim 26, wherein said remote system is further capable of storing a history of locations of said first wireless telephone.

39. (new) The system of claim 38, wherein said transmitting said location to at least one of said users of said list of users over said communications network comprises transmitting to said at least one of said users a location from said history of locations when said first wireless telephone is turned off.

40. (new) The system of claim 26, wherein said remote system is further capable of providing said

location to a device utilized by one of said users of said list of users after said one of said users of said list of users utilizes said device to input a login and password for said one of said list of users into a website.

41. (new) The system of claim 26, wherein said remote system is further capable of storing and transmitting to said first wireless telephone a location of a watch.

42. (new) The system of claim 41, wherein said remote system is capable of communicating with said watch over said communications network to obtain said location of said watch from a positioning system of said watch.

43. (new) The system of claim 26, wherein said remote system is further capable of storing and transmitting to said first wireless telephone a location of a personal computer.

44. (new) The system of claim 26, wherein said remote system is further capable of storing and transmitting to said first wireless telephone a location of a radio.

45. (new) The system of claim 26, wherein said remote system is further capable of storing and transmitting to said first wireless telephone a location of a car.

46. (new) The system of claim 26, wherein said remote system is further capable of providing said

location of said first wireless telephone to a credit card authorization system.

47. (new) The system of claim 26, wherein said remote system is further capable of providing to said one of said plurality of wireless telephones information indicating time to reach said location from said second location according to at least two types of travel selected from the types of travel consisting of subway, walking, running, and driving.

48. (new) The system of claim 26, wherein said remote system is further capable of:

storing a phone book corresponding to a user of said first wireless telephone; and

downloading said phone book to a new wireless telephone of said user.

49. (new) A system comprising:

a remote system comprising a server, the remote system capable of communicating with wireless telephones over a communications network and further capable of:

receiving from a first wireless telephone over said communications network a selection of one of a plurality of users, said selection corresponding to a user of said first wireless telephone manually selecting said one of said plurality of users from a display of said first wireless telephone, wherein each one of said plurality of users is associated to a different one of a plurality of wireless telephones;

receiving from said first wireless telephone information indicative of a login and a password;

determining whether to allow access of location information for said one of said plurality of wireless

telephones associated to said selected one of said plurality of users, wherein said determining includes identifying said user of said first wireless telephone using said information indicative of said login and password and determining whether said selected one of said plurality of users has provided access rights for said location information to said user of said first wireless telephone;

determining whether said user of said first wireless telephone has assigned location access rights to said one of said plurality of wireless telephones associated with said selected one of said plurality of users for obtaining a location of said first wireless telephone; and

transmitting over said communications network said location information to said first wireless telephone.

50. (new) The system of claim 49, wherein said remote system is further capable of receiving a selection from said first wireless telephone that modifies said location access rights assigned by said user of said first wireless telephone to said one of said plurality of wireless telephones.

51. (new) The system of claim 49, wherein said remote system is further capable of transmitting said location of said first wireless telephone to said one of said plurality of wireless telephones associated with said selected one of said plurality of users.

52. (new) The system of claim 49, wherein said remote system is further capable of storing access rights that allow said first wireless telephone to access said

location information for said one of said plurality of wireless telephones for an indefinite period of time.

53. (new) The system of claim 49, wherein said remote system is further capable of storing access rights that allow said first wireless telephone to access said location information for said one of said plurality of wireless telephones for only a specific period of time.

54. (new) The system of claim 53, wherein said remote system is further capable of receiving an indication of said specific period of time from said one of said plurality of wireless telephones.

55. (new) The system of claim 49, wherein said remote system is further capable of transmitting an alert to said first wireless telephone based on said location information for said one of said plurality of wireless telephones.

56. (new) The system of claim 55, wherein said remote system is further capable of receiving a request for said alert from said first wireless telephone.

57. (new) The system of claim 56, wherein said alert is geographic area-based and said remote system is further capable of alerting said first wireless telephone when a location of said one of said plurality of wireless telephones is within a geographic area specified by said first wireless telephone.

58. (new) The system of claim 49, wherein said remote system is further capable of transmitting an alert to said one of said plurality of wireless telephones when

said first wireless telephone locates said one of said plurality of wireless telephones.

59. (new) The system of claim 49, wherein said remote system is further capable of storing a history of locations of said one of said plurality of wireless telephones.

60. (new) The system of claim 59, wherein said transmitting said location information to said first wireless telephone comprises transmitting to said first wireless telephone a location from said history of locations when said one of said plurality of wireless telephones is turned off.

61. (new) The system of claim 49, wherein said remote system is further capable of providing said location information to another device utilized by said user of said first wireless device after said user utilizes said another device to input said login and said password into a website.

62. (new) The system of claim 49, wherein said remote system is further capable of storing and transmitting to said first wireless telephone a location of a watch.

63. (new) The system of claim 62, wherein said remote system is capable of communicating with said watch over said communications network to obtain said location of said watch from a positioning system of said watch.

64. (new) The system of claim 49, wherein said remote system is further capable of storing and

transmitting to said first wireless telephone a location of a personal computer.

65. (new) The system of claim 49, wherein said remote system is further capable of storing and transmitting to said first wireless telephone a location of a radio.

66. (new) The system of claim 49, wherein said remote system is further capable of storing and transmitting to said first wireless telephone a location of a car.

67. (new) The system of claim 49, wherein said remote system is further capable of providing said location of said first wireless telephone to a credit card authorization system.

68. (new) The system of claim 49, wherein said remote system is further capable of providing to said first wireless telephone information indicating time to reach a location of said one of said plurality of wireless telephones from said location of said first wireless telephone according to at least two types of travel selected from the types of travel consisting of subway, walking, running, and driving.

69. (new) The system of claim 49, wherein said remote system is further capable of:

storing a phone book corresponding to a user of said first wireless telephone; and

downloading said phone book to a new wireless telephone of said user.

70. (new) A system comprising:

a remote system comprising a server, the remote system capable of communicating with a first wireless device and a second wireless device over a communications network and further capable of:

receiving a request for a location of said first wireless device from said second wireless device;

determining that said second wireless device does not have location access rights for said first wireless device;

after determining that said second wireless device does not have said location access rights for said first wireless device, receiving a request from said second wireless device that said location access rights be assigned for said second wireless device by said first wireless device;

receiving from said first wireless device an assignment of said location access rights for said first wireless device to said second wireless device;

storing said location access rights; and

providing said location to said second wireless device dependent upon said location access rights.

71. (new) The system of claim 70, wherein said first wireless device and said second wireless device are cellular phones.

72. (new) The system of claim 70, wherein said location access rights include the ability to obtain said location, wherein said location is provided to said second wireless device from said server even when said first wireless device is off.

73. (new) The system of claim 70, wherein said location access rights comprise a plurality of access levels.

74. (new) The system of claim 70, wherein said remote system is further capable of providing to said second wireless device directions from a location of said second wireless device to said location of said first wireless device.

75. (new) The system of claim 70, wherein said remote system is further capable of providing to said second wireless device a travel time to said location.

76. (new) The system of claim 70, wherein said location access rights comprise a plurality of levels of access rights, at least one of said plurality of levels of access rights comprise the exact location of said first wireless device, and another one of said plurality of levels of access rights comprise an approximate location of said first wireless device.

77. (new) The system of claim 70, wherein said access rights comprise a plurality of levels of access rights, at least one of said plurality of levels of access rights comprise an approximate location of said first wireless device, and said approximate location comprises a city or state.

78. (new) The system of claim 70, wherein said remote system is further capable of receiving a login and password from said second wireless device to identify a user of said second wireless device.

79. (new) The system of claim 70, wherein said remote system is further capable of:

receiving a request from said first wireless device to modify said location access rights for said second wireless device; and

modifying said location access rights for said second wireless device based on said request.

80. (new) The system of claim 70, wherein said remote system is further capable of:

receiving a request from said first wireless device to delte said location access rights for said second wireless device; and

deleting said location access rights for said second wireless device based on said request.

81. (new) The system of claim 70, wherein said remote system is further capable of filtering information about said location such that only a portion of location information associated with said location is transmitted to said second wireless device.

82. (new) The system of claim 70, wherein said remote system is further capable of alerting said second wireless device when said first wireless device is within a distance of second wireless device.

83. (new) The system of claim 70, wherein said remote system is further capable of:

receiving a request for a second location of said first wireless device from a non-wireless device, wherein said non-wireless device does not comprise a positioning system; and

providing said second location of said first wireless device to said non-wireless device in response to said request.

84. (new) The system of claim 70, wherein said remote system is further capable of receiving said location of said first wireless device from a positioning system of said first wireless device.

85. (new) The system of claim 70, wherein said remote system is further capable of setting at least one location alert associated with said first wireless device for a user associated with said second wireless device in response to a request from said second wireless device.

86. (new) The system of claim 70, wherein said storing said location access rights comprises storing location access rights that allow a user of said second wireless device to access said location of said first wireless device for an indefinite period of time.

87. (new) The system of claim 70, wherein said storing said location access rights comprises storing location access rights that allow a user of said second wireless device to access said location of said first wireless device for only a specific period of time.

88. (new) The system of claim 87, wherein said remote system is further capable of receiving an indication of said specific period of time from said first wireless device.

89. (new) The system of claim 70, wherein said remote system is further capable of transmitting an alert

to said second wireless device based on said location of said first wireless device.

90. (new) The system of claim 89, wherein said remote system is further capable of receiving a request for said alert from said second wireless device.

91. (new) The system of claim 90, wherein said alert is geographic area-based and said remote system is further capable of alerting said second wireless device when said location of said first wireless device is within a geographic area specified by said second wireless device.

92. (new) The system of claim 70, wherein said remote system is further capable of transmitting an alert to said first wireless device when said second wireless device locates said first wireless device.

93. (new) The system of claim 70, wherein said remote system is further capable of storing a history of locations of said first wireless device.

94. (new) The system of claim 93, wherein said providing said location to said second wireless device comprises providing to said second wireless device a location from said history of locations when said first wireless device is turned off.

95. (new) The system of claim 70, wherein said remote system is further capable of providing said location to another device utilized by a user of said second wireless device after said user utilizes said

another device to input a login and password for said user into a website.

96. (new) The system of claim 70, wherein said remote system is further capable of storing and transmitting to said second wireless device a location of a watch.

97. (new) The system of claim 96, wherein said remote system is capable of communicating with said watch over said communications network to obtain said location of said watch from a positioning system of said watch.

98. (new) The system of claim 70, wherein said remote system is further capable of storing and transmitting to said second wireless device a location of a personal computer.

99. (new) The system of claim 70, wherein said remote system is further capable of storing and transmitting to said second wireless device a location of a radio.

100. (new) The system of claim 70, wherein said remote system is further capable of storing and transmitting to said second wireless device a location of a car.

101. (new) The system of claim 70, wherein said remote system is further capable of providing said location of said first wireless device to a credit card authorization system.

102. (new) The system of claim 70, wherein said remote system is further capable of providing to said second wireless device information indicating time to reach said location of said first wireless device from a second location of said second wireless device according to at least two types of travel selected from the types of travel consisting of subway, walking, running, and driving.

103. (new) The system of claim 70, wherein said remote system is further capable of:

storing a phone book corresponding to a user of said second wireless telephone; and

downloading said phone book to a new wireless telephone of said user.

REMARKS/ARGUMENTS

Summary of Applicant's Amendments

Without prejudice and solely in order to expedite prosecution, applicant has cancelled claims 1-25 and added new claims 26 to 103.

Examiner Interview Summary

In October 2021, Examiner and Applicant held communications in which the merits of the case were discussed.

Terminal Disclaimers

Without prejudice and solely in order to expedite prosecution, applicant submits Terminal Disclaimers herewith.

Conclusion

Applicant respectfully submits that this application, including the pending claims, is in condition for allowance. Reconsideration and prompt allowance of this application are respectfully requested.

The Director is hereby authorized to charge any fees associated with this filing, or credit any overpayments thereon, to Deposit Account No. 50-3855, Order No. JDM/002 CON7.

Respectfully Submitted,

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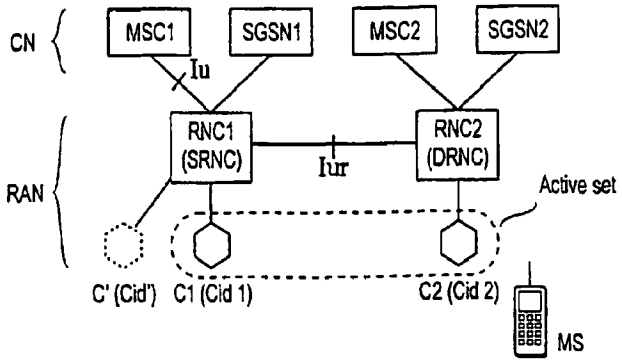
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(54) Title: LOCATION MANAGEMENT FOR CELLULAR SYSTEMS



(57) Abstract: A method for indicating a mobile station's (MS) location. A first radio network controller, RNC, acts as the mobile station's serving RNC (SRNC), for reporting the mobile station's location to the core network (CN). A second RNC acts as the mobile station's drift RNC (DRNC), for maintaining a radio connection with the mobile station. In response to fulfilment of at least one criterion in a first set of criteria, the mobile station (MS) sends location information about its location to the second RNC (DRNC) which forwards the location information to the first RNC (SRNC) for reporting to the core network (CN). There is also a second set of criteria for transforming the location information. In response to fulfilment of at least one criterion in the second set, the first RNC (SRNC) sends falsified information about the mobile station's location to the core network (CN).

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Location management for cellular systems

Background of the invention

The invention relates to methods and equipment for reporting a mobile terminal's location. The invention can be used e.g. for implementing handover in a mobile communications system. The invention is particularly useful in a system which is at least partly a third generation (3G) mobile communications system. 3G mobile communications systems, such as the UMTS (Universal Mobile Telecommunications System) are being standardised by the UMTS Forum and the European Telecommunication Standard Institute ETSI. The current vision is that 3G systems will include both circuit-switched and packet-switched components.

Fig. 1 is a block diagram of a telecommunications system showing the components which are essential for understanding the invention. A UMTS Mobile Station MS consists of Mobile Equipment ME and a USIM card (User and Services and Identity Module). There is a radio interface Uu between the MS and a Radio Access Network RAN, which comprises Base Stations BS under control of Radio Network Controllers RNC. For circuit-switched services, the RNCs are connected, via an Iu interface, to Mobile services Switching Centres MSC, and for packet-switched services, there is a connection, via a Gb interface, to Serving GPRS Support Nodes SGSN (GPRS = General Packet Radio Service). The MSC and SGSN elements may include separate UMTS addition sections. Subscriber data related to the MS is stored permanently in a Home Location Register HLR and for circuit-switched operation, the data is transferred to the Visitor Location Register VLR of the MSC which currently serves the MS. There may be separate Interworking units IWU for adapting the A and Gb interfaces of GSM/GPRS systems to the Iu interface of the UMTS. For storing equipment-related data, the network comprises an Equipment Identity Register EIR. For entering and updating subscriber-specific data, there is an Operation and Maintenance O&M section having a Man-Machine Interface MMI. For creating and managing supplementary services, there is typically a dedicated Service Control Node SCN which can be seen as an evolved version of a Service Control Point (SCP) of Intelligent Networks.

Only the packet-switched section will be described in more detail, and it is assumed that this section will resemble a GPRS system. The GPRS infrastructure comprises support nodes such as a GPRS gateway support node (GGSN) and a GPRS serving support node (SGSN). The main functions

of the GGSN nodes involve interaction with the external data network. The GGSN updates the location directory using routing information supplied by the SGSNs about an MS's path and routes the external data network protocol packet encapsulated over the GPRS backbone to the SGSN currently serving the MS. It also decapsulates and forwards external data network packets to the appropriate data network and handles the billing of data traffic.

The main functions of the SGSN are to detect new GPRS mobile stations in its service area, handle the process of registering the new MSs along with the GPRS registers, send/receive data packets to/from the GPRS MS, and keep a record of the location of the MSs inside of its service area. The subscription information is stored in a GPRS register (HLR) where the mapping between a mobile's identity (such as MS-ISDN or IMSI) and the PSPDN address is stored. The GPRS register acts as a database from which the SGSNs can ask whether a new MS in its area is allowed to join the GPRS network.

The GPRS gateway support nodes GGSN connect an operator's GPRS network to external systems, such as other operators' GPRS systems, data networks 11, such as an IP network (Internet) or a X.25 network, and service centres. Fixed hosts 14 can be connected to the data network 11 e.g. by means of a local area network LAN and a router 15. A border gateway BG provides access to an inter-operator GPRS backbone network 12. The GGSN may also be connected directly to a private corporate network or a host. The GGSN includes GPRS subscribers' PDP (Packet Data Protocol) addresses and routing information, i.e. SGSN addresses. Routing information is used for tunnelling protocol data units PDU from data network 11 to the current switching point of the MS, i.e. to the serving SGSN. The functionalities of the SGSN and GGSN can be connected to the same physical node.

The home location register HLR of the GSM network contains GPRS subscriber data and routing information and it maps the subscriber's IMSI into an SGSN address and one or more pairs of the PDP type and PDP address. The HLR also maps each PDP type and PDP address pair into a GGSN node. The SGSN has a Gr interface to the HLR (a direct signalling connection or via an internal backbone network 13). The HLR of a roaming MS and its serving SGSN may be in different mobile communication networks.

The intra-operator backbone network 13, which interconnects an operator's SGSN and GGSN equipment, can be implemented, for example, by

means of a local network, such as an IP network. It should be noted that an operator's GPRS network can also be implemented without the intra-operator backbone network, e.g. by providing all features in one computer.

Fig. 2 shows the protocol stacks used at various points in a 3G network.

A mobile station (MS) engaged in GPRS traffic sends a CELL UPDATE (CU) message after detecting that it has changed its cell. A number of cells constitute a routing area (RA), and when the routing area changes, the MS sends a ROUTING AREA UPDATE (RAU) message. In the UMTS the cell update messages are not sent to the SGSN, only to the RNC. Therefore the SGSN is not aware of the exact cell of the MS. For an active MS, the SGSN only knows an identifier of the RNC which handles the MS. For an idle MS, the SGSN only knows the MS's routing area identifier.

A first problem underlying the invention will now be described with reference to Fig. 3. A 3G system may pose certain problems which do not exist in 2G systems, such as the GSM and the GPRS. For example, when the MS is changing its cell, it is possible that a connection-oriented connection is not handled by the RNC controlling the MS's active cells but by another RNC. The former RNC is called a 'drift RNC' and the latter RNC is called a 'serving RNC'. In Fig. 3, RNC1 is the serving RNC (SRNC) and RNC2 is the drift RNC (DRNC). In such a case, the CU and RAU messages are transmitted over the air interface piggybacked to the channel which is reserved for the circuit-switched connection (connection-oriented connection), and they terminate at the serving RNC. In a GPRS core network, if the Radio Access Network (RAN) inserts a cell ID (identifier) into the CU or RAU messages, thereby indicating where the MS is actually located, and if that cell is not controlled by the serving RNC, the SGSN may use another RNC for the packet-switched connections. This is not possible, however, because all simultaneous connections for one user should be handled by one RNC. In other words, there may be an ambiguity concerning the RNC which the SGSN should use. The same holds in a UMTS system if the Radio Access Network (RAN) inserts a cell ID (identifier) into a RAU message or an equivalent.

A second, related problem is that current GPRS or 3G systems do not offer a smooth Inter-SGSN routing area update (RAU) procedure. A lot of signalling is needed between the new SGSN and the old SGSN, the HLR, MSC and the GGSN(s). In particular, the new SGSN must receive the sub-

scriber data from the old SGSN before it can be sure that it can accept the RAU and continue signalling. This signalling causes a delay of up to several seconds, which in some cases could be unacceptable. Moreover, in packet traffic a virtual connection can last for several days. Therefore, the existing concepts of an anchor-MSC and float-MSC are not appropriate.

Disclosure of the invention

It is an object of the invention to provide a method and equipment for eliminating the first problem associated with prior art systems. The object is attained with the method and equipment which are characterized by what is disclosed in the characerizing part of the appended independent claims. Solutions to the second problem and preferred solutions to the first problem are disclosed in the appended dependent claims.

The invention is based on the idea that for a terminal sending information on the basis of which its location can be determined (such as a mobile station having a connection-oriented connection while sending a CU or RAU message), the terminal's location information (e.g. its cell ID) can betransformed, e.g. by using a masked or falsified (faked) location information, such as a fake cell ID. The fake location information is preferably chosen so that the SGSN assumes the location of the MS to be under the serving RNC. A certain pool or group of cell addresses can be used for this purpose. It might be beneficial to choose the addresses so that the SRNC (or SGSN) can detect that the traffic has been forwarded.

According to various preferred embodiments of the invention, the information about the MS's location indicates one or more of the following:

a location (e.g. a cell) which is controlled by the SRNC and which is part of the MS's active set, if such a cell exists;

a virtual location (e.g. cell), which is not controlled by either RNC, in case the MS's active set does not comprise a cell which is controlled by the SRNC;

the last location (e.g. a cell) which is controlled by the SRNC and which has been part of the MS's active set in case the MS's active set does not comprise a cell which is controlled by the SRNC;

a location (e.g. a cell) controlled by the DRNC in case the MS's active set does not comprise a cell controlled by the SRNC; and/or

a location (e.g. a cell) whose location information the MS received last.

The fact that the MS's location information indicates one of these cells has two possible interpretations. The MS's location information may indicate such a cell either explicitly or implicitly. An explicit indication means that the location information contains actual cell identifiers. An implicit indication means that the location information contains some information (e.g. one or more routing or location area identifiers) on the basis of which a cell can be identified (if so desired). It is also feasible to transfer only some location-related data and use it for calculating the MS's location.

The criteria for sending location information preferably comprises a change of the MS's location, activation of a PDP context for the MS and expiry of a recurring period of time.

As briefly noted above, the information about the MS's location may indicate a location, such as a cell, whose location information the MS received last. When a mobile station has at least one active connection, it receives system information only via its dedicated signalling connection. This system information comprises e.g. current location (such as routing area, location area and cell identity) of the mobile station. The system information is similar in nature to the information which the MS receives via a broadcast control channel BCCH when it does not have any active connections. The SRNC only sends system information about the cells controlled by it. In other words, it does not send system information about cells controlled by the DRNC. Based on the system information, the MS can determine whether or not it has moved into a new routing or location area. The SRNC sends this information as necessary. One suitable criterion for sending it is that the MS has moved and its active set does not contain the cell whose system information the SRNC has sent last, or after an SRNC handover (relocation).

Use of the transformed location, such as a fake cell ID, causes another problem, however. When the MS's last connection-oriented connection is terminated and the serving RNC deleted from the MS-URAN connection, the SGSN must be informed about the new (correct) RNC. This holds also for cases where the serving RNC is changed. This problem can be solved as follows. If the MS's last connection-oriented connection is terminated or if the serving RNC is changed, an additional CU or RAU must be performed for the MS, even if the MS's location information has not changed.

The location reporting functionality performed by a serving RNC can be summarised as follows:

1. Check if RNC handover should be performed. If not, then:

2. Select a location, such as a cell which is controlled by the serving RNC and which is part of the MS's active set, if such a cell exists. (N.B. The active set must also comprise at least one cell controlled by the drift RNC, otherwise the concept of drift RNC would not exist.)

If no handover was performed in step 1 or no cell was found in step 2, then do one of the following:

3A. Select a virtual location, such as a cell. A virtual cell is not a real cell (i.e. it is not covered by radio transceivers); or

3B. Select, among the cells controlled by the serving RNC, the last one used by the MS.

If step 3A is taken, i.e. a virtual location is selected, the core network elements (the MSC and/or the SGSN) must determine that the location information does not refer to reallocation. Such a determination can be made on the basis of a suitable cell ID numbering plan or a translation table.

Brief description of the drawings

The invention will now be described in connection with its preferred embodiments, with reference to the accompanying drawings, in which:

Fig. 1 is a block diagram of a telecommunications system showing the components which are essential for understanding the invention;

Fig. 2 shows the protocol stacks used at various points in a 3G network;

Fig. 3 is a simplified block diagram for pointing out the problem more clearly;

Fig. 4 shows a routing area update (RAU) procedure for a GPRS network; and

Fig. 5 shows an alternative Inter-SGSN routing area update procedure according to a preferred embodiment of the invention.

Detailed description of the invention

Fig. 4 shows a routing area update (RAU) procedure for a GPRS network. In step 4-1 the MS sends a ROUTING AREA UPDATE REQUEST via RNC2 (drift RNC) to RNC1 (serving RNC). In step 4-2 RNC1 adds the MS's location information and forwards the RAU Request to SGSN1. In step 4-3 SGSN2 requests the MS's PDP context from SGSN1 which responds in step 4-4. In step 4-5 SGSN1 begins to forward MS-terminated (MT) packets to

SGSN2. Security functions have been shown as step 4-6. In step 4-7 SGSN2 sends an UPDATE PDP CONTEXT REQUEST to the GGSN node which responds in step 4-8. In step 4-9 the MS's location is updated in the HLR. In step 4-10 the HLR cancels the MS's location in SGSN1 which acknowledges this in step 4-11. In step 4-12 the HLR sends an INSERT SUBSCRIBER DATA to SGSN2 which acknowledges in step 4-13. In step 4-14 the HLR sends to SGSN2 an acknowledgement to the message sent in step 4-9. In step 4-15, if the MS is IMSI-attached and does not have a circuit-switched connection, the SGSN-VLR association must be updated. SGSN2 updates the MS's location and SGSN number in the VLR, which acknowledges these in step 4-16. In steps 4-17 and 4-18 the RAU process is completed.

Fig. 5 shows an alternative Inter-SGSN routing area update procedure according to a preferred embodiment of the invention. This embodiment and its alternative modifications solve the second problem underlying the invention.

Due to macrodiversity, the triggering of a RAU is less clear than in 2G systems. A RAU could be triggered e.g. if all cells in the MS's active set belong to the new RA, or if more than half of the cells belong to it. In step 5-1 the MS sends a ROUTING AREA UPDATE REQUEST via RNC2 (drift RNC) to RNC1 (serving RNC). The MS sends the RAU request via its uplink connection, if one exists. Because of the coexistence of the drift RNC and the serving RNC, the update is received by the SRNC which does not control the MS's new routing area. The MS should suspend its session management procedures. In step 5-2 RNC1 adds the MS's location information and forwards the RAU REQUEST to SGSN1. This is in contrast to prior art GPRS systems where the RAU REQUEST is sent to SGSN2. In step 5-3 security functions may be performed, as usual. A benefit of sending the RAU REQUEST to SGSN1 is that SGSN1 already knows the MS's digital signature (PTMSI signature in GPRS terms), and it is likely to have authentication triplets for it. Thus there is no need to fetch these separately, whereby the delays due to the inter-SGSN handover can be shortened.

In step 5-4, if the security functions are completed successfully, the SGSN1 sends a FORWARD RAU REQUEST to SGSN2. This message includes parameters for resuming the connection(s) after the RAU. Such parameters include session management data and eventually Iu information (address of

RNC2). SGSN1 may start a timing period during which it will keep the MS's data in its memory.

In step 5-5 SGSN2 updates the MS's location (IMSI, SGSN address) in the HLR. In step 5-6 the HLR inserts the subscriber data (IMSI, subscription details) into SGSN2 which validates the MS's presence in the new RA. If all regional and other checks are passed, SGSN2 establishes an MM (Mobility Management) context for the MS and returns an acknowledgement to the HLR in step 5-7.

In step 5-8 SGSN2 may establish an Iu link to RNC2 which may send some radio parameters to resume quickly a connection with the MS. This feature is especially useful if the MS has a delay-sensitive application (this can be determined by checking the MS's session management context).

In step 5-9 SGSN2 returns an accept message to the message sent in step 5-4. The accept message includes the new RA index, the MS's new temporary identity (P-TMSI in GPRS terms) and/or its new digital signature. Additionally, some radio parameters or codes obtained from RNC2 may be sent. SGSN1 should immediately acknowledge this message to facilitate error handling. In step 5-10 SGSN1 sends to the MS an RAU ACCEPT message which preferably contains the same parameters as the message of step 5-9. Additionally, if an acknowledgement transmission is active, it may contain some protocol state information known by SGSN1 (this corresponds to LLC acknowledgement in GPRS).

In step 5-11 SGSN1 suspends downlink data transmission for acknowledged mode, in order to keep the protocol state intact. Depending on the QoS, SGSN1 may continue data transmission for unacknowledged mode.

In step 5-12 the MS acknowledges with a RAU COMPLETE message which contains the new temporary identity (P-TMSI) and some protocol state information known by the MS, such as an LLC acknowledgement for each LLC connection used by the MS (which confirms all MT N-PDUs transferred succesfully before the start of the update procedure. If the packet acknowledgement (equivalent to LLC acknowledgement in GPRS) confirms reception of certain N-PDUs, these N-PDUs will be discarded by SGSN1. This message will trigger RNC relocation (which in this embodiment is triggered by the MS).

In step 5-13 the MS establishes a radio connection with RNC2. If radio parameters were sent in step 5-10 (RAU ACCEPT), the MS could set up a radio connection immediately with these parameters. Otherwise, the MS

should re-establish the radio connection by accessing the common channel, which causes a longer break in the connection. This is why sending the radio parameters in step 5-10 may be QoS-dependent. The MS should send an uplink packet (not shown) to SGSN2 in case the RAU COMPLETE message was lost because of error handling. An alternative embodiment, omitting step 5-13, will be described later.

In step 5-14 SGSN1 sends a FORWARD RAU COMPLETE message to SGSN2. In step 5-15 SGSN1 cancels the Iu links towards RNC1 and begins to forward downlink packets to SGSN2. It may keep the MS's context and forward MT packets until the expiry of the optional timing period which was started in step 5-4. In step 5-16, when SGSN2 receives the FORWARD RAU COMPLETE message, it resumes data transmission towards the MS.

In step 5-17 SGSN2 sends to the relevant GGSN(s) an UPDATE PDP CONTEXT REQUEST (SGSN2 address, Tunnel Identifier, QoS Negotiated). The GGSNs update their PDP context fields and return a response in step 5-18. N.B: Steps 5-17 and 5-18 may take place any time after step 5-5.

In step 5-19 the HLR cancels the MS's location in SGSN1. This message contains the MS's IMSI, and the cancellation type is set to Update procedure. If the optional timer was not set in step 5-4, SGSN1 deletes the MS's MM and PDP contexts. Otherwise it waits until the timer expires. The timing period allows SGSN1 to complete forwarding of N-PDUs. It also ensures that the MS's MM and PDP contexts are kept in case the MS initiates another Inter-SGSN RAU before completing the ongoing RAU. In step 5-20 SGSN1 acknowledges with a CANCEL LOCATION ACK.

According to an alternative embodiment step 5-13 is omitted. Instead, during step 5-15 RNC1 receives an indication from SGSN1 that the RNC could now be relocated. RNC1 will inform RNC2 which will start handling the MS directly.

In general, the invention is equally applicable if the SGSN is replaced by a 3G MSC (or an MSC/SGSN combination). For this embodiment, the MSC and/or SGSN could be called 'switching elements' since they route packets and/or establish circuit-switched connections.

In GSM systems no location area updates are performed during connection, in order not to confuse the relay and anchor MSCs. With macro diversity the LAU could reach the old MSC directly, whereby it is possible to have a LAU during a call. However, in a hard inter-MSC handover, a special

message (LAU with an active call indication) may be needed. Such a message could trigger the new MSC to establish a connection with the old MSC and try to resume the call. A problem is that this would happen especially between the GSM and the UMTS, which means that a GSM MSC would need to interpret this special LAU message.

It should be noted that figures 4 and 5 illustrate worst-case scenarios in the sense that both RNCs are under different SGSN nodes or MSCs. If the SGSNs or the MSCs are the same, these scenarios could be simplified accordingly.

Claims

1. A method for indicating a terminal's (MS) location in a telecommunications system comprising:

a core network (CN); and

an access network (RAN) comprising a first network controller, which at least temporarily acts as the terminal's serving network controller (SRNC), for reporting the terminal's location to the core network, and a second network controller, which at least temporarily acts as the terminal's drift network controller (DRNC), for maintaining a connection with the terminal; wherein

there is a first set of predetermined criteria for sending information about the terminal's (MS) location to the core network (CN); and

in response to fulfilment of at least one criterion in the first set, the terminal (MS) sends to the second network controller (DRNC) location information (4-1, 5-1) on the basis of which the terminal's location can be determined; and the second network controller (DRNC) forwards the location information to the first network controller (SRNC) for reporting to the core network (CN);

characterized in that

there is a second set of at least one predetermined criterion for transforming the location information;

the first network controller (SRNC) checks whether at least one criterion in the second set is fulfilled; and

in response to fulfilment of at least one criterion in the second set, the first network controller (SRNC) sends transformed information (4-2, 5-2) about the terminal's location to the core network (CN).

2. A method according to claim 1, characterized in that in response to terminating the last connection-oriented connection with the terminal, the first network controller (SRNC) reports the terminal's correct location to the core network (CN).

3. A method according to claim 1 or 2, characterized in that the information about the terminal's (MS) location indicates a location which is controlled by the first network controller (SRNC) and which is part of the terminal's active set, if such a location exists.

4. A method according to claim 3, characterized in that if the terminal's active set does not comprise a location which is controlled by the first network controller (SRNC), the information about the terminal's (MS) location indicates a virtual location, which is not controlled by either of said network controllers.

5. A method according to claim 3, characterized in that if the terminal's active set does not comprise a location which is controlled by the first network controller (SRNC), the information about the terminal's (MS) location indicates the last location which is controlled by the first network controller and which has been part of the terminal's active set.

6. A method according to claim 3, characterized in that if the terminal's active set does not comprise a location which is controlled by the first network controller (SRNC), said information about the terminal's (MS) location indicates a location which is at least partially controlled by the first network controller.

7. A method according to any one of the preceding claims, characterized in that the information about the terminal's (MS) location indicates a location the location information of which the terminal received last.

8. A method according to any one of the preceding claims, characterized in that if the terminal's (MS) active set does not comprise a location controlled by the first network controller (SRNC), the information about the terminal's (MS) location indicates a location controlled by the second network controller (DRNC).

9. A method according to any one of the preceding claims, characterized in that said information about the terminal's (MS) location indicates at least one cell identifier, routing area identifier or location area identifier.

10. A method according to any one of the preceding claims, characterized in that said first set of criteria comprises a change of the terminal's location, activation of a PDP context for the terminal and expiry of a recurring period of time.

11. A method according to any one of the preceding claims, characterized in that

the first and the second network controller (RNC1, RNC2) are associated, respectively, with a first and a second switching element (SGSN1, SGSN2) for maintaining subscription information related to the terminal (MS); and

information about the terminal's location is received by the first switching element (SGSN1) sends (5-4) information about the terminal's location to the second switching element (SGSN2) without a separate request.

12. A method according to claim 11, characterized in that said information about the terminal's location comprises the terminal's Packet Data Protocol and/or Mobility Management context.

13. A method according to claim 11 or 12, characterized in that each of the first and the second switching element (SGSN1, SGSN2) is substantially an SGSN node, a Mobile services Switching Centre or a combination of both.

14. A method according to any one of the preceding claims, characterized in that said terminal is a mobile station, said access network is a radio access network and said network controller is a radio network controller.

15. A first network controller for supporting a terminal (MS) in a telecommunications system which comprises a core network (CN) and an access network (RAN);

wherein said first network controller is adapted to act, at least temporarily, as the terminal's serving network controller (SRNC) in said access network (RAN), for reporting the terminal's location to the core network (CN); and

the first network controller (SRNC) is adapted to receive location information from a drift network controller (DRNC) and to report it to the core network (CN) for determining the terminal's (MS) location;

characterized in that

the first network controller (SRNC) is adapted to transform said information about the terminal's location before reporting it to the core network (CN).

Fig. 1

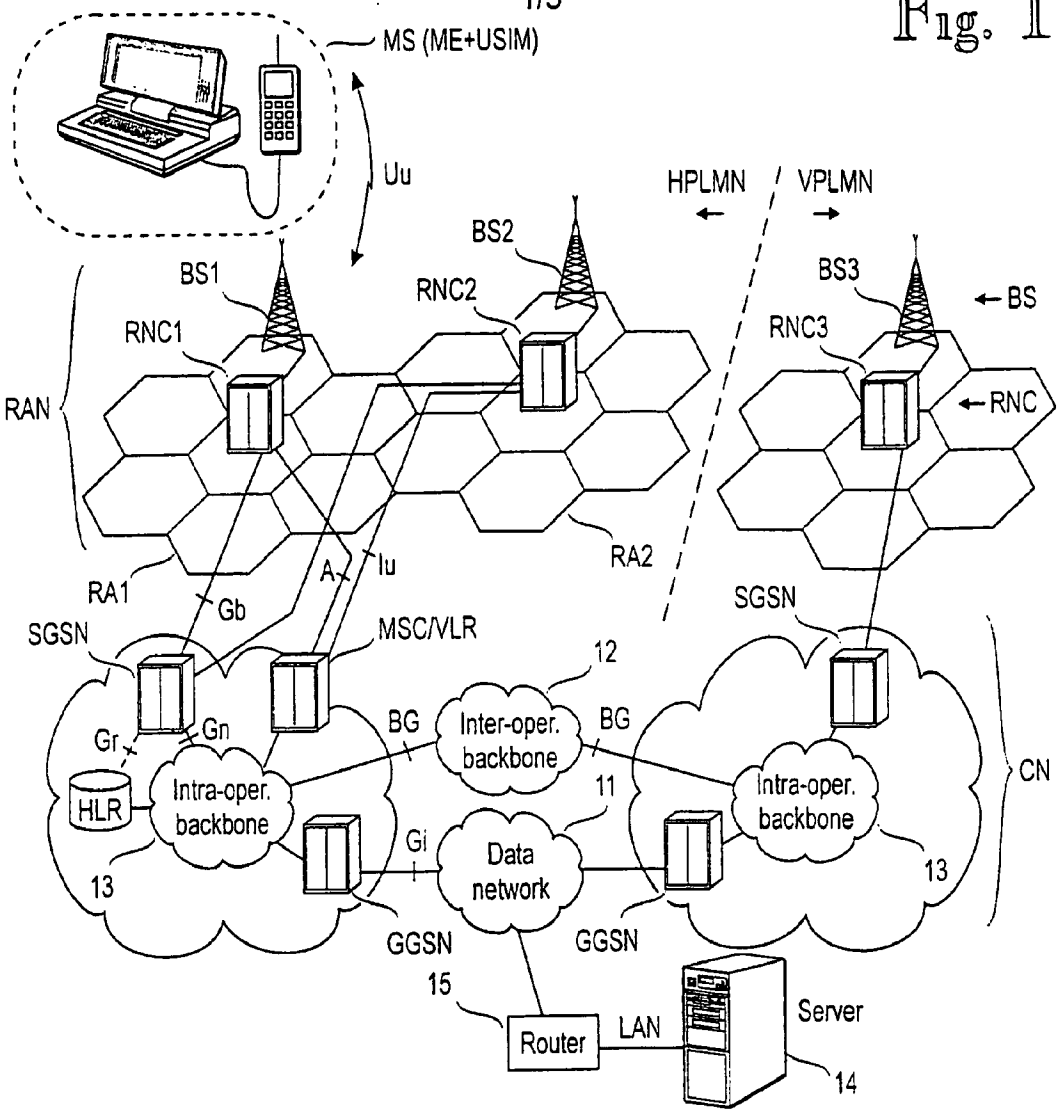
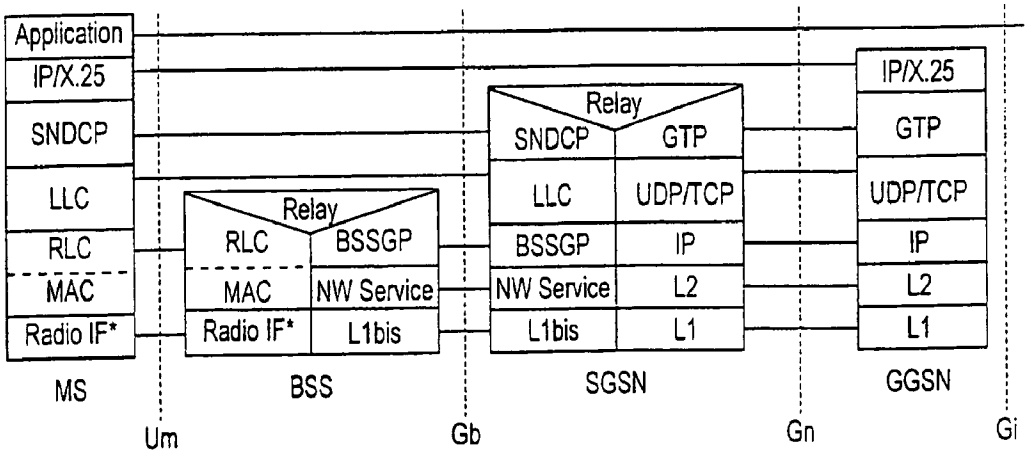


Fig. 2



*WCDMA in 3G

Fig. 3

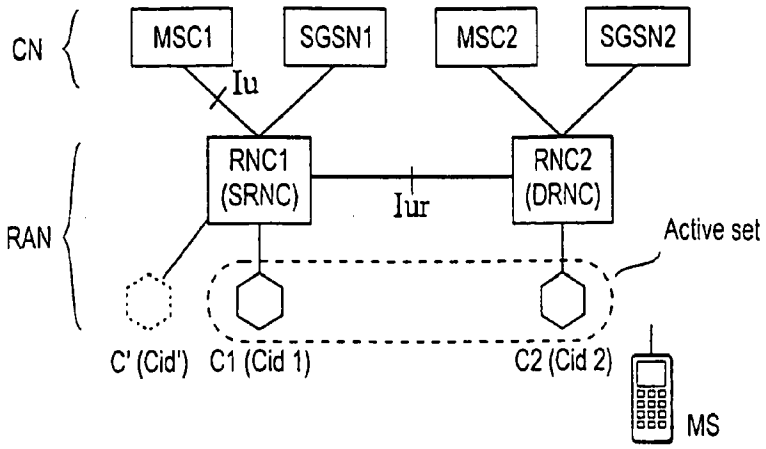

CN
MSC1
SGSN1
MSC2
SGSN2
Iu
RAN
RNC1
(SRNC)
Iur
RNC2
(DRNC)
Active set
C' (Cid')
C1 (Cid 1)
C2 (Cid 2)
MS

Fig. 4

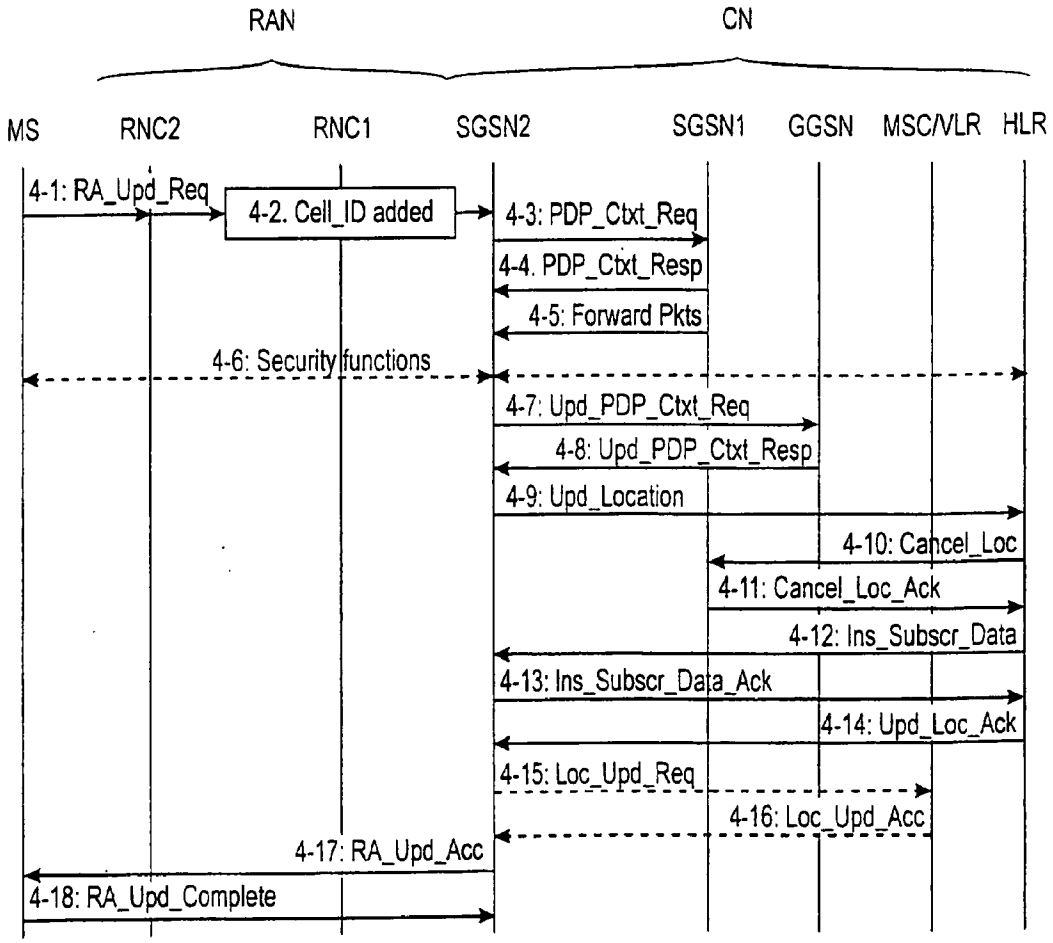
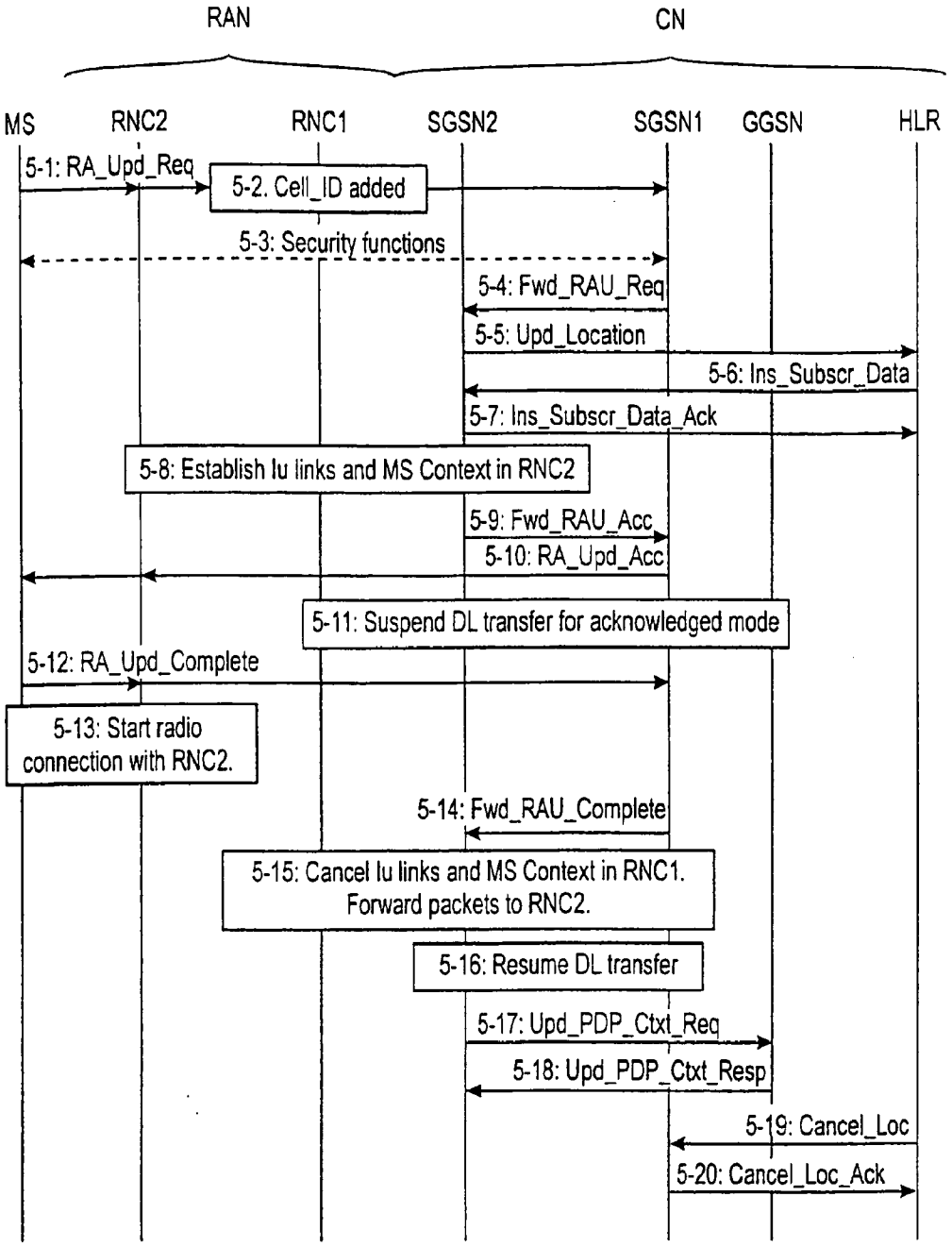

RAN
CN
MS
RNC2
RNC1
SGSN2
SGSN1
GGSN
MSC/VLR
HLR
4-1: RA_Upd_Req
4-2. Cell_ID added
4-3: PDP_Ctxt_Req
4-4. PDP_Ctxt_Resp
4-5: Forward Pkts
4-6: Security functions
4-7: Upd_PDP_Ctxt_Req
4-8: Upd_PDP_Ctxt_Resp
4-9: Upd_Location
4-10: Cancel_Loc
4-11: Cancel_Loc_Ack
4-12: Ins_Subscr_Data
4-13: Ins_Subscr_Data_Ack
4-14: Upd_Loc_Ack
4-15: Loc_Upd_Req
4-16: Loc_Upd_Acc
4-17: RA_Upd_Acc
4-18: RA_Upd_Complete

Fig. 5


RAN
CN
MS
RNC2
RNC1
SGSN2
SGSN1
GGSN
HLR
5-1: RA_Upd_Req
5-2. Cell_ID added
5-3: Security functions
5-4: Fwd_RAU_Req
5-5: Upd_Location
5-6: Ins_Subscr_Data
5-7: Ins_Subscr_Data_Ack
5-8: Establish Iu links and MS Context in RNC2
5-9: Fwd_RAU_Acc
5-10: RA_Upd_Acc
5-11: Suspend DL transfer for acknowledged mode
5-12: RA_Upd_Complete
5-13: Start radio connection with RNC2.
5-14: Fwd_RAU_Complete
5-15: Cancel Iu links and MS Context in RNC1. Forward packets to RNC2.
5-16: Resume DL transfer
5-17: Upd_PDP_Ctxt_Req
5-18: Upd_PDP_Ctxt_Resp
5-19: Cancel_Loc
5-20: Cancel_Loc_Ack

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/00357

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/38
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)

IPC7: H04Q

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

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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P,A	--	1-14
P,A	WO 0011878 A2 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 2 March 2000 (02.03.00), page 6, line 18 - page 8, line 13	1-15
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A	WO 9920071 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 22 April 1999 (22.04.99), page 5, line 6 - page 7, line 3, abstract	1-15
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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

Date of the actual completion of the international search	Date of mailing of the international search report
13 October 2000	17 -10- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jaana Raivio/mj Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/08/00

International application No.
PCT/FI 00/00357

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Electronic Patent Application Fee Transmittal

Application Number:	11841765
Filing Date:	20-Aug-2007
Title of Invention:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
First Named Inventor/Applicant Name:	Jeffrey David Mullen
Filer:	Jeffrey David Mullen
Attorney Docket Number:	JDM/002 CON7

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	55	50	2750
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	130	130
STATUTORY OR TERMINAL DISCLAIMER	2814	3	170	510
		Total in USD ($)		**3390**

Electronic Acknowledgement Receipt

EFS ID:	44165950
Application Number:	11841765
International Application Number:	
Confirmation Number:	2475
Title of Invention:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
First Named Inventor/Applicant Name:	Jeffrey David Mullen
Customer Number:	32733
Filer:	Jeffrey David Mullen
Filer Authorized By:	
Attorney Docket Number:	JDM/002 CON7
Receipt Date:	30-OCT-2021
Filing Date:	20-AUG-2007
Time Stamp:	16:29:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	EFT
Payment was successfully received in RAM	$3390
RAM confirmation Number	E20210TG30222687
Deposit Account	503855
Authorized User	Jeffrey Mullen

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

37 CFR 1.16 (National application filing, search, and examination fees)

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)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	JDM-002CON7--IDS.pdf	116361 ab6d0616ede1c87f5a2d6aa473e48e2e57dc590f	no	15
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	JDM-002CON7--SB08A.pdf	286728 1f7b9cee25eed4ef6b590dab5a9bfc04bb135c90	no	11
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Terminal Disclaimer Filed	JDM-002CON7--TD--US8374575.pdf	91780 d57c28920c317149af34aab4bb2d68755986c9ae	no	2
Warnings:					
Information:					
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Warnings:					
Information:					
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Warnings:					
Information:					
6		JDM-002CON7--SupplementalAmendment.pdf	124414 351ebeaba066acc4baa1b8f71895422b6e875887	yes	18

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Supplemental Response or Supplemental Amendment	1	1
	Claims	2	17
	Applicant Arguments/Remarks Made in an Amendment	18	18

Warnings:					
Information:					
7	Non Patent Literature	JDM-002C7--ref--1of4.pdf	9131124 b9606cd62533b8f551278c8f281af1225a199e9b	no	241
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Warnings:					
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Warnings:					
Information:					
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Warnings:					
Information:					

12	Fee Worksheet (SB06)	fee-info.pdf	42311 46954c63acdf5ae723f14fbd495819f7816a0176	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	59615194	

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.

JDM/002 CON7

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Jeffrey D. Mullen
Application No.	:	11/841,765
Confirmation No.	:	2475
Filed	:	August 20, 2007
For	:	SYSTEMS AND METHODS FOR LOCATING CELLULAR PHONES AND SECURITY MEASURES FOR THE SAME
Group Art Unit	:	2614
Examiner	:	William J. Deane Jr.

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

Pittsburgh, PA 15116
October 30, 2021

INFORMATION DISCLOSURE STATEMENT

Sir:

A Request for Continued Examination is applicable hereto and being submitted herewith. In accordance with 37 C.F.R. §§ 1.56 and 1.97, applicant wishes to call the attention of the Examiner to the following documents:

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It is respectfully requested that these documents be (1) fully considered by the Patent and Trademark Office during examination of this application; and (2) printed on any patent which may issue on this application. Applicant requests that a copy of Form PTO/SB/08A, as considered and initialed by the Examiner, be returned with the next communication.

Documents above marked with a (1) were cited in Application No. 10/400,296. Applicant respectfully requests the Examiner review the prosecution history of this

application including all communications from the United States Patent and Trademark Office contained therein (e.g., the Office Actions contained therein).

Documents above marked with a (2) were cited in Application No. 11/387,384. Applicant respectfully requests the Examiner review the prosecution history of this application including all communications from the United States Patent and Trademark Office contained therein (e.g., the Office Actions contained therein).

Documents above marked with a (3) were cited in Application No. 11/462,201. Applicant respectfully requests the Examiner review the prosecution history of this application including all communications from the United States Patent and Trademark Office contained therein (e.g., the Office Actions contained therein).

Documents above marked with a (4) were cited in Application No. 11/462,201. Applicant respectfully requests the Examiner review the prosecution history of this application including all communications from the United States Patent and Trademark Office contained therein (e.g., the Office Actions contained therein).

Documents above marked with a (5) were cited in Application No. 11/834,674. Applicant respectfully requests

the Examiner review the prosecution history of this application including all communications from the United States Patent and Trademark Office contained therein (e.g., the Office Actions contained therein).

Documents above marked with a (6) were cited in Application No. 11/841,734. Applicant respectfully requests the Examiner review the prosecution history of this application including all communications from the United States Patent and Trademark Office contained therein (e.g., the Office Actions contained therein).

Documents above marked with a (7) were cited in Application No. 11/841,750. Applicant respectfully requests the Examiner review the prosecution history of this application including all communications from the United States Patent and Trademark Office contained therein (e.g., the Office Actions contained therein).

Applicant respectfully requests the Examiner review the prosecution history of this application including all communications from the United States Patent and Trademark Office contained therein (e.g., the Office Actions contained therein).

Applicant hereby submits that not all of the patent documents and non-patent literature submitted herein may be,

in fact, prior art to the present application. Applicant reserves the right to dispute whether references, or subject matter within references, are prior art to the present application (e.g., continuation-in-part subject matter filed after the filing date of the present application).

This Statement is being submitted after a first Office Action on the merits. Accordingly, pursuant to 37 CFR 1.97(c), the fee set forth in Section 1.17(p) is provided herewith.

Applicant respectfully submits that this application, including the pending claims, is in condition for allowance. A favorable action is respectfully requested.

The Director is hereby authorized to charge any fees associated with this filing, or credit any overpayment of the same, to Deposit Account No. 50-3855.

Respectfully Submitted,

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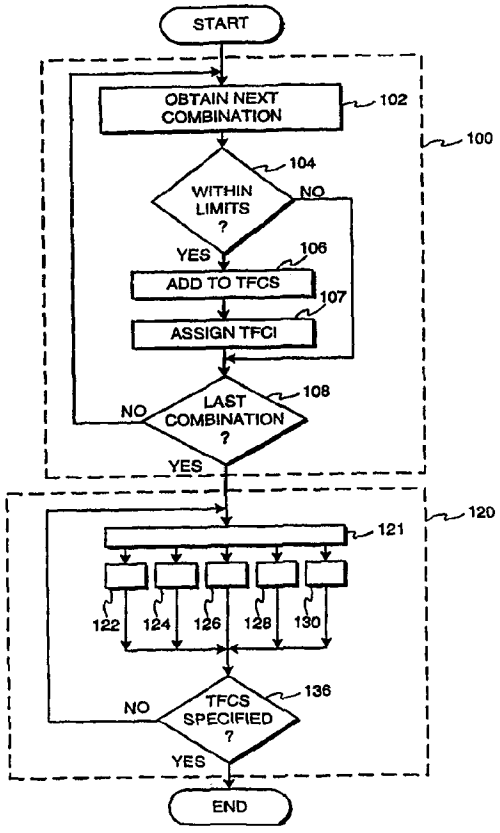
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(54) Title: METHOD FOR CONTROLLING BEARER PROPERTIES

(57) Abstract

The invention concerns the control of connections in cellular telecommunication systems. According to the invention, the available radio resources are controlled by allowing only certain conbinations of transport formats to be used by a single user. The inventive method restricts the combinations of bearer bit rates which can be used, without strictly limiting some bearers from using highest bit rates. This inventive approach allows flexible overall control of radio resources, while retaining the possibility of bearers to select between different bit rates.



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Method for controlling bearer properties

TECHNICAL FIELD OF THE INVENTION

The invention concerns the control of connections in cellular telecommunication systems.

BACKGROUND OF THE INVENTION

In cellular telecommunication systems a single speech connection or data connection through the cellular telecommunication network is called a bearer. Generally, a bearer is associated with a set of parameters pertaining to data communication between a certain terminal equipment and a network element, such as a base station or an interworking unit (IWU) connecting the cellular network to another telecommunications network. The set of parameters associated with a bearer comprises typically for example data transmission speed, allowed delays, allowed bit error rate (BER), and the minimum and maximum values for these parameters. A bearer may further be a packet transmission bearer or a circuit switched bearer and support for example transparent or non-transparent connections. A bearer can be thought of as a data transmission path having the specified parameters connecting a certain mobile terminal and a certain network element for transmission of payload information. One bearer always connects only one mobile terminal to one network element. However, a bearer can pass through a number of network elements. One mobile communication means (ME, Mobile Equipment) may in some cellular telecommunication systems support one bearer only, in some other systems also more than one simultaneous bearers.

In the new cellular telecommunication systems such as the UMTS system (Universal Mobile Telecommunication System) under development, variable bit rate bearers will be in much more widespread use than in the present systems. Multiple simultaneous bearers with multiple bit rate options will result in high amount of combinations to be supported. It is desirable that also the air interface part of the communications system supports this kind of bearer combinations efficiently, i.e. without excessive use of radio resources. Since the bit rates of bearers may change from frame to frame, the bit rates need to be indicated in the frames. Assuming that all possible combinations of instantaneous bit rates of different bearers shall be supported, the amount of bits required for identification of the transmission rate of a

radio frame may become excessive. On the other hand, fixed allocation of radio resources according to the maximum possible total bit rate is not feasible. Maximum bit rates of the bearers may be rarely used and if the resources allocated for a user are dimensioned based on the worst case combination i.e. all bearers using the highest possible bit rate, scarce radio resources will be wasted.

SUMMARY OF THE INVENTION

An object of the invention is to realize a method for controlling the bearers, which allows the control of maximum total bit rate of all bearers of a user, while aiming to avoid as much as possible restrictions of use of the highest data rates by a bearer. A further object of the invention is to realize a method, which reduces the amount of data transmission needed for communicating the bit rates of bearers from a transmitting entity to a receiving entity.

The objects are reached by restricting the allowed bit rate combinations, associating an identifier with each allowed combination, and identifying the instantaneous transmission rate using the identifier associated with the particular combination.

The method according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim. The system for controlling bearers in a cellular telecommunication system according to the invention is characterized by that, which is specified in the characterizing part of the independent claim directed to a system for controlling bearers in a cellular telecommunication system. The dependent claims describe further advantageous embodiments of the invention.

According to the invention, the available radio resources are controlled by allowing only certain combinations of transport formats to be used by a single user. The inventive method restricts the combinations of bearer bit rates which can be used, without strictly limiting some bearers from using highest bit rates. Consequently, depending on the available resources, one bearer may well use its highest data rate, possibly even more bearers than one, although the total resource usage of all bearers of the user may be restricted. This inventive approach allows flexible overall control of radio resources, while retaining the possibility for bearers to select between different bit rates.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in more detail in the following with reference to the accompanying drawings, of which

Figure 1 illustrates a method according to an advantageous embodiment of the invention,

Figure 2 illustrates another method according to an advantageous embodiment of the invention,

Figure 3 illustrates a system according to an advantageous embodiment of the invention, and

Figure 4 illustrates a further method according to an advantageous embodiment of the invention.

Same reference numerals are used for similar entities in the figures.

DETAILED DESCRIPTION

In the following discussion, the term bit rate refers to the bit rate after channel coding, i.e. the bit rate actually transmitted over the air interface, and not the payload data bit rate unless otherwise specified.

According to the present invention, transmission of a single mobile communication means is controlled by controlling the allowed bit rate combinations of the bearers of the mobile communication means. The allowed combinations of bearer bit rates are restricted in such a way, which does not refuse the possibility of using the highest bit rates for some bearers.

To aid in the description of the invention, certain terms are defined in the following.

A transport format (TF) is a set of parameters, which correspond to a single way of preparing a payload data stream for transmission over the air interface. The set of parameters indicate for example payload data rate, the error control coding method used, interleaving method used, and other processing methods used in the particular cellular telecommunications network, i.e. describe the physical layer processing

applied to the data to be transmitted. Consequently, each TF corresponds to a specific instantaneous bearer bit rate. Further, each bearer has at least one transport format. In the case of a bearer supporting for example multiple bit rates, a bearer can have more than one corresponding TF.

Each transport format has a corresponding transport format identifier (TFID). The TFIDs can be assigned to TFs in many ways, for example in ascending order starting from the lowest bit rate, or according to some other predefined rule.

The combination of transport formats of the active bearers is a Transport Format Combination (TFC). The set of all possible transport format combinations form a Transport Format Combination Set (TFCS). Each TFC has a corresponding transport format combination identifier (TFCI), i.e. each TFCI corresponds to a definite group of transport formats. The TFCI is used to inform the current combination of transport formats to the receiver. The TFCI:s are preferably integer numbers.

A. Determination of allowed combinations

The determination about which combinations can be used and which cannot can be made on the basis of many different requirements according to the needs of the particular embodiment of the invention. Some examples of such requirements are given in the following.

A.1. An example of a limit: size of TFCI word

In order to further reduce the amount of data transmission needed for transmission of transport format information over the air interface to the receiver, the size of the TFCI word can be changed. If the TFCI word has m bits, the maximum number N of combinations that can be represented is $N = 2^m$. Consequently, the length of the TFCI word simply limits the number of allowed combinations. The length of the TFCI word can be adjusted to give a suitable compromise between use of transmission resources for transmitting the TFCI word and the variety of transport format combinations available. In an advantageous embodiment of the invention, the length of the TFCI word can be changed during a connection.

A.2. An example of a limit: maximum bit rate for the user

In a further advantageous embodiment of the invention, maximum allowed bit rate of a user is used in the determination of allowed transport format combinations. In such an embodiment, the allowed combinations include all transport combinations, whose total bit rate is less than or equal to the maximum bit rate for a user.

In various embodiments of the invention, the maximum bit rate may be user-dependent, some users having a different maximum limit from that of others. This provides one way of priorization of users, for example to provide high-paying users and otherwise prioritized users such as rescue workers a better service than to the rest of users.

A.3. Other grounds for combination decisions

In addition to the previously mentioned limits, other information can be used in making decisions about allowed transport format combinations. This kind of information may for example comprise priorities of the bearers, measured throughputs for each bearer as well as the aggregate throughput for the user in question, current load in the cell and interference levels.

B. Construction of TFCS

The construction of the transport format combination set and the assigning of transport format combination identifiers to the various combinations can be performed in many different ways. Some examples of these ways are presented in the following.

B.1 A first example

Preferably, a table of the allowed transport format combinations is constructed, whereby the table index can be used as the TFCI. Thereafter, only the table index i.e. the TFCI needs to be communicated between the transmitter and the receiver. However, the invention is not limited to using tables, since other means such as linked lists or other data structures can be used for associating a transport format combination and a TFCI.

B.2 A second example

Further, a predefined algorithm or rule can be used to generate the TFCI corresponding to a TFC, whereafter the TFCI found in this way can be used as the index to a table for storing the different allowed combinations. The TFCI of a TFC can be determined for example according to the following algorithm:

1. $factor = L(K)$
2. $TFCI = TFID(K)$
3. step through all values of j from K-1 to 1, repeating 3a and 3b:
   - 3a. $TFCI = TFCI + TFID(j) * factor$
   - 3b. $factor = factor * L(j)$

where

factor	is a temporary variable used in the algorithm,
L(j)	is number of TF:s for bearer *j*,
TFID(j)	is TFID of the TF of bearer *j*, and
K	is the number of active bearers.

This algorithm assumes that TFIDs are assigned to TFs in ascending order starting from the lowest bit rate, the first TFID being zero.

B.3 A third example

In a further advantageous embodiment of the invention, the TFCI values are assigned simply by iterating through all combinations of all transport formats of the bearers, checking for each combination whether the combination is allowed or not. If the combination is allowed, the next free TFCI value is assigned to the combination. For example, the allowed combination can be entered into the next free position in a table containing the TFCS, the index of the position then being the assigned TFCI.

B.4 A fourth example

In a still further advantageous embodiment of the invention, TFCI values are classified into two categories: active and inactive values. Active values are those values which are in use, and inactive values those that are not in use. In such an embodiment, new services can be taken into use by specifying the corresponding TFCI values to be active. If some transport format combinations are removed from use, the corresponding TFCI values are simply specified to be inactive. Such an embodiment has the advantage, that the timing of the changes in the TFCS and TFCI values is not very critical, since other active TFCI values remain unchanged. It is enough from the viewpoint of timing, that any new TFCI values are not used before the receiver has had enough time to receive the message specifying the new values and to change the TFCS and TFCI configuration. In such an embodiment, the message specifying that a TFCI value is now active may for example comprise also the specification of the TFC corresponding to the TFCI. In further embodiments of the invention, the TFC corresponding to a TFCI specified to be active may be previously known by the receiver, or may be deduced from the TFCI by the receiver according to a predefined rule. For example, all possible combinations of transport formats of the bearers can be stored in a table whose index values correspond to the TFCI values, and only those TFCI values are used, which are specified to be active.

B.5 A fifth example

In a further advantageous embodiment, the transport format combinations and the corresponding TFCI values are ordered according to the total bit rate of the TFC or some other desired criteria. In such an embodiment, the allowed transport format combinations are indicated simply by indicating the highest allowed TFCI. In such an embodiment, when a new TFC is allowed, the new TFC is inserted in the corresponding location in the ordered sequence of transport format combinations and given the TFCI value corresponding to that position in the sequence. The TFCI values are updated accordingly, i.e. the higher TFCI values are incremented by one. In a similar way, when a TFC is removed from use, it is removed from the ordered sequence, and the TFCI values are updated accordingly.

Preferably, the TFCI of the TFC with lowest bit rate is 0, the TFCI of the TFC with the next lowest bit rate is 1, and so on. However, this numbering scheme is not the only possible method that can be used in various embodiments according to the

section B.5 of this specification. Preferably, the TFCI values form a sequence of consecutive integer numbers.

The ordering of transport format combinations and the corresponding TFCI values may take into account also other parameters than the total bit rate of a TFC. For example, if more than one transport format combination has the same total bit rate, these combinations can be ordered according to their relative priority.

In this embodiment, a mobile station can request more resources simply by indicating a new desired highest allowed TFCI in the resource request, to which the network can reply by allocating more resources if possible, and returning a possibly new highest allowed TFCI limit.

C. Changing of the set of allowed transport formats

The transport format combination set (TFCS) needs to be known both to transmitter and receiver. Each time new variable rate bearer requires establishment of a connection or an old connection is released the TFCS is changed. Further, it may be desirable to restrict the use of certain combinations for some other reasons. To ensure that the transport format combination sets in the transmitter and in the receiver correspond to each other, the set or any changes to the set may need to be signalled from the transmitter to the receiver. Some ways to signal the TFCS according to various advantageous embodiments of the invention are described in the following.

C.1 Signalling of TFCS by explicit recitation

In an advantageous embodiment of the invention, the TFCS is signalled from a first end of a connection to a second end of the connection by explicitly reciting all allowed combinations. This embodiment is advantageous, if the number of allowed combinations is relatively small compared to the total number of combinations. In this embodiment, the first end sends one or more messages to the second end, which messages specify at least all allowed combinations, and for each combination specify one TFID at least for each bearer having more than one transport format.

In a further advantageous embodiment of the invention, the TFCS is signalled from a first end of a connection to a second end of the connection by explicitly reciting all those combinations, which are not allowed. This embodiment is advantageous, if

the number of non-allowed combinations is smaller than the number of allowed combinations. In this embodiment, the first end sends one or more messages to the second end, which messages specify at least all non-allowed combinations, and for each combination specify one TFID at least for each bearer having more than one transport format.

In a further advantageous embodiment of the invention, the message or messages specifying the allowed or non-allowed combinations, also specify whether the recited combinations are allowed or not. This allows the use of the same message type for specifying allowed and non-allowed combinations.

C.2 Signalling of the TFCS by indicating construction limits

In another advantageous embodiment of the invention, the end of the connection deciding about the allowed combinations informs the other end of the connection only about which limits and other information are to be used in construction of the TFCS. Such a limit may be for example the maximum total bit rate of a single user, and such other information may be for example the priorities of the bearers. Thereafter, the other end constructs the TFCS independently following the specified limits. Since the same limits are used at both ends, the resulting TFCS will be the same. The construction of the TFCS may proceed for example by going through all possible transport format combinations, and checking for each one whether the combination is allowed or not.

C.3 Signalling of the TFCS by indicating specific transport formats

If the restriction of the combinations is to be done in such a way that some transport formats of some bearers are not used in any of the allowed combinations, the TFCS can be specified with bearer specific messages restricting the use of one or more transport formats of a specific bearer.

In a further advantageous embodiment of the invention, the TFCS is specified with bearer specific messages indicating, which transport formats can be used.

C.4 Further methods

The previous methods have given examples of methods, in which the TFCS is constructed from scratch by indicating allowed or non-allowed transport formats or

combinations of transport formats. However, a new TFCS may also be defined by specifying the changes in the allowed transport format combinations and transport formats relative to the previous TFCS. The messages may specify whether the item being specified is to be allowed or restricted. The item being specified in a message may be for example a TFC, a bearer, or a single transport format of a bearer. For example, the new TFCS may be specified by a message, which restricts the use of one or more transport formats of a specific bearer.

After specifying the changes in the allowed combinations, transport formats and/or bearers, the TFCS is preferably reconstructed so that the TFCS contains only allowed combinations, and the TFCI values updated to correspond to the new TFCS.

The previously described ways of specifying the TFCS to a receiver are examples only and do not limit the invention in any way. Many other ways of specifying a set of combinations or for example different combinations of the previously described ways can as well be used in various embodiments of the invention.

D. Time of validity

In the previous examples of specifying the TFCS, the message or messages carrying the specifying information of TFCS may also comprise an indication of the starting time, after which the new TFCS is valid. However, the starting time of validity may also be defined implicitly, e.g. the new TFCS may be valid from the time the specifying message arrives or in the case of more than one message being used to specify the TFCS, from the receiving time of the last of these messages.

E. Examples of admission control methods according to the invention

The cellular telecommunications network can use for example the previously described TFCS construction limits at least partly as the admission condition in an admission control method. For example, the system can determine how many TFCI bits would be required to represent all combinations in the TFCS based on the size of the TFCS and the transport formats of all the bearers. If the amount of TFCI bits is less than equal to a maximum TFCI word length, the network can then refuse the bearer request, or for example in the case of a high priority request, refuse the service from other already established bearers. As another example, the maximum

bit rate limit may be considered. In such an example, the bearer is advantageously admitted, if at least some of its transport formats result in an allowed combination. Consequently, a multi-bit-rate bearer may be only partially admitted, i.e. admitted with a restricted selection of bit rates.

If the requested bearer has higher priority than some other bearers, the cellular network preferably allocates resources for the higher priority bearer first and restricts the bit rates of the other bearers to such values, that the resulting TF combination is an allowed combination. This may result in the adjustment of transport format for a bearer having a lower priority, or even refusing the service for a bearer having a lower priority.

Each bearer requiring establishment of a connection preferably indicates the variability of the user bit rate in a predefined way, e.g. using a predefined signalling procedure. The network then determines transport formats for the requested bearer and updates the TFCS accordingly, if the network can provide service for the bearer or for at least some of its transport formats.

Figure 1 shows the flow diagram of an advantageous embodiment of the invention. Figure 1 illustrates one example of the use of the inventive method in admission control. In step 135, a bearer request is received. As a response to the request, a TFCS is constructed in step 100. The step 100 of construction of a TFCS may also take into account the priority of the requested bearer as described previously. After the TFCS is constructed, it is checked in the following step 140 if the bearer belongs to any allowed combination. If the bearer is not a part of any allowed combination, the bearer is refused at step 150, after which the method is ended without taking the newly constructed TFCS into use. If the bearer is found to be a part of at least one TFC, the bearer is admitted in step 145. At the next step 120, the new TFCS is communicated to the receiver, after which the communicated TFCS is taken into use at step 155, after which the method is ended.

In further advantageous embodiments of the invention, the admission requirement may be different from the example of step 140 of Figure 1. For example, the bearer may be allowed only, if at least one transport format of the bearer is allowed in all combinations. Further, the bearer may also be allowed, if at least one transport format of the bearer is allowed in at least a predefined part of all combinations. In a further advantageous embodiment of the invention, a real time bearer is allowed only, if the highest transport format of the bearer is allowed in at least one TFC.

F. An example of a method

In the following, an example of a method according to an advantageous embodiment of the invention is presented. The method is described with reference to Figure 2, which illustrates as a flow diagram the construction 100 of a transport format combination set and the communication 120 of information to the receiver for construction of the same set at the receiver.

In this example, the step of construction 100 of a TFCS comprises the following steps 102, 104, 106, 107, and 108. All combinations are examined one by one, starting with step 102, in which the next, or at the first time after start of the method, the first combination is taken into consideration. In step 104 it is checked, whether the combination is within the predefined limits, such as within a predefined maximum total bit rate limit. If the combination is within the limits, the combination is added to the TFCS at step 106, and a TFCI is assigned to the combination in step 107. If the combination is not within the limits, the method is continued directly at step 108. In either case, in step 108 it is checked if the combination is the last one to be considered. If the combination is not the last one, it is returned back to step 102. If the combination is the last one, the method is continued at step 120.

In this example, the step of communication 120 of information to the receiver for construction of the set at the receiver comprises the following steps 121, 122, 124, 126, 128, 130, and 136. At step 121, the way of communicating the TFCS to the receiver is chosen. In this example, the steps 122, 124, 126, 128, 130, and 136 represent different ways of communicating the TFCS. At step 122, each allowed transport format combination is communicated to the receiver. At step 124, each non-allowed transport format combination is communicated to the receiver. At step 126, predefined limits for construction of the TFCS are communicated to the receiver. At step 128, information specifying at least one transport format of at least one bearer, which at least one transport format of at least one bearer is not a part of any allowed transport format combination is communicated to the receiver. At step 130, differences between the TFCS being communicated and a previous TFCS are communicated to the receiver.

The steps 122, 124, 126, 128, and 130 may comprise communication of all necessary information at one method step, or communication of only part of all necessary information. Therefore, at step 136 it is checked if the whole TFCS has been specified. If the whole TFCS has not been specified, it is returned back to step

121 for continuing the communication of the TFCS to the receiver. If the whole TFCS has been specified, the method is ended.

In the step 107 of assigning a TFCI to a combination, the assignment may be performed simply by assigning the next free TFCI value for the combination. Any other method or predefined rule of assigning TFCI values can be used, for example any of those described in the previous section B in this specification.

G. An example of a system

Figure 3 illustrates an example of a system according to an advantageous embodiment of the invention. Figure 3 shows mobile communication means 505, base stations 510, a network element 520 and the rest of a cellular telecommunications network 550. The network element 520 may be for example a radio network controller (RNC) of the UMTS cellular telecommunications network. The network element further comprises a processing unit 521 such as a microprocessor and a memory element 522 for storing programs for the processing unit and one or more transport format combination sets.

Further, according to this example the system comprises means 521 for construction of a set of allowed transport format combinations in a network element of the cellular telecommunication system, and means 521, 510 for communication of a constructed set of allowed transport format combinations to a mobile communication means 505.

During construction of a TFCS, the processor unit 521 performs the previously described checking whether a single transport format combination is within the predetermined limits. The processor unit 521 can perform this task by executing a program 523 stored in the memory means 522, which program directs the processor unit to perform the task. If a transport format combination is found to be within the limits, the processor unit 521 adds the combination to the set of allowed transport format combinations 529 stored in the memory means 522. Preferably, the processor unit also assigns a transport format combination identifier (TFCI) to each transport format combination. The transport format combination identifiers can also be stored in the memory means 522.

The processor unit 521 can also take care of the communication of the constructed TFCS to the receiver, in this case the mobile communication means 505 with the

help of other components of the cellular telecommunications network such as base stations 510. The previously described method steps, such as for example determining non-allowed transport format combinations or searching the differences between a transport format combination set and said previously stored second set of allowed transport format combinations can be realized using a program 524 stored in the memory means 522, which program directs the processing unit 521 to perform the method step. Further, the system may store more than one TFCS in the memory means, such as a previously constructed TFCS 529b, which can be used for example in determining the differences between a newly created TFCS and a previously created and communicated TFCS, after which a new TFCS can be communicated to the receiver simply by communicating the differences between the old and new TFCS. The receivers 505 store the communicated TFCS 506 in a memory means in the receiver, whereafter they are able to determine the current transport format combination on the basis of a received TFCI.

Preferably, the system also comprises means for assigning a transport format combination identifier to each transport format combination stored in said memory element. These means may comprise for example the processing unit 521, which can assign TFCI values to transport format combinations for example according to any of the embodiments of the invention described previously.

Preferably, the system also comprises means for sending a transport format combination identifier for identifying the transport formats used in a transmission. These means may comprise for example the processing unit 521, which can add the TFCI of the currently used TFC into the data transmitted to a receiver.

In an advantageous embodiment of the invnetion, also a mobile communication means 505 can comprise the means 521, 522, 523, 524, 525, 529, and 529b, or other means providing similar functionality. Although conventionally it is the network which decides about radio resource usage, the mobile communication means preferably has the capability and functionality needed for construction of a TFCS for example, according to the embodiments of the invention described in section C.2 in this specification, or according to other rules and limits set by the network.

H. A further example of a method

The TFCI values can be used to indicate, which transport formats are used in a transmission. For example, a TFCI value can be transmitted in each transmission

frame to describe the transmission format or transmission formats used in the frame. In another exemplary embodiment, a TFCI value can be transmitted each time, when the transport format combination is changed. Figure 4 illustrates one example of signalling according to an advantageous embodiment of the invention. Figure 4 illustrates events during communication between a transmitting party and a receiving party, such as, respectively, a mobile communication means and a base station of a cellular telecommunications network. First, a TFCI is sent from the transmitter to the receiver in step 610 for indicating, which transport formats are used in the next unit of transmission. In the next step 615, data is transmitted from the transmitter to the receiver, using the transport formats specified by the TFCI value transmitted in the previous step. In various embodiments of the invention, the order of sending of the TFCI value and the data which the TFCI value refers to, does not necessarily need to be that shown in figure 4. For example, in such systems in which data is transmitted in frames, such as in the GSM system, the TFCI value can be sent in the same transmission frame as the data which the TFCI value refers to, in which case the exact order of the data and the TFCI value is not important and can be set according to the requirements of the particular application.

I. Further considerations

In some advantageous embodiments of the invention, the TFCS used for transmission by a party and the TFCS used for reception by the same party do not need to be the same. This is advantageous for example when the amount of radio resources reserved for uplink communication is different from the amount of radio resources reserved for downlink communication. Such a situation is possible for example in the HSCSD (High Speed Circuit Switched Data) mode in GSM networks. Such an arrangement is advantageous for example in data terminal use when browsing information databases or the Internet, where only short requests are transmitted from the mobile communication means, but large amounts of information are returned from the data networks. In such embodiments of the invention, a communicating party preferably has at least two transport format control sets, one of which is used for reception and one for transmission.

In a further advantageous embodiment of the invention, multiple transport format combination sets are used to further reduce transport format signalling between a receiver and a transmitter. In such an embodiment, a plurality of transport format combination sets is constructed and communicated to the receiver, after which the current TFCS to be used is selected simply by sending a TFCS identifier to the

receiver. Such an embodiment reduces signalling over the air interface in such a case, in which some transport format combination sets are used relatively often. The plurality of transport format combination sets preferably comprises such sets, which are constructed as a result of most common bearer sets and limits, such as the maximum total bit rate for a user.

In such a case, when the allowed transport format combinations are limited by certain limits, which allow straightforward determination of allowability for a TFC, and the TFCI values are constructed according to a certain rule, explicit construction of a TFCS is not necessary for both parties of the connection. For example, the transmitting party may simply check if a new TFC is allowable according to the limits, and if the TFC is allowed, use the TFC in transmission, generating the TFCI on the fly. The receiving party can then use the TFCI as an index to a table containing the TFCS or, if the transport formats can be deduced from the specified TFCI using an inverse of the rule used for generating the TFCI, determine the used transport formats directly from the TFCI. Therefore, the existence of an explicit TFCS is not necessary in all embodiments of the invention.

In some circumstances, as a result of some kind of an error situation, it may be possible that the receiver and the transmitter have assigned the same TFCI to different transport format combinations. If such an error situation occurs, data transmission does not succeed, since the receiver attempts to interpret the received data stream in a different way than the data stream was constructed. Recovery from such an error situation can proceed in many ways in various embodiments of the invention. For example, according to one advantageous embodiment of the invention, the party which detects the error, informs the other end about the error, whereafter both ends reconstruct their TFCI values for example according to some of the previously described examples, such as those described in sections B.2 or B.3, after which the meaning TFCI values should be the same at both ends. According to another embodiment, the party detecting the error communicates its TFCS and TFCI values to the other party, which takes the communicated values into use. According to a third embodiment, if a mobile communication means detects the error, it requests the network to send the TFCS and the TFCI values used by the network and if the network detects the error, it sends the TFCS and the TFCI values used by the network preferably without waiting for the mobile communication means to request for the information.

In various examples of embodiments described in this specification, the transport formats have been classified as allowed or non-allowed. However, in some embodiments of the invention, a bearer having no allowed transport formats in a TFC can be assigned a null transport format, i.e. a transport format having a zero bit rate. Therefore, a null transport format corresponds to a non-allowed transport format. Therefore, in this specification and the accompanied claims the term allowed transport format refers to a non-null transport format, i.e. a transport format with an essentially nonzero bit rate, which can be used in the TFCS.

The present invention reduces the use of radio resources, while retaining flexibility in the use of different transport formats. The present invention allows restriction of the use of radio resources without making it impossible for some bearers to use high data rates. The flexibility of the inventive method allows such overall control of radio resources, while providing a way to specifically restrict certain specific services as well.

In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention.

Claims

1. Method for controlling bearers in a cellular telecommunication system, **characterized** in that the method comprises steps, in which
- a set of allowed transport format combinations is constructed, and
- information for construction of said set at a receiver is communicated to the receiver.

2. A method according to claim 1, **characterized** in that said set of allowed transport format combinations is constructed by checking for each transport format combination, whether the combination is within predefined limits.

3. A method according to claim 1, **characterized** in that a transport format combination identifier is assigned to each combination of said set of allowed transport format combinations.

4. A method according to claim 3, **characterized** in that said assigning of transport format combination identifiers is performed according to a predefined rule.

5. A method according to claim 4, **characterized** in that said set of allowed transport format combinations is ordered according to at least the total bit rate of the transport format combinations, and said transport format combination identifiers are assigned so that the identifiers form a sequence of consecutive integer numbers.

6. A method according to claim 1, **characterized** in that said step of communicating information for construction of said set comprises the step of communicating of each allowed transport format combination to said receiver.

7. A method according to claim 1, **characterized** in that said step of communicating information for construction of said set comprises the step of communicating of each non-allowed transport format combination to said receiver.

8. A method according to claim 1, **characterized** in that
said step of communicating information for construction of said set comprises the step of communicating at least one limit for construction of said set to said receiver.

9. A method according to claim 1, **characterized** in that
said step of communicating information for construction of said set comprises the step of communicating information specifying at least one transport format of at least one bearer, which at least one transport format of at least one bearer is not a part of any allowed transport format combination.

10. A method according to claim 1, **characterized** in that
said step of communicating information for construction of said set comprises the step of specifying the differences between said set to a previous set of transport format combinations.

11. A method according to claim 1, **characterized** in that
a bearer request is admitted, if at least one of the transport formats of the requested bearer is a part of an allowed transport format combination.

12. A method according to claim 3, **characterized** in that
transport formats used in a transmission between a receiver and a transmitter are identified by sending a transport format combination identifier from the transmitter to the receiver.

13. A method according to claim 3, **characterized** in that
if either party of the connection detects that the transport format combination identifiers of the receiver do not correspond to the transport format combination identifiers of the transmitter, the transport format combination identifiers are reconstructed at at least one party of the connection.

14. A method according to claim 13, **characterized** in that
said step of reconstruction comprises the reconstruction of transport format combination identifiers at both parties of the connection according to a predefined rule.

15. A method according to claim 13, **characterized** in that
in said step of reconstruction, one of the parties of the connection communicates its

transport format combination identifiers to the other party, which takes the communicated identifiers into use.

16. System for controlling bearers in a cellular telecommunication system **characterized** in that the system comprises
- means for construction of a set of allowed transport format combinations in a network element of the cellular telecommunication system, and
- means for communication of a constructed set of allowed transport format combinations to a mobile communication means.

17. A system according to claim 16, **characterized** in that
said means for construction of a set of allowed transport format combinations comprises
- a memory element for storing a set of allowed transport format combinations,
- means for checking whether a single transport format combination is within predetermined limits, and
- means for adding a single transport format combination to said set of allowed transport format combinations stored in said memory element.

18. A system according to claim 16, **characterized** in that
said means for communication of a constructed set of allowed transport format combinations to a mobile communication means comprises
means for determining non-allowed transport format combinations.

19. A system according to claim 16, **characterized** in that the system further comprises means for storing a previously constructed second set of allowed transport format combinations,
and said means for communication of a constructed set of allowed transport format combinations to a mobile communication means comprises
means for searching the differences between a transport format combination set and said previously stored second set of allowed transport format combinations.

20. A system according to claim 16, **characterized** in that the system further comprises means for assigning a transport format combination identifier to each transport format combination stored in said memory element.

21. A system according to claim 16, **characterized** in that the system further comprises means for sending a transport format combination identifier for identifying the transport formats used in a transmission.

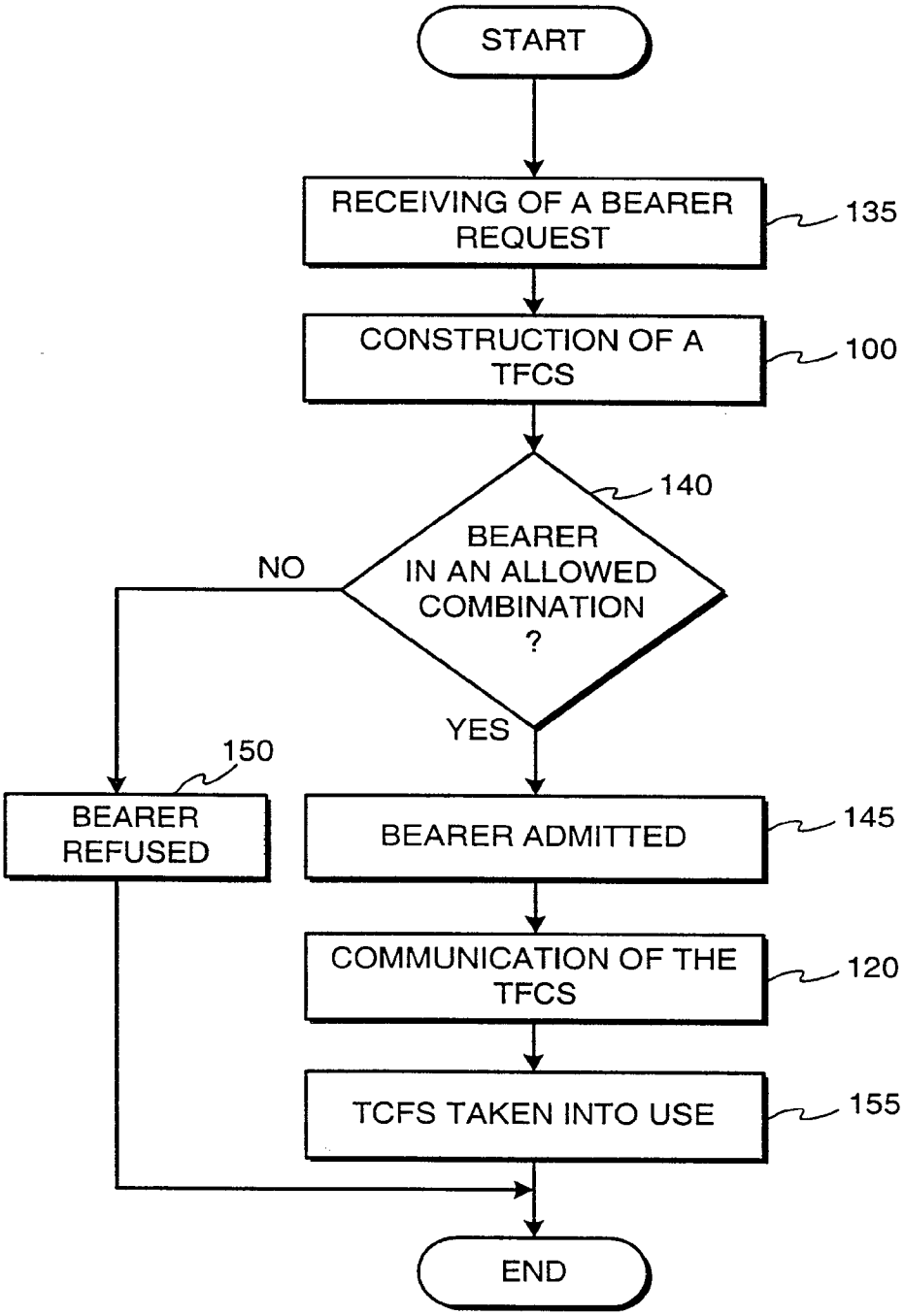

START
RECEIVING OF A BEARER REQUEST
135
CONSTRUCTION OF A TFCS
100
140
BEARER IN AN ALLOWED COMBINATION ?
NO
YES
150
BEARER REFUSED
BEARER ADMITTED
145
COMMUNICATION OF THE TFCS
120
TCFS TAKEN INTO USE
155
END

Fig. 1

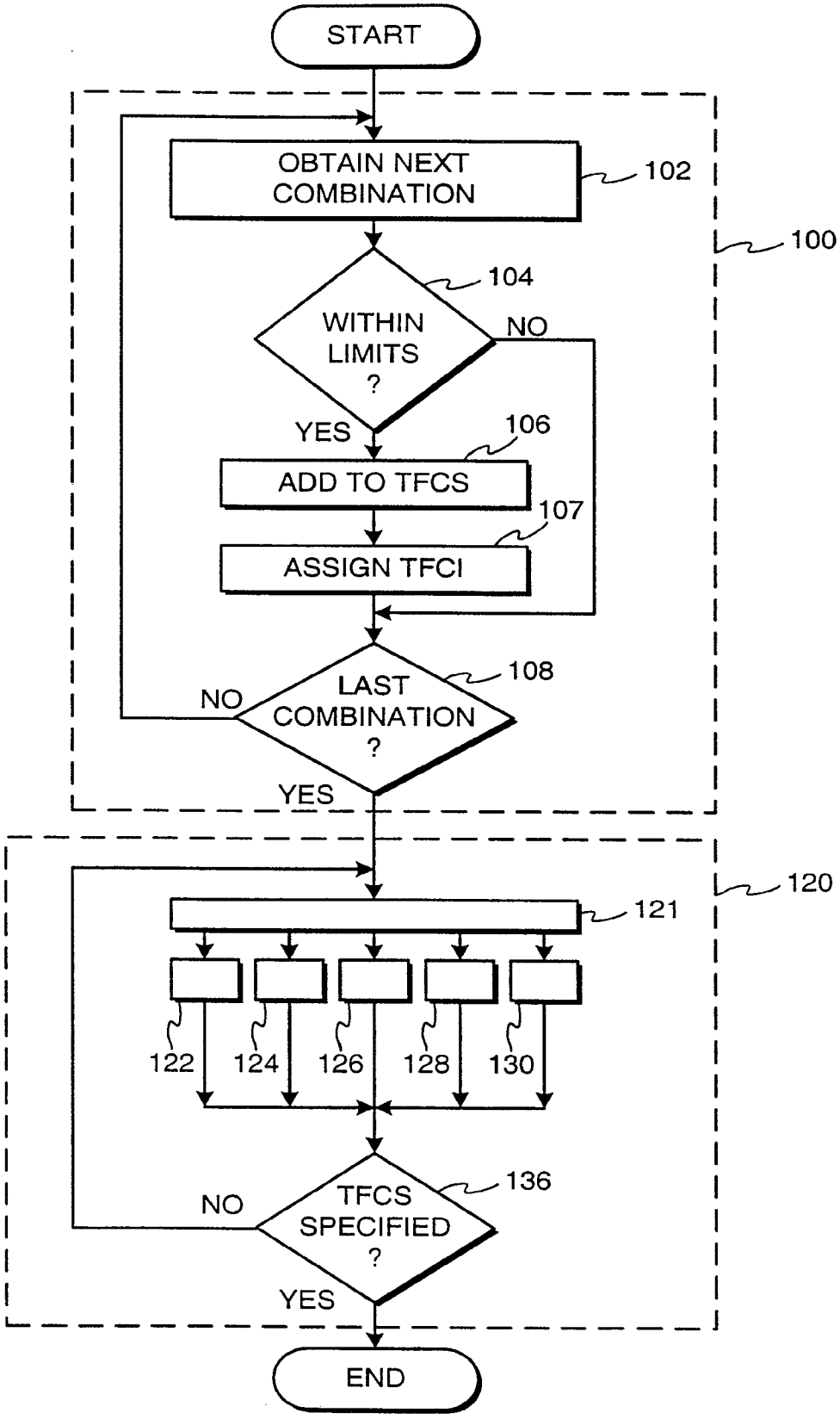

START
OBTAIN NEXT COMBINATION
102
100
104
WITHIN LIMITS ?
NO
YES
106
ADD TO TFCS
107
ASSIGN TFCI
108
LAST COMBINATION ?
NO
YES
120
121
122
124
126
128
130
136
TFCS SPECIFIED ?
NO
YES
END

Fig. 2

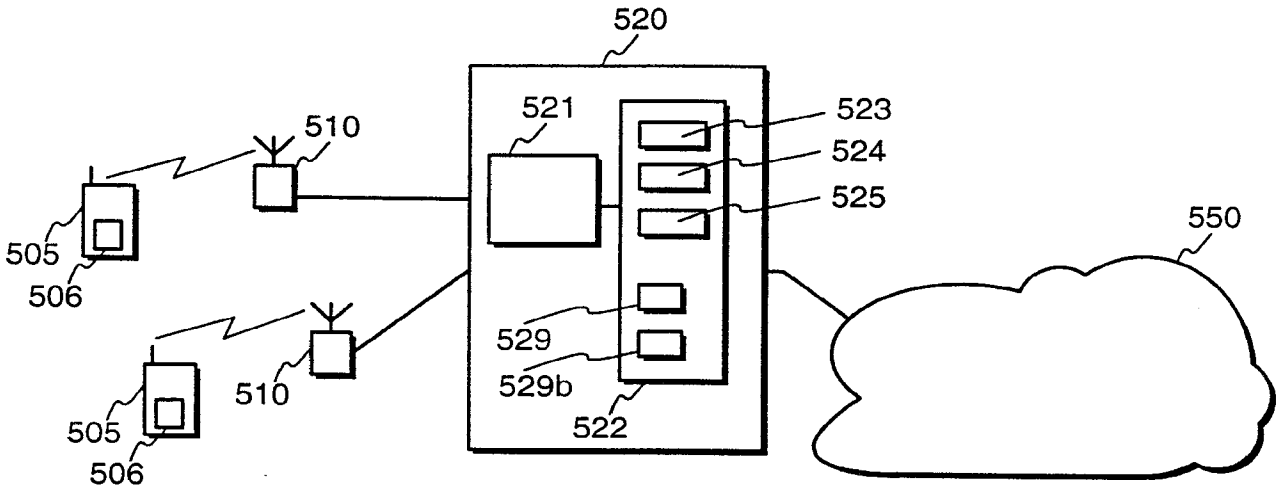

520
521
523
524
525
510
505
506
550
529
529b
522
510
505
506

Fig. 3

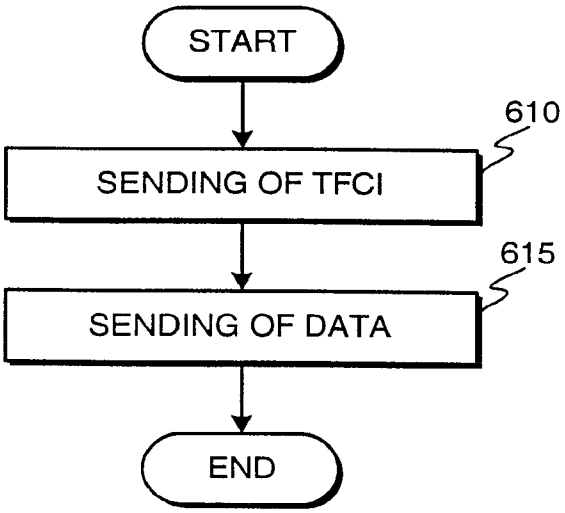

START
610
SENDING OF TFCI
615
SENDING OF DATA
END

Fig. 4

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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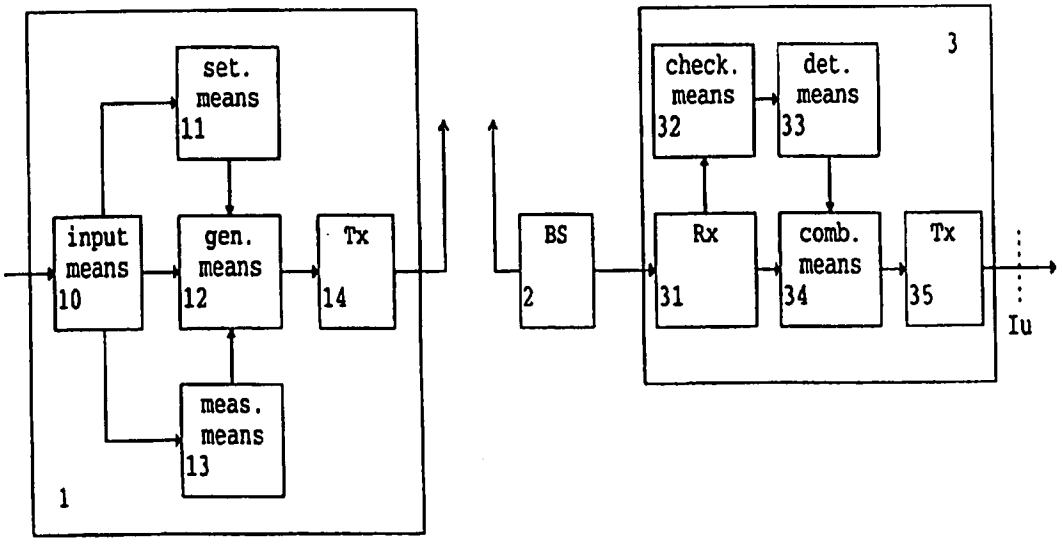
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(54) Title: METHOD AND SYSTEM FOR TRANSMITTING A POSITION INFORMATION



(57) Abstract

A method and system for transmitting a position information from a mobile terminal of a mobile communication network via a network element (3) to a network node, wherein a control information indicating the requirement of a position information of the mobile terminal (1) at the network node is set in the radio interface message. This control information is checked at the network element as to whether a position information has to be forwarded or not. The position information is determined at the network element (3) and may be combined with a higher layer information so as to generate a complete higher layer information to be forwarded to the network node. Thereby, a position information can be supplied to the network node without substantially increasing overhead and processing power required for the radio interface message.

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Method and system for transmitting a position information

FIELD OF THE INVENTION

The present invention relates to a method and system for transmitting a position information from a mobile terminal of a mobile communication network such as a UTRAN (UMTS Radio Access Network) via a network element to a network node such as an SGSN (Serving GPRS Support Node) of the GPRS (General Packet Radio Service) or an MSC (Mobile Switching Center) of the GSM (Global System for Mobile Communications) or their equivalents in the UMTS (Universal Mobile Telecommunications System).

BACKGROUND OF THE INVENTION

Third generation mobile telecommunications systems aim at providing end-users, apart from terminal and personal mobility, with enhanced services. Compared to second generation systems, enhancement that will cover features all the way between the end-user and core network elements are required, i.e. from mobile terminals to radio access and fixed networks.

Fig. 1 shows a mobile communication system such as a UMTS system, wherein a UTRAN system is connected to a GPRS-based core network and to a GSM-based core network. According to Fig. 1, a mobile station (MS) 1 is radio-connected to at least one base station (BS) 2 which is connected to a Radio Network Controller (RNC) 3 of the UTRAN. In Code Division Multiple Access (CDMA) based systems, the MS 1 can be

connected to several BS 2 simultaneously due to macrodiversity.

The RNC 3 is connected to a mobile switching center (MSC) 5 of the UMTS or GSM core network which provides access to a circuit-switched network such as a Public Switched Telephone Network (PSTN) 8 or to a packet-switched network such as the Internet 9.

Additionally, the RNC 3 is connected to an SGSN 6 of the UMTS or GPRS core network. The SGSN 6 is connected to a Gateway GPRS Support Node (GGSN) which provides access to the Internet 9.

Thus, the RNC 3 is connected to two non-coordinated core network nodes which may both establish an active connection with the MS 1.

In the GSM system, a cell information field in the A-interface between a Mobile Switching Center (MSC) and a Base Station Controller (BSC) is bound to certain radio interface messages, called initial layer 3 messages. However, these radio interface messages do not comprise any position information relating to the position of the MS 1.

In the UMTS, the MS 1 may be connected via the RNC 3 of the UTRAN 4 to an independent core network node (CN node) such as the MSC 5 or the SGSN 6. In this case, new services of the CN node may require a position information of the MS 1 for an individual setup of the service.

Moreover, it is possible to use one RRC (Radio Resource Control) connection to two independent higher layer connections (connections at Mobility Management (MM) level or connections at Connection Management (CM) level) of

corresponding CN nodes. However, if another service is already provided to the MS 1, the UTRAN 4 does not automatically insert a position information when forwarding the service setup to the CN node, when existing GSM methods are used.

Thus, a mechanism is required to indicate to the RNC 3 that a higher layer protocol data unit (PDU) received from the MS 1 is an initial layer 3 message that should be sent as a complete layer 3 message including an additionally required MS position information to the CN node even if an active connection to the other CN node exists. In addition, the same mechanism can be used for non-initial layer 3 messages if the MS position information needs to be included therein, e.g. in case of a setup of an additional service.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a method and system for transmitting a position information from a mobile terminal of a mobile communication network via a network element to a network node requiring the position information of the mobile terminal.

This object is achieved by a method for transmitting a position information of a mobile terminal of a mobile communication network to a network node using an intermediate network element, comprising the steps of:
setting a control information in a radio interface message, which indicates the requirement of the position information of the mobile station at the network node,
transmitting the radio interface message to the network element,
checking the control information at the network element, and

determining and forwarding the position information to the network node in response to the result of the checking step.

Furthermore the above object is achieved by a system for transmitting a position information of a mobile terminal of a mobile communication network to a network node using an intermediate network element,
wherein said mobile terminal comprises:
setting means for setting a control information in a radio interface message, which indicates the requirement of a position information of the mobile station at the network node, and
transmitting means for transmitting the radio interface message to the network element, and
wherein the network element comprises:
checking means for checking the control information; and
determining means for determining the position information in response to the checking result of the checking means.

Accordingly, since a control information is added to the radio interface message, this parameter can be used at the RNC 3 to determine whether a position information should be forwarded to the core network through the corresponding Iu interface.

Thereby, the protocol amendments and additionally required information at the RRC level can be kept short so as to minimize message overhead transmitted via the radio interface.

An additional advantage arises when the position of the MS 1 can be detected more accurately than the cell level at the RNC 3 and new services need such an accurate position information. Then, only a short control information has to be transmitted via the radio interface to the RMC 3 in order to

indicate that the position information must be added before forwarding the message to the CN.

A higher layer information may be incorporated into the radio interface message at the mobile terminal, wherein the position information is combined with the higher layer information at the network element in response to the checking result. Thereby, a complete higher layer message including an additionally required MS position information can be forwarded to the network node.

Preferably the control information is provided in a control field used for signaling the requirement of the position information. This control field may have a length of one bit. Accordingly, the required additional overhead of a radio interface message can be restricted to only one bit.

Alternatively, the length of this control field may be more than one bit, if e.g. several accuracy levels of the MS position are possible.

Furthermore, a position measurement information can be incorporated at the MS1 into the radio interface message before transmission, wherein the position information may be determined at the RNC 3 on the basis of the position measurement information.

The position measurement information may also be sent from the MS to the network element, i.e. UTRAN, if no higher layer message is included. This position measurement reporting can be started either by an explicit request from the network element or it can be part of a default measurement started without explicit request from the network element.

In case no position information is required, the higher layer information can be transmitted in a transparent mode to the network node. Thus, the determination of the MS position at the RNC 3 is restricted to those cases, where it is actually required. Thereby, processing capacity is saved and unnecessary delay can be prevented.

Preferably, the network element is a radio network controller of the mobile communication network such as a radio access network of the UMTS, and the network node is a mobile switching center or a serving GPRS support node.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, the present invention will be described in greater detail on the basis of a preferred embodiment with reference to the accompanying drawings, in which:

Fig. 1 shows a principle block diagram of a mobile communication network connected to two independent core networks,

Fig. 2 shows an RRC Direct Transfer message according to the preferred embodiment of the present invention,

Fig. 3 shows a block diagram of a radio access network according to the preferred embodiment of the present invention, and

Fig. 4 shows a flow diagram of a transmission control procedure according to the preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the following, the preferred embodiment of the method and system according to the present invention will be described on the basis of a mobile communication system such as the UMTS system shown in Fig. 1.

In case a connection is established between the MS 1 and one of the CN nodes MSC 5 or SGSN 6, an RRC connection is used to send a corresponding higher layer PDU via the UTRAN 4. Such a higher layer message could be an MM (Mobility Management) layer message or a CM (Connection Management) layer message and is carried over the radio interface piggypacked into a radio interface message, i.e. an RRC message such as RRC Direct Transfer. Since the MS 1 knows based on the MM layer or the RRC layer, whether the present higher layer message is to be carried to the CN with a position information or not, a position information control field may be provided in the RRC message.

Fig. 2 shows an RRC Direct Transfer message according to the preferred embodiment, which is transmitted by the MS 1 to the RNC 3. The position information control field may consist of one bit which notifies whether a position information is required at the CN, or not. Alternatively, the position information control field may consist of more than one bit, if e.g. several accuracy levels are provided for the position information. In case the MS 1 derives from the MM or RRC layer information that the CN supplying the requested service requires a position information, it sets the position information control bit in the RRC Direct Transfer message to "0". If no position information is required, the position information control bit remains "1". Of course, an opposite setting control of the position information control bit is possible as well.

In addition thereto, a position measurement report can be added to the RRC Direct Transfer message so as to be used by the RNC 3 to calculate the MS position. Alternatively, the position measurement report can be a separate procedure between the MS 1 and the UTRAN 4, independent from the transmitting of the RRC Direct Transfer message.

Other contents of the RRC Direct Transfer message are a message type information used to indicate the type of the RRC message, a CN identifier used as a routing information for routing the higher layer information from the MS 1 to the correct Iu interface connection, and the higher layer information, i.e. higher layer PDU, to be transmitted to the CN.

Thus, upon receiving the above described RRC Direct Transfer message, the RNC 3 can calculate the MS position and generate a corresponding Iu interface message as a complete layer 3 information.

In case the one bit position information control field is set to "1", the RNC 3 detects that no position information is needed at the CN and transmits the higher layer information in a transparent manner over the Iu interface. In this case, a Direct Transfer Application Part (DTAP) of the layer 3 protocol at the RNC 3 is used.

Fig. 3 shows a block diagram of a radio access network such as the UTRAN 4 according to the preferred embodiment of the present invention.

According to Fig. 3, the MS 1 comprises an input means 10 for inputting a higher layer message to be transmitted via the radio interface of the UTRAN 4 and the Iu interface to an

independent CN node such as the MSC 5. Such a higher layer message could be a setup request for a service provided by the MSC 5.

Furthermore, a setting means 11 is provided to which an information derived from the higher layer message is supplied from the input means 10 as to whether the connected CN node requires a position information, or not. In response to this information, the setting means 11 supplies an instruction to a message generating means 12 so as to correspondingly set the position information control field of the RRC message generated by the message generating means 12 on the basis of the higher layer message or PDU supplied from the input means 10.

Optionally, a measurement means 13 may be provided for supplying a position measurement report to a generating means 12, wherein the position measurement report is incorporated at a corresponding field in the RRC message, if the position information is required.

Finally a transmitter Tx 14 is connected to the message generating means 12 so as to transmit the generated RRC message via the radio interface.

The transmitted RRC message is received by the BS 2 of the UTRAN 4 and supplied to the RNC 3, as previously described in connection with Fig. 1.

In the following, the operation of the RNC 3 shown in Fig. 3 is described with reference to the flow diagram shown in Fig. 4, wherein an RRC Direct Transfer message including a higher layer PDU is transmitted to the RNC 3.

The RRC Direct Transfer message including the higher layer PDU for the CN node is received by a receiver Rx 31 of the RNC 3 (step S101). Thereafter, the position information control field of the RRC message is checked by a checking means 32 connected to the Rx 31 (S102). Then, the received RRC message is supplied to a combining means 34. If the checking performed in the checking means 32 reveals in step S103 that no position information is required, the higher layer message (higher layer PDU) is supplied to a transmitter Tx 35 and sent to the desired CN node via the Iu interface in a transparent manner using the DTAP protocol (S104).

Otherwise, if the checking means 32 determines that a position information is required at the CN node, a corresponding information is supplied by the checking means 32 to a determining means 33 which is arranged to determine the position information.

Subsequently, the determining means 33 calculates the position of the transmitting MS 1 using the position measurement report included in the RRC message (step S105). Alternatively, the position information may be calculated or determined based on a corresponding position information of the MS 1 provided in the RNC 3.

Thereafter, the determining means 33 supplies the determined position information to the combining means 34, where the position information is combined with or added to the higher layer message so as to generate a Iu interface message (step S106). Thus, the Iu interface message corresponds to a complete layer 3 information.

Finally, the generated Iu interface message is sent by the Tx 35 to the desired CN node (S107).

Accordingly, a position information can be transmitted via the UTRAN 4 of the UMTS without requiring major changes of the radio interface messages, i.e. the RRC messages. Essentially, only one bit has to be added as a new parameter to each RRC message carrying a higher layer PDU on the radio interface. Alternatively, the position information control field may consist of more than one bit, if e.g. several accuracy levels are provided for the position information.

It is to be pointed out, that the transmission method and system described in the preferred embodiment is not restricted to the UTRAN of a UMTS, but can be used in connection with any mobile communication network where a higher layer message is to be carried on a radio interface message which does not include any position information. The above description of the preferred embodiment and the accompanying drawings are only intended to illustrate the present invention. The preferred embodiment of the invention may vary within the scope of the attached claims.

In summary, a method and system for transmitting a position information from a mobile terminal of a mobile communication network via a network element to a network node is described, wherein a control information indicating the requirement of a position information of the mobile terminal at the network node is set in the radio interface message. This control information is checked at the network element as to whether a position information has to be forwarded or not. The position information is determined at the network element and may be combined with a higher layer information so as to generate a complete higher layer information to be forwarded to the network node. Thereby, the position information can be supplied to the network node without substantially increasing overhead and processing power required for the radio interface message.

Claims

1. A method for transmitting a position information of a mobile terminal **(1)** of a mobile communication network to a network node **(5, 6)** using an intermediate network element **(3)**, comprising the steps of:

a) setting a control information in a radio interface message, which indicates the requirement of said position information of said mobile terminal at said network node;

b) transmitting said radio interface message to said network element;

c) checking said control information at said network element; and

d) determining and forwarding said position information to said network node in response to the result of said checking step.

2. A method according to claim 1, further comprising the step of incorporating a higher layer information into said radio interface massage, and forwarding said position information together with said higher layer information to said network node.

3. A method according to claim 1 or 2, wherein said control information is provided in a control field used for signaling the requirement of said position information.

4. A method according to claim 3, wherein said control field has a length of one bit.

5. A method according to claim 3, wherein said control field has a length of more than one bit, each value of said control field referring to an accuracy level of said position information.

6. A method according to any one of claims 1 to 5, further comprising the steps of incorporating a position measurement information into said radio interface message before said transmission step, and determining said position information on the basis of said position measurement information.

7. A method according to any one of claims 2 to 6, wherein said higher layer information is transmitted in a transparent mode to said network node, when said checking step reveals that no position information is required.

8. A method according to any one of the preceding claims, wherein said network element is a radio network controller **(3)** of said mobile communication network, and wherein said setting step is performed in said mobile terminal.

9. A method according to any one of the preceding claims, wherein said mobile communication network is a radio access network of the UMTS, and wherein said network node is a mobile switching center **(5)** or a serving GPRS support node **(6)**.

10. A system for transmitting a position information of a mobile terminal **(1)** of a mobile communication network to a network node **(5, 6)** using an intermediate network element **(3)**,

a) wherein said mobile terminal **(1)** comprises:

setting means **(11)** for setting a control information in a radio interface message, which indicates the requirement of said position information of said mobile terminal **(1)** at said network node **(5, 6)**; and

transmitting means **(14)** for transmitting said radio interface message to said network element **(3)**; and

b) wherein said network element **(3)** comprises:
checking means **(32)** for checking said control information;
determining means **(33)** for determining said position information in response to the checking result of said checking means **(32)**.

11. A system according to claim 10, wherein said mobile terminal **(1)** comprises a message generating means **(12)** for incorporating a higher layer information into said radio interface message; and wherein said network element **(3)** comprises combining means **(34)** for combining said position information with said higher layer information in response to said checking result.

12. A system according to claim 11, wherein said message generating means **(12)** is arranged to incorporate a position measurement information into said radio interface message, and wherein said determining means **(33)** is arranged to determine said position information on the basis of said position measurement information.

13. A system according to any one of claims 10 or 12, wherein said network element is a radio network controller **(3)** of said mobile communication network **(4)**.

14. A system according to any one of claims 10 to 13, wherein said mobile communication network is a radio access network **(4)** of the UMTS, and wherein said network node is a mobile switching center **(5)** or a serving GPRS support node **(6)**.

15. A mobile terminal for transmitting a radio interface message via a network element **(3)** to a network node **(5, 6)**, comprising:

a) setting means **(11)** for setting a control information in said radio interface message, which indicates the requirement of a position information of said mobile terminal **(1)** at said network node **(5, 6)**; and

b) a transmitting means **(14)** for transmitting said radio interface message to said network element **(3)**.

16. A mobile terminal according to claim 15, further comprising message generating means **(12)** for incorporating a higher layer information into said radio interface message.

17. A mobile terminal according to claim 16, wherein said message generating means **(12)** is arranged to incorporate a position measurement information into said radio interface message.

18. A network element for forwarding a position information of a mobile terminal **(1)** to a network node **(5, 6)**, comprising:

a) checking means **(32)** for checking a control information provided in a radio interface message received from said mobile terminal **(1)**; and

b) determining means **(33)** for determining said position information in response to the checking result of said checking means **(32)**.

19. A network element according to claim 18, further comprising combining means **(34)** for combining said position information of said mobile terminal **(1)** with a higher layer information, to be forwarded to said network node **(5, 6)**, in response to said checking result.

20. A network element according to claim 18 or 19, wherein said determining means **(33)** determines said position

information on the basis of a position measurement information included in said received radio interface message.

21. A network element according to any one of claims 18 to 20, wherein said network element is a radio network controller **(3)** of a radio access network of the UMTS, and wherein said network node is a mobile switching center **(5)** or a serving GPRS support node **(6)**.

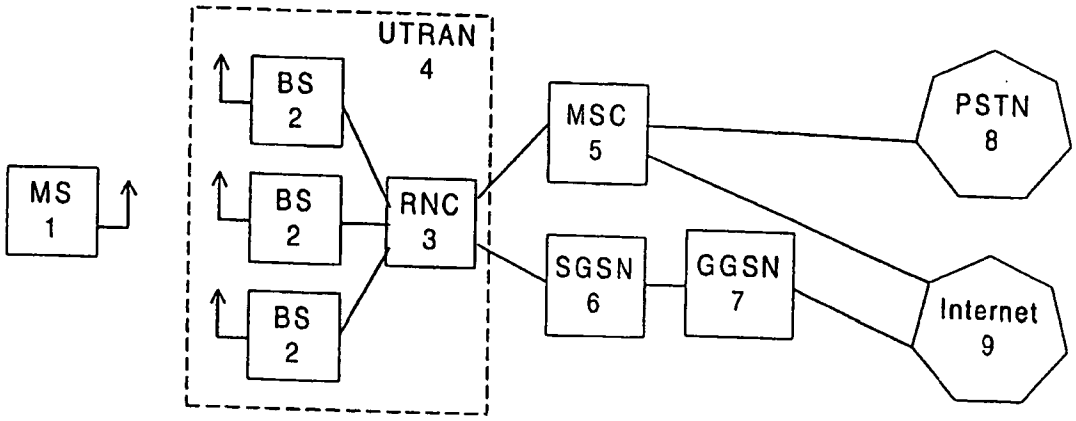

UTRAN
4
BS
2
BS
2
BS
2
MS
1
RNC
3
MSC
5
SGSN
6
GGSN
7
PSTN
8
Internet
9

Fig. 1

RRC Direct Transfer message

Message type	CN id	Pos. info control field	Position measurement report	PDU

Fig. 2

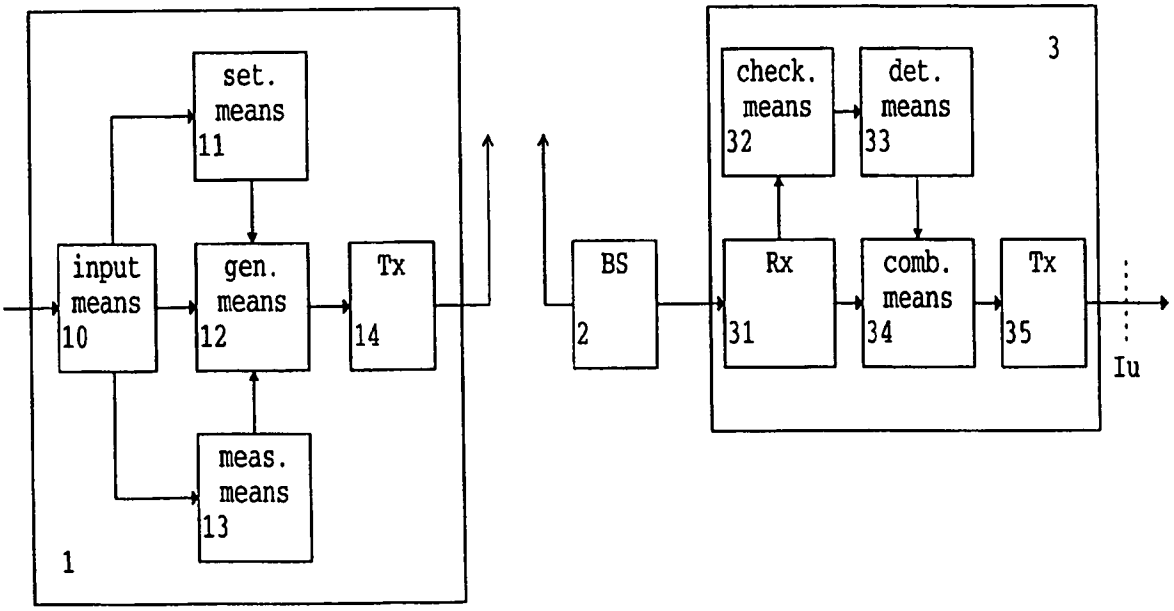


Fig. 3

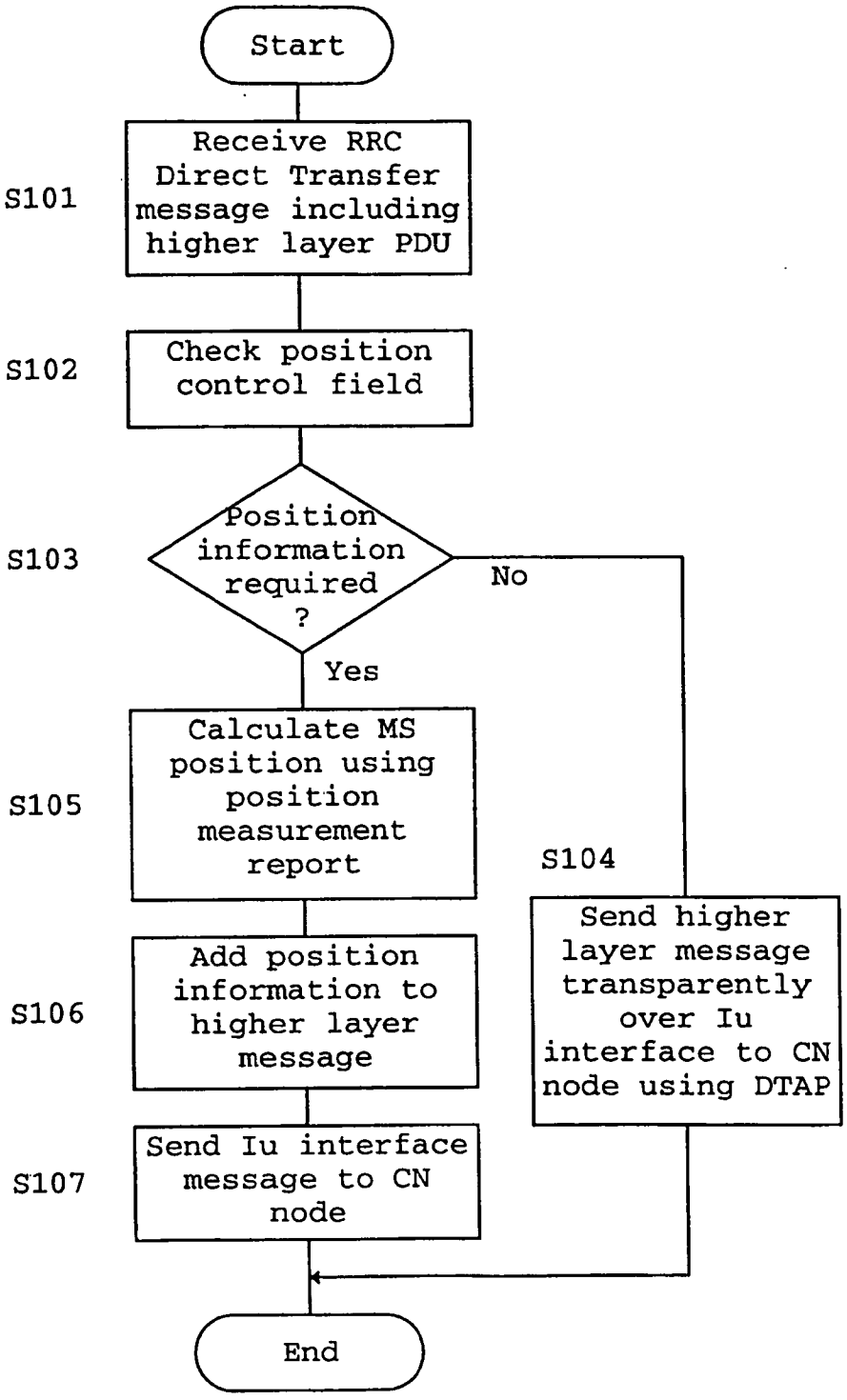

Start
Receive RRC Direct Transfer message including higher layer PDU
S101
Check position control field
S102
Position information required ?
S103
No
Yes
Calculate MS position using position measurement report
S105
S104
Send higher layer message transparently over Iu interface to CN node using DTAP
Add position information to higher layer message
S106
Send Iu interface message to CN node
S107
End

Fig. 4

INTERNATIONAL SEARCH REPORT

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PCT/EP 98/08065

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

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 7 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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	EP 0 546 758 A (MOTOROLA INC) 16 June 1993 (1993-06-16) column 4, line 16 - line 31 column 7, line 33 - line 44 column 9, line 6 - line 24; figure 7	1,10,15, 18

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Information on patent family members

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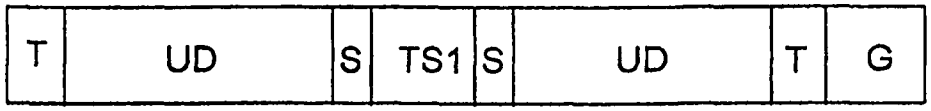
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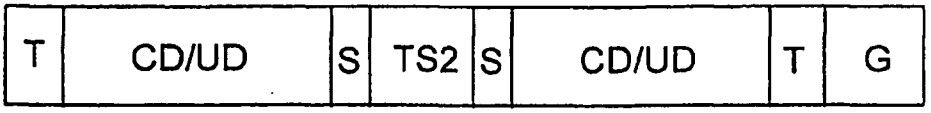
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(57) Abstract

A signaling method in a wireless digital telecommunication system between a base station and a terminal, where the signals between the base station and the terminal are generated from bursts comprising symbols, the bursts comprising a known training sequence. The symbols are used for generating a second training sequence of the same length as the known training sequence and a burst comprising said training sequence to be used for transmitting signalling messages. The number of training sequences used can be restricted to two, whereby conventional user data is sent in the burst comprising the known training sequence and information deviating from the conventional user data is sent by the burst comprising the second training sequence, and the stealing symbols in the burst can be used for specifying a signalling message to be transmitted.

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SIGNALLING METHOD AND TELECOMMUNICATION SYSTEM

The invention relates to a signalling method in a wireless digital telecommunication system between a base station and a terminal, where the signals between the base station and the terminal are generated from bursts comprising symbols, the bursts comprising a known training sequence.

The invention further relates to a wireless digital telecommunication system for signalling between a base station and a terminal, where the signals to be transmitted over a radio connection between the base station and the terminal comprise bursts generated from symbols, the bursts comprising a known training sequence, and the system comprising at least one transmitter and at least one receiver, whereof the transmitter comprises means for generating said training sequence and the receiver comprises means for identifying said training sequence.

In digital radio systems, call-related signalling between a base station and a terminal occurs simultaneously with a call to be transferred on a traffic channel. The GSM system, for example, employs two signalling channels for conducting call-related signalling, a SACCH (Slow Associated Control Channel) and a FACCH (Fast Associated Control Channel). The SACCH is a separate low-rate signalling channel associated with each traffic channel. Due to its low rate the channel can be used for non-urgent signalling only. The FACCH is fast signalling within the traffic channel, and can be used for time-critical signalling. However, a part of the traffic channel capacity is then lost.

In digital radio systems, such as the GSM system, data transmission occurs in bursts, and a specific burst structure is determined for each purpose, like data and signalling transmission, synchronization or equalization. A normal burst used for data and signalling transmission comprises in the middle a training sequence including a set of predetermined symbols that the receiver identifies. When comparing the received training sequence with a known training sequence the receiver may create information on the distortion caused by an un-ideal radio path to the received signal. On the basis of this information the receiver can demodulate the received signal more efficiently. The applicant's previous patent application PCT/FI97/00465 describes a signalling method, in which a training sequence is used for signalling, that speeds up the signalling and leaves the entire traffic channel to be used by the payload.

The problem with the above system is the number of different training sequences required for transmitting versatile signals. One training sequence can describe one signalling message only, and if, for example, power control signalling including eight steps is to be performed, eight different training sequences are required. If the aim is to perform several signalling events with the above method, the number of training sequences easily increases significantly. This increases the receiver load and complicates the implementation of the receiver, since the received training sequence must be separately compared with each known training sequence. Particularly distinguishing training sequences from one another becomes more difficult when the reception conditions are poor. Furthermore, when higher data transmission rates are aimed at, the use of a training sequence no longer necessarily guarantees fast enough signalling owing to the above and since the duration of the training sequence is relatively long bearing in mind that the training sequence is capable of transmitting one message only. Due to these drawbacks said method has not been widely employed and the GSM system, for example, still uses signalling channels.

A significant drawback with prior art signalling is that it matches poorly with packet-switched data transmission. In present packet-switched wireless telecommunication systems, such as the GPRS system (General Packet Radio Service) designed on the basis of the GSM system, data transmission from a terminal to a base station (uplink) and vice versa (downlink) takes place irrespective of one another. In said systems a channel is formed between the terminal and the base station only, when either party has data packets to send. In other words, there is no need to maintain a continuous return channel for transmitting signalling or acknowledgement messages in said systems. To utilize such asymmetrical data transmission optimally would require transmission of signalling and acknowledgement messages when the channel capacity is used for other purposes as well.

It is thus an object of the invention to provide a method and an apparatus implementing the method so as to solve the above problems. The objects of the invention are achieved with a method, characterized by

generating from symbols a second training sequence of the same length as the known training sequence,

generating a burst comprising said second training sequence and by

using the burst comprising said second training sequence for transmitting various signalling messages.

The wireless digital telecommunication system of the invention is characterized in that

the transmitter comprises means for generating a second training sequence of the same length as the known training sequence and means for generating a burst comprising said second training sequence and for coding a signalling message into said burst and in that

the receiver comprises means for receiving the burst comprising said second training sequence, means for identifying said second training sequence and means for decoding the coded signalling message in said burst.

According to a preferred embodiment of the invention the number of training sequences to be used is restricted to two. According to another preferred embodiment of the invention the stealing symbols in the burst comprising said second training sequence are used for specifying the signalling message to be transmitted.

The invention is based on the idea that various training sequences are used in the burst structure to indicate the contents of the burst. The recipient then interprets the received burst on the basis of the training sequence. A particular training sequence can preferably be employed in the burst structure to indicate that signalling data in particular is transmitted using the burst. The type of the signalling data to be transmitted can also be indicated in more detail by means of the stealing symbols in the burst. Stealing symbols have typically been used in a normal burst to indicate whether the data bits in a burst are allocated to be used on a traffic channel or stolen to be used on the FACCH. However, in the method of the invention the stealing symbols in the normal burst to be utilized for transmitting user data can also be allocated to transmit user data.

The method and system of the invention provide an advantage that enables transmission of signalling and acknowledgement messages particularly when the channel between the terminal and the base station is also employed for transferring user data. This is particularly advantageous in packet-switched wireless data transmission, as in this case the channel between the terminal and the base station does not have to be separately opened for signalling. Another advantage of the invention is that the data transmission capacity of a normal burst to be used for transmitting user data is not used for

the signalling of the invention. A further advantage of the invention is that it alleviates the implementation of the detection in the receiver, as the received training sequence is compared with the two known training sequences only, thus reducing the receiver load. Still another advantage of the invention is that the data transmission capacity of a normal burst increases, since the stealing symbols in the normal burst can also be utilized for transmitting user data.

In the following the invention will be described in greater detail in connection with the preferred embodiments, with reference to the accompanying drawings, in which

Figure 1 schematically shows a normal burst according to the GSM system;

Figure 2 schematically shows a known normal burst and a burst according to a preferred embodiment of the invention;

Figure 3a shows a burst structure according to a preferred embodiment of the invention;

Figure 3b shows a burst structure according to a second preferred embodiment of the invention;

Figure 3c shows a burst structure according to a third preferred embodiment of the invention;

Figure 3d shows a burst structure according to a fourth preferred embodiment of the invention;

Figure 4 is a block diagram showing a transmitter according to a preferred embodiment of the invention;

Figure 5 is a block diagram showing a receiver according to a preferred embodiment of the invention, and

Figure 6 is a flow chart showing parameter adjustment according to a preferred embodiment of the invention.

In the following the invention will be described by way of example on the basis of a TDMA-based (Time Division Multiple Access) GSM system and the further improvement thereof. It is obvious for those skilled in the art that the invention can be used in any corresponding telecommunication system.

Figure 1 shows the structure of a normal burst according to the GSM system, the length of the normal burst being 156,25 and the duration 0,577 ms. The normal burst comprises one time slot of a TDMA frame comprising eight time slots. The normal burst comprises in the middle a training

sequence (TS) that includes 26 symbols and that is used for correcting the received signal as described above. Stealing symbols (S), which are one symbol in length and located on both sides of the training sequence TS, are used for indicating the possible use of even and/or odd data symbols (DS) for FACCH signalling. The data symbols DS intended to transfer user and signalling data are divided into two sequences of 57 symbols which are located before the first stealing symbol and after the second stealing symbol. Tail symbol sequences (T), which are three symbols in length, are located at the beginning and in the end of a burst, and within the duration of the tail symbols the transmitter is correspondingly switched on and off between the bursts. After the burst, there is a guard period (G) of 8,25 symbols that prevents adjacent time slots from overlapping in base station reception.

According to a preferred embodiment of the invention a new burst type is introduced that deviates from the burst structure described above only in that the training sequence of the burst is different. Here the known training sequence in a normal burst is referred to as TS1 and the training sequence of the invention is referred to as TS2 in accordance with Figure 2. According to a preferred embodiment of the invention the burst according to the invention is employed in particular for transmitting control data (CD), whereby the known normal burst can, if necessary, be allocated to transfer user data (UD) only. User data can also be transmitted using the burst of the invention in situations where the transfer of user data also requires exceptional signalling. Then, in the reception the type of information in the burst can be deduced on the basis of the training sequence. Particularly when a burst comprising the training sequence TS2 is received, the receiver knows that the burst may comprise specific signalling data.

According to another preferred embodiment of the invention the number of various training sequences is restricted to said two training sequences TS1 and TS2. This alleviates the implementation of the detection in the receiver, as the received training sequence is compared with the two known training sequences only, thus reducing the receiver load. Particularly distinguishing training sequences from one another becomes easier in poor reception conditions compared with prior art, since the symbol constellations of the two training sequences can easily be determined to differ greatly from one another, and a large number of symbol errors in the received training sequences cannot either prevent the detection of the training sequence.

According to a preferred embodiment of the invention the stealing symbols in the burst of the invention are used to specify the information in the burst. Then, the stealing symbols of the known normal burst can also, if needed, be utilized when transferring user data. The use of the stealing symbols of the invention is explained in the following in greater detail with reference to the examples in Figures 3a-3d. In order to simplify the description, it is assumed in the following examples that the stealing symbols of the burst structure both comprise one bit. The invention can naturally also be implemented in systems where several bits are modulated into one symbol, in which case the amount of information to be specified using the stealing symbols is multiplied.

Figure 3a shows the burst structure of the invention, where the data symbols DS are allocated to the user data UD, the training sequence is the training sequence TS2 of the invention and both the stealing symbols are 0-bits. On the basis of the indicated training sequence TS2 the receiver knows that the burst comprises some signalling data and checks the specified information indicated by the stealing symbols. This burst may indicate, for example, the last time slot from the user data flow to be transferred on a particular channel. The transmission of a specific end sign is thus avoided in an additional burst.

Figure 3b describes the burst structure of the invention intended for fast signalling in particular. In this burst the data symbols DS are entirely or partly allocated to the signalling data, the training sequence is the training sequence TS2 of the invention and the first of the stealing symbols is preferably a 0-bit and the second a 1-bit. The spreading figure shown in Figure 3b describes in greater detail the signalling and user data fields CD/UD in the data symbols DS. There is a field in the beginning of the data symbols determining the field length of the signalling data (ctrl field length). A signalling discriminator (ctrl discriminator) defines the signalling message in question which is added after the signalling discriminator. Several signalling messages (ctrl field) can preferably also be transferred in the same burst. When the receiver knows, on the basis of the signalling discriminator, which signalling fields are concerned, it can distinguish the transmitted messages from the burst. If all messages to be transmitted and the lengths thereof are predetermined, i.e. standardized messages are concerned, then the field determining the total length of the signalling data is not needed, as the receiver is aware of the

length of the messages. However, it is preferable to keep the field determining the total length of the signalling data as an optional alternative and thereby alleviate the introduction of new signalling messages. If all data symbols are not needed for the signalling message, the unused symbols can be employed for transmitting user data. The burst according to Figure 3b can preferably be used to replace the FACCH signalling according to the GSM system.

Figure 3c describes the burst structure of the invention intended for slow signalling in particular, that is for replacing the SACCH signalling according to the GSM system, for example. A field of a specific length is allocated in the beginning of the data symbol field to the signalling data CD, and the rest of the data symbols can be employed for transmitting user data UD. The training sequence is the training sequence TS2 of the invention and the first of the stealing symbols is preferably a 1-bit and the second a 0-bit. This burst structure provides the advantage that if a known short signalling message is to be transmitted in one burst or if a longer, non-urgent signalling message is interleaved into several bursts, it is not necessary to attach the field determining the total length of the signalling data to the signalling data field.

Figure 3d describes the burst structure of the invention that can be used in applications that enable restricted retransmission of a burst. Such cases include real time speech or video image transmission, in which a sensible use of the application enables retransmission of a burst that is poorly received in the following TDMA frame only. In the burst the data symbols DS are allocated to the user data UD, the training sequence is the training sequence TS2 of the invention and both stealing symbols are 1-bits. Said burst can be employed in situations where the received normal burst is of poor quality and it is requested to be resent in the following time slot allocated to the channel. If the transmitter is able to receive the retransmission request in time, the data symbols of the previous burst are sent in the burst according to Figure 3d. Then, on the basis of the training sequence TS2 and the 1-bit stealing symbols the receiver can deduce that retransmission is concerned. If stealing symbols have been used for transmitting user data in the original normal burst, these have to be punctured before connecting the original burst to the retransmitted burst and attached to the original position in the burst structure when connecting the bursts. If the transmitter cannot receive a retransmission request, then the bursts are continued to be normally transmitted.

The burst of the invention can therefore, if needed, also be used for

transmitting user data. However, the training sequence TS2 in the burst indicates that the information in the burst is somehow exceptional as regards the normal burst.

The following describes the essential parts of the transmitter in the telecommunication system of the invention by means of the block diagram in Figure 4. The transmitter comprises means 100 that include the information to be sent, for example, the information about the last burst in the data flow according to Figure 3a. This information is coded in accordance with the invention into a combination of a determined training sequence and a stealing symbol combination in coding means 101, from where the coded information is applied to means 102 to be connected with the signal to be transmitted and the stealing symbols thereof. Next, the signal is modulated by processing means 103 and applied to conversion means 104 where the signal is converted from digital to analogue mode. The analogue signal is transferred to radio frequency parts 105 where the signal is converted to the transmission frequency. Then the signal is sent by an antenna 106 through the radio path to the receiver.

The essential parts of the receiver in the telecommunication system of the invention are described in the block diagram according to Figure 5. The receiver comprises an antenna 200 for receiving the signal sent through the radio path and wherefrom the signal is applied to radio frequency parts 201 in which the signal is converted to an intermediate frequency. The signal is then transferred to conversion means 202 where the signal is reconverted from analogue to digital mode. The digital signal propagates to processing means 203 where the signal may be filtered and demodulated, the channel impulse response and the energy thereof can be estimated, and the signal distorted on the channel can be restored into its original form. The restored signal is applied to separation means 204 where the identified training sequence and the stealing symbols are separated from the signal. Decoding means 205 decode the received training sequence and the stealing symbols in accordance with the method presented in the invention, and means 206 start the operations according to the preferred embodiments that correspond with the message in the transmitted signalling data.

The above operations in the transmitter and the receiver can be implemented, for example, using general or signal processors or separate logic. To implement single operations is known for those skilled in the art and the

description thereof is not needed in this context.

In the following the application of the invention is explained in greater detail by means of an example describing on-demand adjustment of a parameter to be performed in packet-switched wireless data transmission. Such an adjustment is based on the idea that only those parameters are adjusted that need to be adjusted at a particular time, in which case a separate signalling channel, for example, does not have to be maintained for this purpose.

The uplink and downlik data transmission can be totally independent of one another in packet-switched wireless data transmission. In short-delay real time data transmission, the uplink and downlink traffic channels are maintained only for the time the data packets are sent in either direction. Sending signalling messages and acknowledgement messages becomes more difficult in the opposite direction, as a continuously maintained channel for this purpose does not exist. It is therefore preferable if any maintained channel can be used for transmitting acknowledgement messages. The terminal may simultaneously comprise several active data transmission connections which are determined and restricted in different ways. A terminal may for instance comprise, in addition to a normal telephone connection, a simultaneous packet-switched connection with an outside telephone number service. Then, the signalling between the terminal and the network or the acknowledgement thereof can be selected to be performed through the best available data transmission connection. If, for example, the counterpart speaks on the telephone connection of the terminal, when the uplink speech connection of the terminal is not in use, the signalling messages can be multiplexed to said packet-switched data connection. If, in turn, the downlink signalling takes place through an active call connection and the call is disconnected midst signalling, then the signalling can be transferred to a possible data connection. If no data connections exist, the downlink signalling can preferably be arranged as a broadcast message to all terminals within the cell area. Naturally only the terminals for whom the message is indicated tend to operate as the message requires. However, in this way the frequency band is used more efficiently as compared with opening a separate channel for signalling.

Figure 6 is a flow chart describing the adjustment of an on-demand adaptive parameter where the signalling of the invention can be utilized. The adjustable parameter concerned can, for example, be the transmission power

of a terminal. The adjustment process is started by checking if the time t_{last} that has elapsed from the previous adjustment is sufficient for providing a new adjustment which is determined on the basis of the adjustment frequency *afr*. Next a parameter value *par* is measured and the value is compared with the optimal value par_t of the parameter. If the difference between the parameter value *par* and the optimal value par_t of the parameter exceeds the error threshold e_{th}, then the parameter is adjusted and the value of the adjustment frequency *afr* is increased by a predetermined change afr_{step}. If the error threshold is not exceeded, the parameter does not need to be adjusted either, but the value of the adjustment frequency *afr* is reduced by a predetermined change afr_{step}. In both cases it is confirmed that the value of the adjustment frequency *afr* remain between the predetermined maximum value afr_{max} and minimum value afr_{min}.

Even though the invention has above been described by way of example in connection with power control signalling, the invention is not restricted thereto but the signalling of the invention can be used for any similar purposes, particularly in packet-switched data transmission. One example is the change of the used coding method in connection with link adaptation. However, it should be noted that digital wireless telecommunication systems, particularly TDMA systems, also comprise other types of bursts than the normal burst described in this context and the embodiment of the invention thereof. The burst structure of the invention cannot necessarily be used for sending the signalling data transmitted by these bursts.

Furthermore, even though the invention has above been described by way of example according to the preferred embodiment of the invention in which two training sequences are used, the number of training sequences is not restricted to two, but the invention can also be implemented using several training sequences. Then, the implementation of the receiver becomes more complicated, but the number of signalling messages to be indicated increases when the possible combinations of training sequences and stealing symbols increase.

It is obvious for those skilled in the art that as technology progresses the basic idea of the invention can be implemented in a number of ways. The invention and the embodiments thereof are thus not restricted to the above examples but may vary within the scope of the claims.

CLAIMS

1. A signalling method in a wireless digital telecommunication system between a base station and a terminal, where the signals between the base station and the terminal are generated from bursts comprising symbols, the bursts comprising a known training sequence, **characterized** by

generating from symbols a second training sequence of the same length as the known training sequence,

generating a burst comprising said second training sequence and by

using the burst comprising said second training sequence for transmitting at least one signalling message.

2. A method as claimed in claim 1, **characterized** by indicating the existence of said signalling message, in response to the received burst comprising said second training sequence.

3. A method as claimed in claim 2, **characterized** by restricting the number of the training sequences to be used to two.

4. A method as claimed in claim 3, **characterized** by

sending user data in the burst comprising said known training sequence and

sending signalling data and/or user data in the burst comprising said second training sequence.

5. A method as claimed in any one of the preceding claims, **characterized** by using the stealing symbols in the burst comprising said second training sequence for specifying the signalling message to be transmitted.

6. A method as claimed in any one of the preceding claims, **characterized** by using the burst comprising said second training sequence for transmitting FACCH signalling according to the GSM system.

7. A method as claimed in any one of the preceding claims, **characterized** by using the burst comprising said second training sequence for transmitting SACCH signalling according to the GSM system.

8. A method as claimed in any one of claims 1 to 5, **characterized** by using the method in a packet-switched wireless telecommunication system.

9. A method as claimed in any one of the preceding claims, **characterized** by using the method for adjusting the transmission

power of the mobile station and the base station.

10. A wireless digital telecommunication system for signalling between a base station and a terminal, where the signals to be transmitted over a radio connection between the base station and the terminal comprise bursts generated from symbols, the bursts comprising a known training sequence, the system comprising at least one transmitter and at least one receiver, whereof the transmitter comprises means for generating said training sequence and the receiver comprises means for identifying said training sequence, **characterized** in that

the transmitter comprises means for generating a second training sequence of the same length as the known training sequence and means for generating a burst comprising said second training sequence and for coding a signalling message into said burst and in that

the receiver comprises means for receiving the burst comprising said second training sequence, means for identifying said second training sequence and means for decoding the coded signalling message in said burst.

11. A telecommunication system as claimed in claim 10, **characterized** in that the receiver is arranged to indicate the existence of said signalling message, in response to the received burst comprising said second training sequence.

12. A telecommunication system as claimed in claim 11, **characterized** in that the number of the training sequences to be used in the system is restricted to two.

13. A telecommunication system as claimed in claim 12, **characterized** in that

said burst comprising the known training sequence is arranged to transmit user data and

said burst comprising the second training sequence is arranged to transmit signalling data and/or user data.

14. A telecommunication system as claimed in any one of claims 10 to 13, **characterized** in that at least one stealing symbol in the burst comprising said second training sequence is arranged to specify the contents in the signalling message to be transmitted.

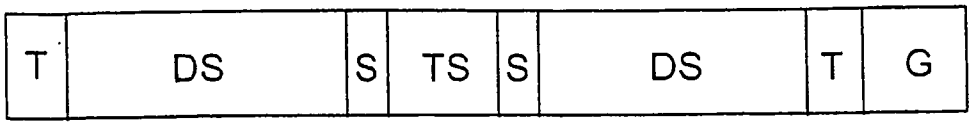


FIG. 1

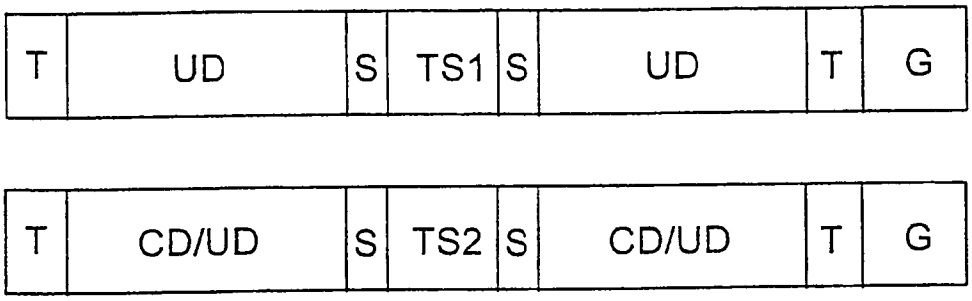


FIG. 2

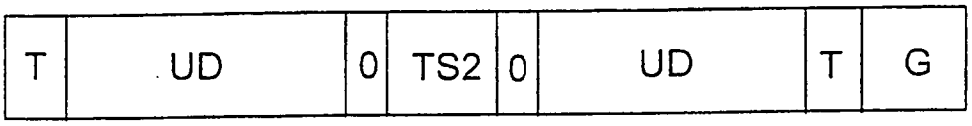


FIG. 3a

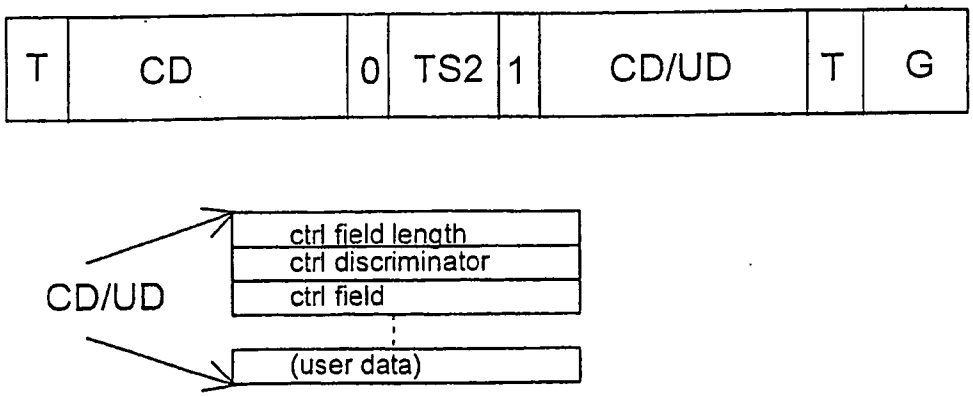


FIG. 3b

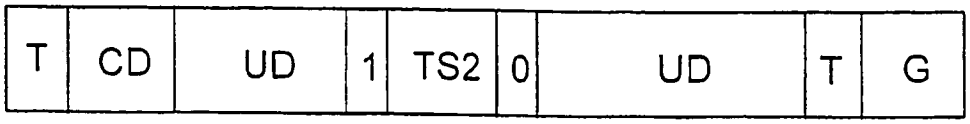


FIG. 3c

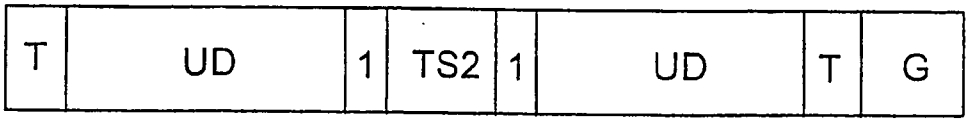


FIG. 3d

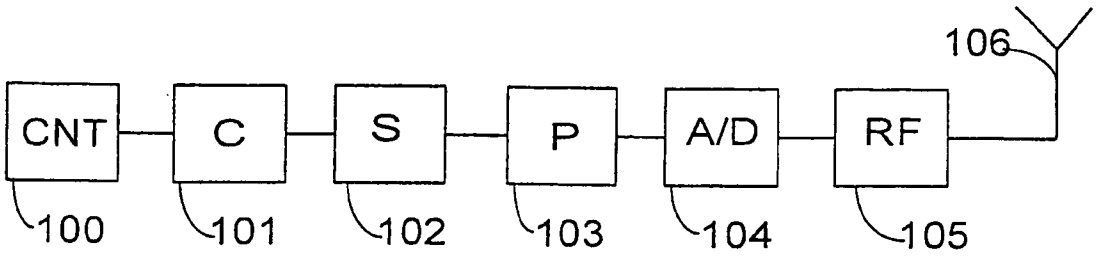


FIG. 4

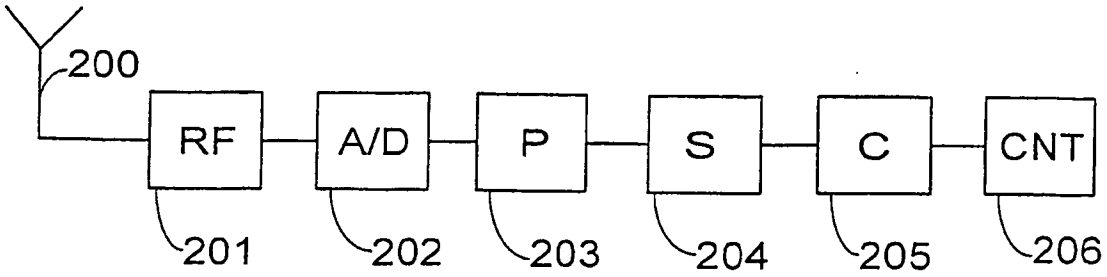


FIG. 5

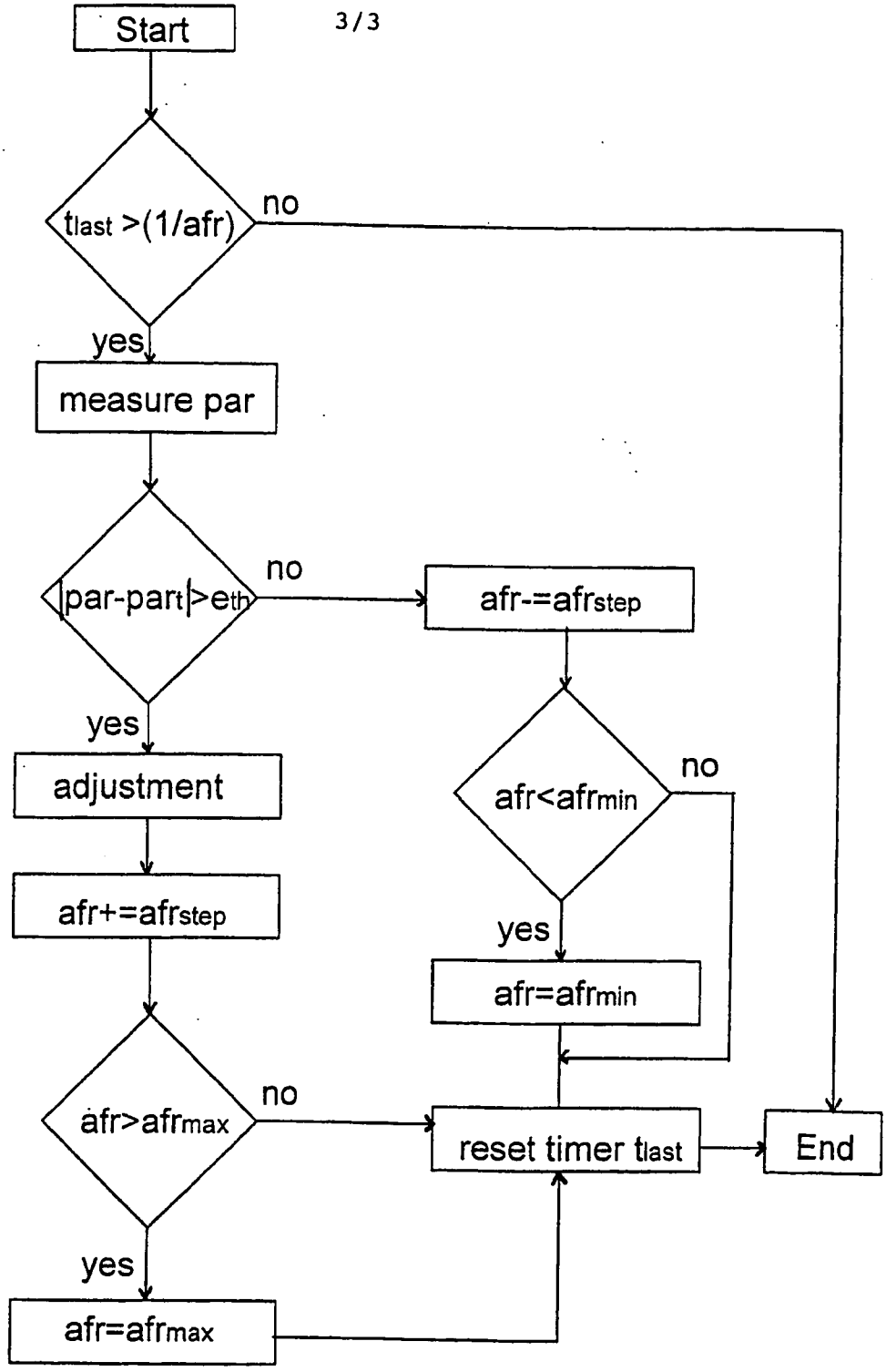

Start
tlast >(1/afr)
no
yes
measure par
|par-part|>eth
no
afr-=afrstep
yes
adjustment
afr<afrmin
no
afr+=afrstep
yes
afr=afrmin
afr>afrmax
no
reset timer tlast
End
yes
afr=afrmax

FIG. 6

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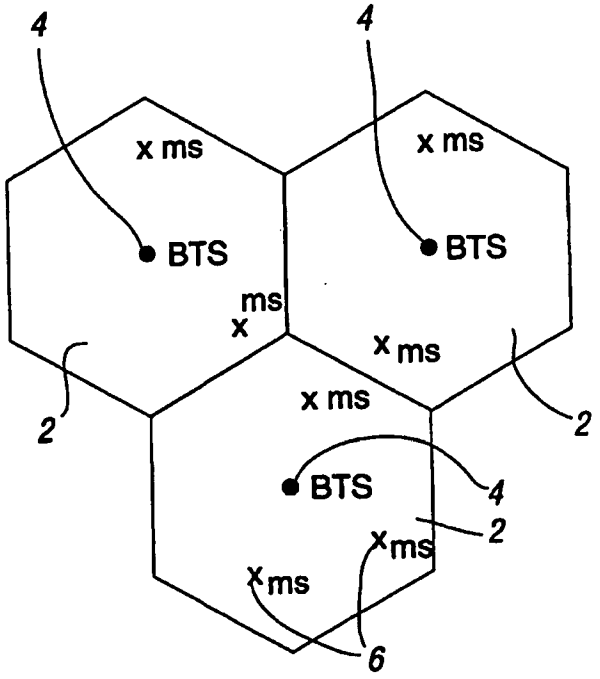
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(54) Title: DISCONTINUOUS TRANSMISSION CDMA SYSTEM

(57) Abstract

A method of transmitting from a first node to a second node, said method comprising the steps of transmitting in a first mode at least one data frame from said first node to said second node; and determining if there is no data to be transmitted and if there is no data to be transmitted transmitting at least one empty frame in the first mode; and switching to a second mode in which no transmission is made in the absence of data to be transmitted at least some of the time.



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DISCONTINUOUS TRANSMISSION CDMA SYSTEM

Field of the invention

The present invention relates to a method of transmitting and in particular but not exclusively to a method of transmitting in a wireless telecommunications network.

Background of the invention

The use of code division multiple access (CDMA) is being proposed for the next generation of cellular telecommunication networks. Additionally, code division multiple access is also being used in the IS-95 Standard in the USA. CDMA is a direct sequence spread spectrum technique. In a wireless cellular network using CDMA, the mobile terminals in one cell associated with a first base station will use the same frequency as mobile stations in an adjacent cell associated with a second base station. The different mobile stations can be distinguished by the respective base stations as each mobile station will be using a different spreading code.

In US-A-5101501 a CDMA system is described which uses "soft" handoff. With soft handoff, a mobile station is capable of communicating with more than one base station at the same time. This will typically occur when the mobile station is close to the boundary defined between two cells. The signals sent by the mobile stations will be received and processed by both of the base stations. Likewise, the mobile station will receive the same signal from the two base stations. The signals from the two base stations may be combined. The combined signal may provide better quality than the any of the individual signals received by the mobile station.

Thus, one mobile station can listen to two or more base stations simultaneously. It is therefore important that the information received by the mobile stations from the different base station

be identical. If different information is received from the different base stations, the mobile station will have no way of determining which is the correct information and which information can be ignored. Additionally it will not be possible to combine the signals from the different base stations to provide a meaningful combined signal.

Generally, different information will be received by the mobile station because an error in transmission has occurred and one of the expected transmissions from one or more of the base stations is not transmitted by the base station. The base station may not receive any information to be transmitted to the mobile station for two reasons. Firstly there has been an error in the information received by the base station. Secondly, there is in fact no information to be received. The lack of information may be due to, for example a pause in conversation or because the transmission is a discontinuous transmission. It is therefore necessary to determine whether the lack of received information is intentional or whether it is due to an error.

It has been suggested by the inventor that empty frames of data can be sent to the base station in two different ways. These two ways do not constitute prior art. Firstly, the transmission is suspended. In other words, the base station will be sent nothing. This has the advantage that the processing resources at the base station are saved as well as in other network elements. The load at the interface between the base station and the network controller, which is sending the information to the base station, is reduced. However this method has the disadvantage that it is not possible to distinguish between a transmission error and the fact that there is no data. This leads to two problems.

Firstly, failures in the interface between the base station and the network controller are not detected by the base station in the case of information being sent from the network controller to the base station or by the network controller in the case of information being sent from the base station to the network

controller.

Secondly, if a data frame is not received, due to an error, by a base station, that data frame cannot be transmitted by the base station to the mobile station. If the mobile station is in soft handoff, that is communicating with more than one base station at a time, the mobile station will receive different data streams from the base stations due to the error. This may lead to errors in the mobile station when it attempts to combine the different data streams.

The second method for dealing with empty frames of data is for the base station to be sent empty frames of data. This makes it possible to distinguish between errors and the fact that there is no information. However, this method does have the disadvantage that additional processing capacity is required at the base station and other network elements. Additionally, the load at the interface between the base station and the network controller is increased.

Similar problems can also occur in the uplink directions.

Summary of the invention

It is an aim of embodiments of the present invention to provide a method of dealing with the absence of information or data which addresses the disadvantages of the known methods.

According to one aspect of the present invention, there is provided a method of transmitting from a first node to a second node, said method comprising the steps of transmitting in a first mode at least one data frame from said first node to said second node; and determining if there is no data to be transmitted and if there is no data to be transmitted transmitting at least one empty frame in the first mode; and switching to a second mode in which no transmission is made in the absence of data to be transmitted at least some of the time.

The first and second nodes may be any suitable elements in a telecommunications network.

According to a second aspect of the present invention there is provided a method of receiving transmissions from a first node at a second node, said transmission have a first mode in which if there is no data to be transmitted, empty frames are transmitted and a second mode in which if there is no data to be transmitted nothing is transmitted, said method comprising the steps of: receiving transmissions from said first node, wherein if the transmissions have a first mode and a frame is not received and error is determined to have occurred.

According to a third aspect of the present invention there is provided a first node for transmitting data to a second node, wherein said first node comprises transmitting means for transmitting data to said second node, said transmitting means have a first mode of operation in which data is transmitted in data frames and if there is no data to be transmitted empty frames are transmitted and a second mode of operation in which if there is no data no frames are transmitted.

According to a fourth aspect of the present invention, there is provided a second node for receiving transmissions from a first node at a second node, said transmissions have a first mode in which if there is no data to be transmitted, empty frames are transmitted and a second mode in which if there is no data to be transmitted nothing is transmitted, said second node comprising means for receiving transmissions from said first node, and determining means for determining that if the transmissions have a first mode and a frame is not received, an error has occurred

Brief description of the drawings

For a better understanding of the present invention and as to how the same may be carried into effect, reference will now be made

by way of example to the accompanying drawings in which:
Figure 1 shows a schematic diagram of part of a cellular telecommunications network incorporating base transceiver stations and mobile stations;
Figure 2 shows part of the network of Figure 1 in more detail; and
Figure 3 illustrates the normal and silent modes used by the base stations of Figure 1.

Detailed description of embodiments of the invention

Reference will first be made to Figure 1 in which three cells 2 of a cellular telecommunications network are shown. Each cell 2 is served by a respective base transceiver station (BTS) 4. Each base transceiver station 4 is arranged to transmit signals to and receive signals from the mobile stations 6 located in the cell associated with the given base transceiver station 4. Likewise, each mobile station 6 is able to transmit signals to and receive signals from the respective base transceiver station 4.

The cellular telecommunications network shown in Figure 1 uses a code division multiple access technique. Accordingly, at least some of the mobile stations will be in communication with more than one base station at the same time. This, however, will be described in more detail hereinafter.

Reference is now made to Figure 2. As can be seen from this figure, the base stations are connected to a SRNC (serving radio network controller) 20. Data blocks are transmitted between the SRNC 20 and the base stations 28 and 30 using a frame protocol FP. A data frame contains data which is to be transmitted in one interleaving period and a transport format indicator TFI. The interleaving period is the period over which data is interleaved. The transport format indicator TFI provides information as to the format of the data frame such as the size of the data block, the interleaving period and the like.

Each UE (user equipment for example mobile stations or the like) has an independent transport connection which means that each frame contains the data and current transport format indicator TFI of one bearer only. Typically a call will have more than one bearer, for example a signalling bearer and a data or voice bearer. For downlink communications (from the SRNC 20 to the base station direction), all the data blocks of users having the same user equipment are multiplexed onto a single radio link. The manner in which the multiplexing is done will depend on the transport format indicator TFI of each frame which indicates the amount of data in each frame for the bearers. A transport format combination information TFCI field of the radio frame provided in a dedicated physical control channel DPCCH will indicate the manner in which the multiplexing is carried out. The transport format combination information TFCI field will indicate the transport format indicator TFI for each of the bearers whose data is multiplexed in the radio frame or frames in the dedicated physical data channel DPDCH. In the case of soft handoff where a mobile station is in communication with more than one mobile station at a time, the dedicated physical data channels DPDCH from each of the bases stations communicating with the mobile station in question will be the same as will the rate information RI fields in all the radio links.

The format described hereinbefore is part of the currently proposed UMTS (universal mobile telephone service) standard. It should be appreciated that any other standard can alternatively be used.

In the following, it is assumed for simplicity that there is only one bearer per transport channel and the SRNC does not carry out any multiplexing. The transport format information can have a particular value which indicates that the frame does not contain any data. For simplicity it is assumed that the particular value is zero although the particular value can be any other value.

The SRNC 20 shown in Figure 2 has first and second medium access

controllers MAC 24 which receive the data from respective bearers. For simplicity, the medium access controllers 24 are each shown as receiving information from one bearer only. The medium access controllers can receive information from more than one bearer and carry out the multiplexing function described hereinbefore.

The medium access controller 24 receives an input from a first bearer Bearer 1 and a second bearer, Bearer 2 and outputs a first transport channel 1 and a second transport channel 2. The input from Bearer 1 maps to the first transport channel 1 and the input from Bearer 2 maps to the second transport channel 2. The transport channels are input to respective macrodiversity combiners 26. The macrodiversity combiners 26 output the transport channels to each base station which is in communication with the mobile station for which the transport channel is intended. In the example shown in Figure 2, the first transport channel 1 is output to first and second base stations 28 and 30 as is the second transport channel 2. Thus the first and second base stations are each arranged to transmit the same channels to a single mobile station.

The mode of operation for transmission of information between the SRNC 20 and base stations will now be described with reference to Figure 3. Two modes are defined. The first mode is the normal mode and the second mode is the silent mode. The data which is to be sent to the mobile station is interspersed with periods where there is no data. This may occur during pauses in a conversation between two parties. Alternatively, in the case of non speech data, the data may be discontinuous.

In the normal mode A of operation, on the transmit side, the SRNC 20 transmits a frame F for every interleaving period. As shown in Figure 2, frames F1 and F2 contain data. If no data is present, frames F3, F4 and F5 which are empty frames E are sent. After N consecutively received empty frames E, the frame protocol connection is switched to the silent mode S. N can have any

suitable value such as 1, 2 or 3 or any other suitable value.

In the silent mode S, on the transmit side, the SRNC 20 is prevented from transmitting any frame if there is no data in the frame. The SRNC may transmit K empty frames F6 at the beginning of the silent mode S to ensure that the base station has switched to the silent mode; also if up to K of the N empty frames previously sent have been lost during the transmission. After M consecutive frames F7 and F8 including data are transmitted, the frame protocol connection is switched to the normal mode A again. K may be 0 or 1 or any other suitable number. M can be 1, 2, 3 or any other suitable number.

In the normal mode A, on the receive side, if a frame is not received in an interleaving period, the base station generates an interface failure alarm and decides whether to transmit the radio frame without the data or to not transmit the frame at all. After the base station has received N empty frames, the frame protocol connection is switched to the silent mode S.

In the silent mode S, on the receive side, if a frame is not received in one interleaving period, the base station considers the bearer to be in an inactive state and sets the transport format indicator TFI to zero. After M consecutive data frames with data have been received, the frame control layer connection is switched to the normal mode A.

The parameters M, N and K may be:

1. predetermined, for example fixed in a standard used by the network;
2. Iub/Iur (Iub is the interface between the SRNC and the base station while Iur is the interface between two radio network controllers) interface protocol configurable parameters, that is the parameters can be set at each interface as required; and
3. signalled from the SRNC to base stations every time a new branch or bearer is set. The parameters may be reconfigurable as required.

Control frames which do not contain data but instead contain control information such as power control and synchronisation information are sent in both the normal mode and the silent mode. Control frames may not be present in either or both of these modes.

Reference will now be made to a second embodiment of the present invention which uses explicit signalling in order to switch from the normal mode to the silent mode. In this second embodiment, the base station will not automatically switch to the silent mode when a predetermined number of consecutive empty frames have been received. However, the transmission of a predetermined number of empty frames when in the normal mode can be used as an indication that the silent mode should be used. Of course, any other suitable measure can be used to determine that a switch should be made between the normal and the silent mode.

Once a determination has been made that the base station should stop using the normal mode and start using the silent mode, the radio network controller will include in the next frame sent to the base station a mode bit indicative of this. This mode bit may have a given value for the silent mode and the other value for the normal mode. Alternatively, one value of the bit indicates that the mode should change either from the normal to the silent mode or from the silent mode to the normal mode. The other value of the bit would indicate that the mode is not to be changed.

When the base station receives the frame transmitted by the radio network controller, it checks the mode bit. If this bit indicates that the mode is to change from the normal mode to the silent mode, the base station changes its mode and sends an acknowledgement confirming that the base station has understood that the mode is changed. Once the radio network controller has received the acknowledgement from the base station, the radio network controller will use the silent mode.

Changes from the silent mode to the normal mode can be achieved

in the same way as in the first embodiment. However, it is also possible to alter the mode from the silent to normal mode in the following. When it is determined that the base station is to receive using the normal mode, the radio network controller will alter the mode bit in the next frame sent to the base station, to indicate that the mode should change to the normal mode. If a data frame is being sent to the base station, the mode bit will be altered in that frame. If no data frame is being sent to the base station due to an absence of data, the radio network controller will send an empty frame with the mode bit set accordingly.

The base station will send an acknowledgement indicating that it has received the frame and has noted that the mode is changed to the normal mode. When the radio network controller receives the acknowledgement, the radio network controller will then use the normal mode.

It is possible to use this second method to notify the base station by sending in advance information that the mode will change after a predetermined number of frames or the like.

The method used by the first embodiment has the advantage that the frame structure does not need to be altered. A second advantage of the first method is that two way communication does not have to be set up if one party, for example, the radio network controller is sending data to the base station and the base station is not sending any data to the radio network controller. The second method is advantageous in that both parties are certain as to which mode of operation is being used.

The acknowledgement sent by the base station to the radio network controller may use a mode bit in the frame, as described hereinbefore in relation to the frames sent from the radio network controller to the base station. Thus the acknowledgement may comprise the mode bit in the frame sent by the base station to the radio network changing to reflect the new mode. Either of

the options for the mode bit described hereinbefore may be used.

It should be appreciated that although the transmissions from the SRNC to the base station are described as using the normal and silent mode of operation, this mode of operation can alternatively or additionally be used for transmissions from the base station to the SRNC. The values of the parameters used in the downlink and uplink directions may differ. Embodiments of the present invention may be applied to the communications between any two nodes of a telecommunications network, wired or wireless.

It should be appreciated that although embodiments of the present invention are particularly advantageous when used in a soft handoff or similar context, that is when a mobile station is in communication with more than one base station at the same time, embodiments of the present invention can also advantageously be used where the mobile station is in communication with one base station at a time. In an alternative embodiment of the present invention, the normal and silent mode of operation may only be used when the mobile station is in communication with more than one base station at a time. A different mode of operation may be used when the mobile station is in communication with only one base station. The different mode of operation may be one which incorporates one of the previously known methods for dealing with empty frames.

Whilst preferred embodiments have been described in the context of a code division multiple access system, embodiments of the present invention can be used with any other spread spectrum technique or any other suitable access technique such as time division multiple access, frequency division multiple and space division multiple access as well as hybrids thereof.

CLAIMS:

1. A method of transmitting from a first node to a second node, said method comprising the steps of:

transmitting in a first mode at least one data frame from said first node to said second node; and

determining if there is no data to be transmitted and if there is no data to be transmitted transmitting at least one empty frame in the first mode; and

switching to a second mode in which no transmission is made in the absence of data to be transmitted at least some of the time.

2. A method as claimed in claim 1, wherein said second mode is used if a predetermined number of empty frames are transmitted consecutively.

3. A method as claimed in claim 2, wherein the first station, if using the first mode, switches automatically to the second mode if the predetermined number of empty frames are transmitted consecutively.

4. A method as claimed in claim 1 or 2, comprising the step of the first node sending information to the second node advising that the mode is to change from the first mode to the second mode.

5. A method as claimed in claim 4, wherein the second node is arranged to confirm receipt of said information and when the first node has received the confirmation from the second node, said first node is arranged to use said second mode.

6. A method as claimed in claim 4 or 5, wherein said information is in a frame transmitted from the first node to the second node.

7. A method as claimed in any of claims 4 to 6, wherein said information is sent in advance of the change of mode.

8. A method as claimed in any preceding claim, wherein in said second mode, data to be transmitted is transmitted in data frames and if a predetermined number of data frames are transmitted, the first mode is used.

9. A method as claimed in claim 8, wherein if the predetermined number of data frames is received in said second mode, the first mode is automatically used.

10. A method as claimed in any of claims 1 to 8, wherein when the first node is using the second mode and the mode is to be switched to the first mode, the first node is arranged to transmit information that the mode is to be switched to said second mode.

11. A method as claimed in claim 10, wherein the second node is arranged to confirm receipt of said information that the mode is to be switched from said second mode to the first mode and the first node is arranged to use the first mode when the confirmation has been received by the first node.

12. A method as claimed in claim 2 or any claim appended thereto, wherein said predetermined number of data frames are consecutive data frames.

13. A method as claimed in any one of the preceding claims wherein if no data is to be transmitted at the beginning of the second mode, a predetermined number of empty frames are first transmitted and then no transmission is made in the absence of data to be transmitted.

14. A method as claimed in any one of the preceding claims, wherein said first node is arranged to transmit the same data to a plurality of second nodes, said plurality of second nodes

transmitting the same data to a third node.

15. A method of receiving transmissions from a first node at a second node, said transmission have a first mode in which if there is no data to be transmitted, empty frames are transmitted and a second mode in which if there is no data to be transmitted nothing is transmitted, said method comprising the steps of:

receiving transmissions from said first node, wherein if the transmissions have a first mode and a frame is not received and error is determined to have occurred.

16. A method as claimed in claim 15, wherein if an error is determined to have occurred, said second node transmits an empty frame to a third node.

17. A method as claimed in claim 15, wherein if an error is determined to have occurred, said second node transmits nothing to a third node.

18. A method as claimed in any of claims 15 to 17, wherein after a predetermined number of empty frames are received in said first mode, determining that the second mode is used by the first node.

19. A method as claimed in claim any of claims 6 to 9, wherein when a predetermined number of frames of data are received in said second mode, determining that the first mode is used by the first node.

20. A method as claimed in any of claims 15 to 20, wherein a change in operation of said first node is determined from information received by the second node from the first node.

21. A method as claimed in claim 20, wherein said information is in at least one frame transmitted from the first node to the second node.

22. A method as claimed in claim 16 or any claim appended

thereto, wherein said third node is a mobile station.

23. A method as claimed in any preceding claim, wherein said first node is a base station or a radio network controller in a wireless cellular telecommunications network.

24. A method as claimed in any preceding claim, wherein said second node is a base station or a radio network controller in a wireless cellular telecommunications network.

25. A first node for transmitting data to a second node, wherein said first node comprises transmitting means for transmitting data to said second node, said transmitting means have a first mode of operation in which data is transmitted in data frames and if there is no data to be transmitted empty frames are transmitted and a second mode of operation in which if there is no data no frames are transmitted at least some of the time.

26. A second node for receiving transmissions from a first node at a second node, said transmissions have a first mode in which if there is no data to be transmitted, empty frames are transmitted and a second mode in which if there is no data to be transmitted nothing is transmitted, said second node comprising means for receiving transmissions from said first node, and determining means for determining that if the transmissions have a first mode and a frame is not received, an error has occurred.

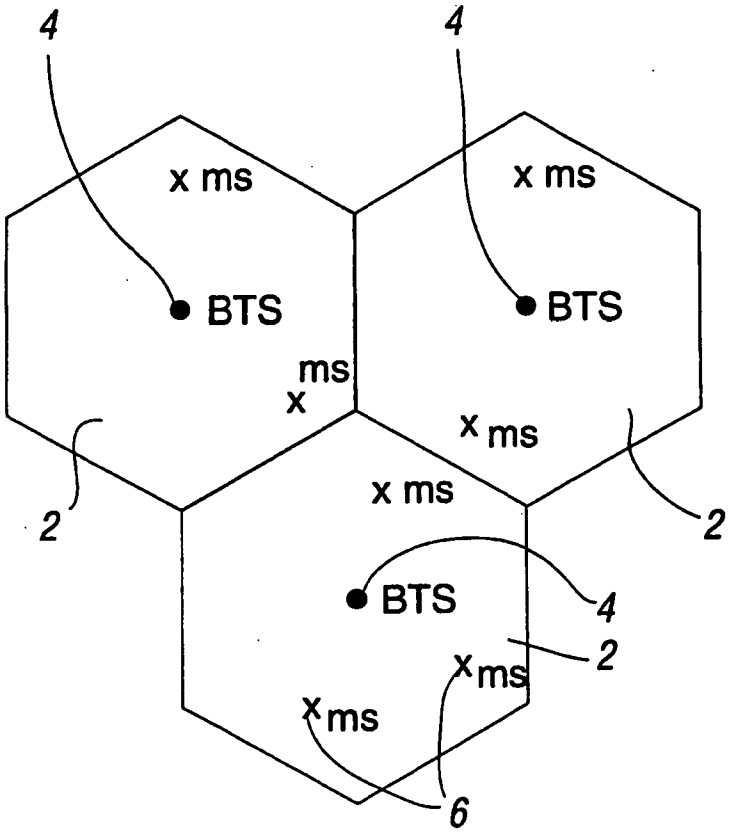


FIG. 1

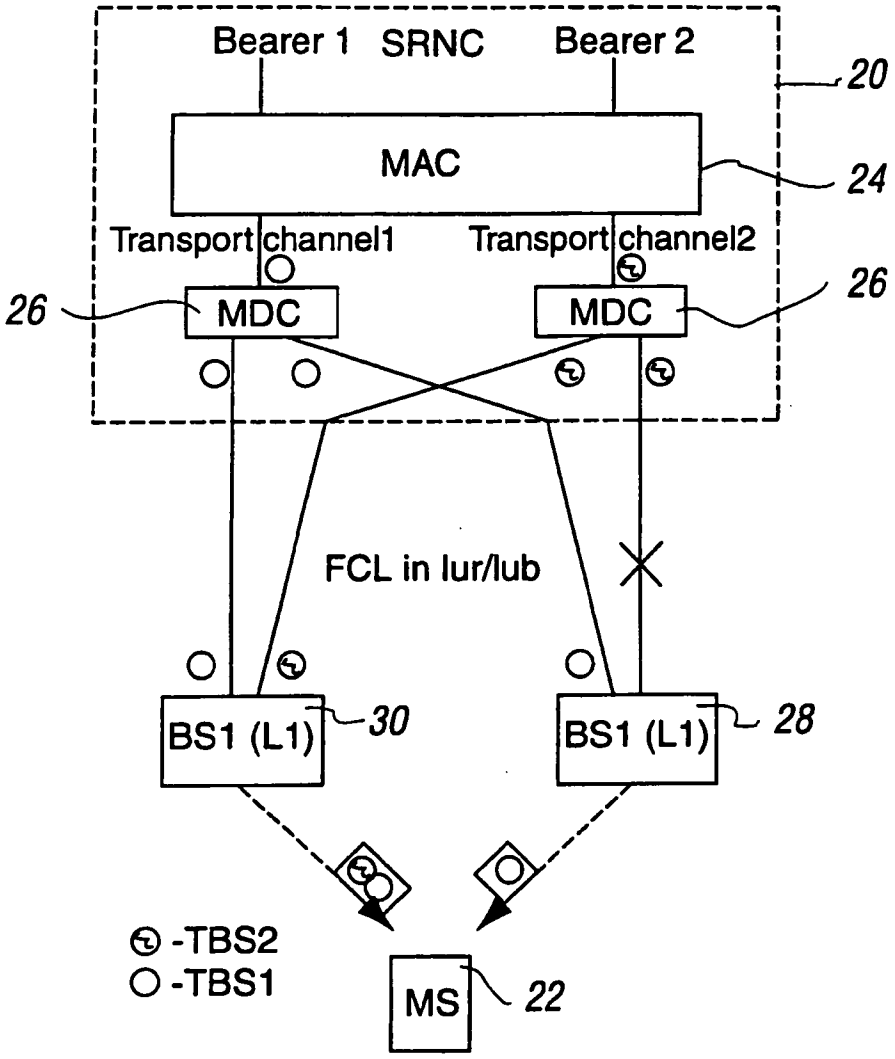

Bearer 1
SRNC
Bearer 2
20
MAC
24
Transport channel1
Transport channel2
26
MDC
MDC
26
FCL in Iur/Iub
BS1 (L1)
30
BS1 (L1)
28
-TBS2
-TBS1
MS
22

FIG. 2

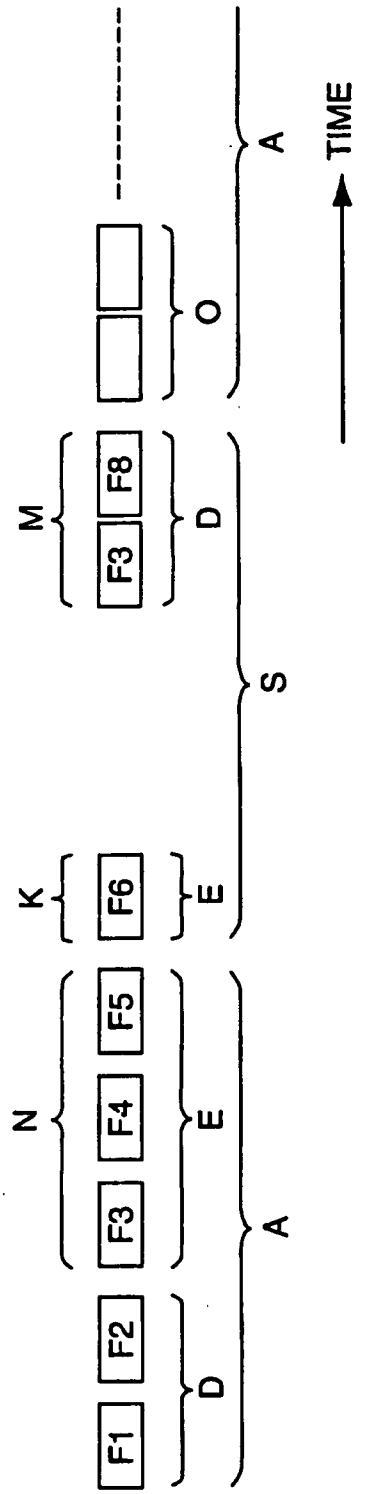


FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 00/03453

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04B7/26

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 7 H04B

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 565 504 A (ERICSSON GE MOBILE COMMUNICAT) 13 October 1993 (1993-10-13) abstract	1,25
A	column 3, line 40 -column 4, line 47 claims 1,2	2-24,26
X	WO 97 02561 A (NOKIA MOBILE PHONES LTD ;KAPANEN PEKKA (FI)) 23 January 1997 (1997-01-23) abstract claim 1; figures 2,4,5	1,25

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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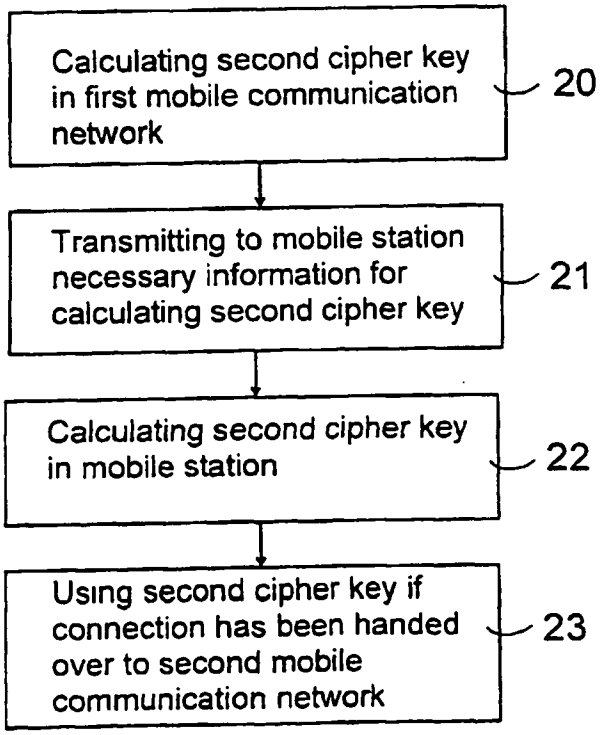
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(54) Title: ARRANGING AUTHENTICATION AND CIPHERING IN MOBILE COMMUNICATION SYSTEM



(57) Abstract: A method of arranging authentication and ciphering in a telecommunication system comprising two different mobile communication networks, a mobile station communicating with a first one of the mobile communication networks. In the first mobile communication network, a cipher key according to a second mobile communication network is calculated and information necessary for calculating the cipher key is transmitted to the mobile station, at which the cipher key according to the second mobile communication network is also calculated. After the connection has been handed over to the second mobile communication network, traffic is ciphered by using said precalculated cipher key.

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ARRANGING AUTHENTICATION AND CIPHERING IN MOBILE COMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION

The invention relates to a method and an arrangement for arranging data protection disclosed in the preambles of the independent claims.

In mobile communication systems, at least one part of a transmission path is comprised of a wireless section, whereby data transmission takes place via a radio path. A radio path is a physically open resource, which puts security at risk. Various solutions have been developed in digital mobile communication systems to arrange data protection, including ciphering methods and methods for identifying, i.e. authenticating, a user or a subscriber.

In mobile communications systems, a mobile network typically carries out subscriber authentication in order to make sure that only correct parties have an access right. For example, a mobile station in a digital GSM system comprises a subscriber identity module SIM application comprising means for authenticating the subscriber. The SIM application further uses a personal identity number PIN check, whereby only the person who knows the PIN code can use the SIM application. In authentication, the mobile station transmits to the GSM network identification information, and the SIM and thus also the subscriber are authenticated on the basis of this information. The SIM comprises mobile-operator-specific information, including an SIM-specific international mobile subscriber identity IMSI of a mobile services subscriber. Typically, the SIM also comprises a temporary mobile subscriber identity TMSI within a location area, which can be used to avoid transferring the IMSI over a radio path.

A mobile switching centre MSC, which typically also comprises a visitor location register VLR, transmits an authentication request to an authentication centre AuC. The authentication centre AuC is typically located as a part of a home location register HLR of the subscriber. Subscriber authentication information and authentication algorithms are stored in the authentication centre. On the basis of the IMSI comprised in the authentication request, the authentication centre AuC selects a subscriber-specific authentication key Ki. In addition, a random-number generator generates a number of random-number parameters RAND, which, together with the key Ki, are used to provide each RAND parameter with a checking parameter SRES by applying authentication algorithm A3. The authentication centre AuC typically transmits

these RAND/SRES parameters simultaneously with a calculated cipher key Kc to the visitor location register VLR to be stored.

When the VLR wishes to authenticate a subscriber, it selects a RAND value for the parameter from a RAND/SRES table corresponding to the present subscriber and transmits the RAND value to the mobile station and further to the SIM application. The SIM comprises the same authentication key Ki and authentication algorithm A3 as those used at the authentication centre AuC. The SIM calculates the SRES parameter, which is the authentication response, by means of the received RAND parameter and the key Ki by applying algorithm A3. The mobile station returns the SRES parameter to the visitor location register VLR. The VLR compares the SRES value transmitted by the mobile station with a stored SRES value, and if they are the same, the authentication has succeeded. In principle, the GSM network can request authentication at any stage when a mobile station is registered in the network. Authentication can be carried out particularly when a mobile station registers in a network.

Ciphering is used in many telecommunication systems to prevent data to be transmitted from becoming subject to unauthorised access. For example, it is possible in the GSM system to use ciphering of data transmission which is difficult to crack, whereby speech and data converted into digital form are ciphered at the mobile station to be transmitted over the radio path. Similarly, received ciphered data in the GSM network is deciphered into plain speech and data. In connection with the present application, ciphering can refer either to ciphering or deciphering of traffic. Ciphering and user authentication utilise cipher keys and ciphering algorithms accessible to the particular transmission and reception equipment only.

When in the GSM system the mobile switching centre MSC/VLR has authenticated the user, ciphering of the traffic to be transmitted can be initiated. The cipher key Kc is calculated in connection with authentication by means of the secret key Ki and the random number RAND by applying algorithm A8 both at the authentication centre AuC and the SIM. Algorithms A3 and A8 are typically implemented such that both the SRES parameter and the cipher key Kc are calculated simultaneously. In the authentication parameters the authentication centre transmits the cipher key Kc with the RAND and SRES parameters to the visitor location register VLR, whereby these three parameters form a "triplet". The cipher key Kc is stored in the visitor location

register VLR. The visitor location register VLR transmits the random number RAND to the SIM application for authentication and cipher key calculation. The SIM calculates the cipher key Kc typically in connection with calculating the SRES parameter on the basis of the RAND parameter and the secret key Ki by applying algorithm A8. Consequently, calculating the cipher key Kc is a part of the GSM authentication. The cipher key Kc is stored in the SIM application. According to the GSM standard, the Kc is 64 bits at most.

When the mobile switching centre MSC/VLR commands ciphering to be initiated, the cipher key Kc is transmitted from the visitor location register VLR to a base station. Furthermore, a command is transmitted to the mobile station, which starts using the Kc calculated at the SIM. The GSM network selects the ciphering algorithm on the basis of the identifier of the ciphering algorithm comprised in a "classmark" identifier transmitted by the mobile station. The base station and the mobile station carry out traffic ciphering and deciphering, depending on the direction of the traffic, by means of the cipher key Kc and the number of the traffic frame by applying algorithm A5. *The GSM System for Mobile Communications* by M. Mouly and M. Pautet, Palaiseau, France, 1992, ISBN: 2-9507190-0-7, for example, discloses a more detailed description of the GSM system.

Third generation mobile communication systems have been developed throughout the world. 3rd generation partnership project 3GPP standardizes a third generation mobile communication system which is based on the GSM system and called a universal mobile telecommunications systems UMTS, which comprises a new radio interface, for example. The UMTS radio interface will be based on the wideband code division multiple access WCDMA technique. The GSM core network will be utilised in the UMTS system, whereby connection management and mobility management will mainly remain the same. The UMTS system will provide circuit-switched services and packet-switched services. The packet-switched services will probably be based on the general packet radio service GPRS in the GSM.

An essential requirement in the UMTS system is the handover requirement between the GSM and the UMTS. In connection with the present application, handover refers to changing a radio traffic connection and radio traffic responsibility from a source system to a target system without the data transfer connection provided for a user service being substantially disconnected. In the GSM/UMTS handover, the connection is thus handed over from

the UMTS system to the GSM system, or vice versa. In the GSM/UMTS handover, the connection provided for the user remains similarly uninterrupted to one in the existing internal handover in the GSM system. This enables the UMTS system to be rapidly introduced since particularly in the beginning, the GSM system with its extensive coverage area can be used as backup. For this purpose, it is probable that devices called dual-mode mobile stations supporting both the GSM system and the UMTS system will appear on the market.

In the UMTS standardization work, it is likely that a solution with mainly similar principles to the GSM procedures will be selected as far as the security architecture is concerned. In such a case, as high compatibility with the GSM architecture as possible can be achieved. Both the UMTS network and a user service identity module USIM application of the SIM identity application kind in the GSM comprise a secret key which is required for carrying out authentication. Changes will primarily relate to key lengths and algorithms used; document TR S3.03 version 0.1.2 "3G Security: Security Architecture" in the 3GPP discusses security requirements in the UMTS system. Particularly the cipher key to be used will probably be longer than in the GSM system.

In order to support the GSM system, a UMTS IC card UICC comprising the USIM application may also comprise the SIM application of the GSM system. The UMTS system further requires that services may be provided to mobile stations with only a smart card comprising a GSM identity SIM application. Furthermore, at the early stage the GSM/UMTS core network may be the same, so the core network of the UMTS system can also support authentication and ciphering according to the GSM system as well.

In the GSM system, in a handover situation, ciphering parameters used in handover between mobile switching centres, such as the cipher key, are transmitted from the source network to the target network. Hence, when a connection is handed over from the GSM network to the UMTS network, the cipher key Kc according to the GSM can be used while the traffic remains ciphered all the time. It is naturally required that the UMTS network supports the ciphering according to the GSM system. It is also possible to carry out authentication according to the UMTS system and start using a UMTS cipher key after handover.

When the mobile station is in the UMTS network, a cipher key according to the UMTS system is available for its use. When handover from the UMTS system to the GSM system is carried out, the problem is the ciphering

since a base station sub-system BSS according to the GSM system is not necessarily able to carry out the ciphering by the UMTS parameters. Consequently, the UMTS cipher key cannot be used as such after handover, according to the GSM principles. According to the prior art, when a change to the GSM system takes place, authentication according to the GSM system can be carried out after handover. In such a case, GSM ciphering can be initiated only after the cipher key Kc has been calculated. This, however, is time-consuming, and some of the traffic will be transferred over the GSM radio interface unciphered.

BRIEF DESCRIPTION OF THE INVENTION

An object of the invention is thus to provide a method and an apparatus implementing the method so as to enable the above-mentioned problems to be alleviated. The objects of the invention are achieved by a method and a system which are characterized by what is disclosed in the independent claims. Preferred embodiments of the invention are disclosed in the dependent claims.

The invention is based on the idea that a cipher key of a "second" mobile communication network according to a mobile communication system, such as a GSM system, is determined in a first mobile communication network typically according to a different mobile communication system, such as a UMTS system, when a mobile station operates in the first mobile communication network. In such a case, a "second" cipher key according to the second mobile communication network can be determined which can preferably be stored both in the mobile station and in the first mobile communication network usually using a "first" cipher key for ciphering traffic. The advantage achieved is that the second cipher key according to the second mobile communication network, such as the GSM network, is already available before a potential handover situation.

In a handover situation, the second cipher key can, according to a preferred embodiment of the invention, be transmitted from the first mobile communication network to a network element performing ciphering, such as a base station, in the second mobile communication network. Furthermore, the second cipher key stored in the subscriber identification application, such as the SIM application, is preferably transmitted to a means in the mobile station which carries out ciphering in the mobile station. Hence, as soon as the logical connection has been handed over to the base station system of the second

mobile communication network, it is possible to start to use ciphering according to the network concerned both at the mobile station and at the network element in the second mobile communication network that carries out the ciphering. The advantage then achieved is that, with the exception of the first signalling messages, no traffic is transferred unciphered over the air interface after handover, as is the case in an internal handover situation in the GSM system.

According to a solution of the invention, a mobile communication network and a mobile station can use several different and alternative methods of ciphering or authentication by using different algorithms or keys. If the mobile communication network and the mobile station support more than one ciphering or authentication method, it is thus possible to e.g. change the cipher key used, if necessary.

According to a preferred embodiment of the invention, a first mobile communication network examines, by means of an IMSI and/or classmark identifier, for example, whether a mobile station supports a second mobile communication network. In such a case, the cipher key according to a second mobile communication network is preferably calculated only if the mobile station supports the second mobile communication network. Furthermore, according to a preferred embodiment of the invention, the second cipher key can be calculated simultaneously with authentication according to the first mobile communication system. In such a case, one message is preferably used for requesting of the authentication centre and further, the mobile station, calculation of a cipher key according to two different systems and, possibly, of an authentication response.

On the other hand, according to another preferred embodiment of the invention, a request can be specified for calculating explicitly a second cipher key according to the second mobile communication system. This can be necessary when, for example, it is detected that handover is necessary to a second mobile communication network. In such a case, calculation of the cipher key according to the second mobile communication network only can be requested preferably in connection with authentication. According to an embodiment of the invention, the second cipher key can be calculated only when necessary, in other words when a decision is made about handover to the second mobile communication network.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is now described in closer detail in connection with the preferred embodiments with reference to the accompanying drawings, in which

Figure 1 shows, by way of example, a UMTS system with a GSM base station sub-system also connected thereto;

Figure 2 shows a method according to a preferred embodiment of the invention in a simplified manner and by means of flow diagram;

Figure 3 shows an authentication implementation according to a preferred embodiment of the invention by means of a signalling diagram;

Figure 4 shows, by way of example and by means of a signalling diagram, a handover function from a UMTS system to a GSM system.

DETAILED DESCRIPTION OF THE INVENTION

In principle, the invention can be applied to any mobile communication system. It is particularly well suited for a UMTS system, which will largely be based on the GSM system. In the following, a preferred embodiment of the invention will be described by using an example wherein GSM authentication functions, calculation of a cipher key in particular, are carried out in a UMTS network before a handover function from the UMTS network to a GSM network (Figures 1 and 3) and a handover function which utilizes, according to the invention, a precalculated cipher key (Figure 4). Figure 2 describes in a simplified manner a method according to a preferred embodiment of the invention independently of the mobile communication system used.

Figure 1 shows, by way of example, a mobile communication network according to the UMTS system, a core network CN of the mobile communication network also being able to control a GSM base station sub-system. A UMTS mobile station MS comprises mobile equipment ME and a UICC smart card. A UMTS radio access network RAN comprises one or more base stations BS, and radio frequencies available to the base stations are controlled by a radio network controller RNC.

For circuit-switched services, the radio network controllers RNC are connected to a mobile switching centre MSC, which is responsible for connection establishment of the circuit-switched services and routing them to correct addresses. Two databases are utilized herein which comprise information on mobile subscribers: a home location register HLR and a visitor location register

VLR. Similarly, a serving GPRS support node SGSN utilizing the home location register HLR is used for packet-switched services. Both the MSC and the SGSN communicate with an authentication centre AuC, typically via the home location register HLR.

The mobile switching centre MSC is via an interworking function IWF connected to other telecommunication networks, such as a public switched telephone network PSTN or an integrated services digital network ISDN. A GPRS gateway support node GGSN communicates with packet data networks PDN.

A base station sub-system BSS according to the GSM system is also connected to the core network CN, the base station sub-system BSS comprising at least one base transceiver station BTS and a base station controller BSC.

A home environment HE specified in the UMTS documents of the 3GPP enters a contract with a subscriber for service provision and provides a USIM application. In such a case, the home location register HLR is located in the home environment HE. A serving network SN refers to a network in the area of which the mobile station is currently located. In roaming situations or in situations in which service provision and network operation are separated from each other, separate home environment HE and serving network SN can be discerned. In Figure 1, the home environment HE and the serving network SN are not separated.

In functions described later, the visitor location register VLR may be located in the serving network SN and the authentication centre AuC may be located in the home environment HE of a different operator or they may belong to a network controlled by the same operator. In connection with the present application, networks elements in the core network CN of Figure 1 are named as in the GSM system; the essential feature is that the network elements are capable of carrying out the functions according to the UMTS system.

The security architecture in the UMTS system will be mainly similar to that in the GSM system. Hence, the procedure described earlier according to the GSM will also be implemented in the UMTS; probable differences will be discussed in the following. Table 1 shows UMTS parameters corresponding to GSM parameters that have been discussed in 3GPP document TR S3.03 version 0.1.2 "3G Security: Security Architecture".

Table 1.

DESCRIPTION	GSM	UMTS
random number parameter	RAND	RANDu
authentication checking parameter to be compared (authentication response)	SRES	XRES
cipher key	Kc	CK
integrity key	-	IK
authentication token	-	AUTN

In authentication according to the UMTS system, the authentication centre AuC produces five parameters in accordance with Table 1 and transmits them to the visitor location register VLR. In the GSM system, three parameters are produced, i.e. a triplet. The random number parameter RANDu corresponds to the RAND parameter in the GSM system, but may vary in length. An authentication checking parameter XRES (Expected Response) and a cipher key CK in particular may also vary in length compared to the GSM parameters SRES and Kc. The GSM lacks an authentication token AUTN; it can be transmitted to the USIM application in the same message as the RANDu parameter. By means of the AUTN token, the USIM application can check whether the serving network has the right to serve UMTS services. As distinct from the GSM system, the USIM generates an XRES parameter and calculates a cipher key CK only if the AUTN parameter is acceptable. As in the GSM system, the USIM transmits the calculated XRES parameter to the network to the visitor location register VLR, which compares it with the authentication checking parameter received from the authentication centre. The authentication has succeeded if the XRES calculated in the network and the XRES parameter calculated in the USIM application correspond to each other.

The GSM system lacks an integrity key IK; in the UMTS system, it will be used for protecting certain signalling messages, such as information on features of a mobile station, for example. The IK is calculated both in the USIM application and in the UMTS network. Since UMTS standardization work is still underway, algorithms necessary for producing the parameters shown in Table 1 have not been determined precisely. They will probably differ from GSM al-

gorithms A3, A5 and A8. The key corresponding to the secret key Ki in the GSM is K in the UMTS, K being used in calculating authentication parameters both in the USIM application and the authentication centre.

In principle, the GSM or the UMTS network can request authentication of a mobile station at any time. Authentication can be carried out e.g. in connection with location update or while providing a paging response when a mobile station receives a call. The invention can be applied to authentication at any time.

In the example according to the invention, the mobile station MS is capable of establishing a connection both to the GSM and the UMTS networks, i.e. it is a so-called dual-mode mobile station. The MS thus comprises functions both according to the GSM system and the UMTS system, and further, functions of the SIM application and the USIM application. The SIM/USIM functions are preferably located on a smart card UICC and they can preferably be provided from the same operator, i.e. home environment HE, as one application. It is assumed that the subscriber identifier, preferably the IMSI, is the same both for the GSM and the UMTS system. Hence, the IMSI identifier identifies both the SIM application and the USIM application. On the basis of the IMSI identifier, the UMTS network can preferably also detect whether a subscriber that has the right to access both GSM and UMTS services is at issue. Even though the IMSI identifier were the same, authentication (comprising calculation of cipher keys) can be carried out in the solution according to a preferred embodiment of the invention for both the SIM application and the USIM application separately.

In the following, a method according to a preferred embodiment of the invention will be described in a simplified manner by means of Figure 2, without being restricted to any certain mobile communication system. In Figure 2, the most important steps of the invention are simplified, not all embodiments being shown. Later, by means of Figures 3 and 4, different steps and embodiments will be described in closer detail, applied to the UMTS and the GSM systems.

When a mobile station operates in a first mobile communication network, traffic being transferred over the air interface is ciphered mainly by using a first cipher key. According to the invention, a second cipher key according to a second mobile communication network is calculated in the first mobile communication network (20). This can take place after the first mobile

communication network has detected a need for handover of the active connection to the second mobile communication network, for example, or in connection with authentication according to the first mobile communication network.

After calculating the second cipher key, the first mobile communication network transmits information necessary for calculating the cipher key to the mobile station (21). The mobile station detects that calculation of the second cipher key according to the second mobile communication network is at issue and carries out calculation of the second cipher key (22). Next, the second cipher key is available both in the first mobile communication network and at the mobile station. If the logical connection provided for the mobile station is handed over to the second mobile communication network, the second cipher key is used both at the mobile station and in the second mobile communication network after the handover (23). The first mobile communication network has then preferably transmitted the second key to the network element carrying out the ciphering in the second mobile communication network before handover. Hence, the traffic between the mobile station and the second mobile communication network can be ciphered immediately after handover.

In the following, a solution according to a preferred embodiment of the invention when applied to circuit-switched connections in the UMTS and GSM networks will be described in closer detail by means of Figure 3. Figure 3 shows an exemplary signalling pattern of an authentication process, i.e. production of a cipher key, production and checking of authentication parameters, only including steps that are essential to the invention. When the mobile station is within the area of the UMTS network, it is further assumed that the traffic between the mobile station and the mobile communication network is ciphered using the UMTS cipher key.

In Figure 3, the mobile station MS transmits a location update request message, for example, in order to request location update (identity, arrow 30). The essential point is that the message (identity, arrow 30) comprises a UMTS subscriber identifier, either a TMSI or an IMSI identifier, for a similar purpose to the one in the GSM system, i.e. for identifying a subscriber. In some UMTS specifications, a temporary mobile user identity TMUI corresponds to the TMSI identifier, and an international mobile user identity IMUI to the IMSI identifier.

The UMTS network may also transmit a request to the mobile station to transmit a subscriber identifier, and the mobile station responds by transmitting the requested subscriber identifier (identity, arrow 30).

It is further possible that in the UMTS system, the IMSI identifier is ciphered over the radio path in order to prevent misuse. If the IMSI identifier is ciphered, the visitor location register VLR has to transmit the ciphered IMSI identifier to the home location register HLR, which transmits the unciphered IMSI identifier back to the visitor location register (not shown).

The visitor location register VLR transmits the request for authentication and the IMSI identifier to the home location register HLR and further to the authentication centre AuC (send authentication info, arrow 31).In the network, the VLR and the HLR communicate using the MAP signalling protocol. In the UMTS system, it is possible to use a different MAP version than in the GSM since, compared to the GSM, the above-described UMTS authentication functions require changes in the MAP protocol. Consequently, the home environment HE and further, the authentication centre AuC in connection with the home location register can infer from, for example, the MAP version that the request (send authentication info, arrow 31) has been received from a network capable of the UMTS.

On the basis of the IMSI identifier the home environment HE, preferably the home location register HLR, can detect that the subscriber has the right to access both the GSM and the UMTS network. According to a preferred embodiment of the invention, the authentication centre AuC calculates both the authentication parameters of the UMTS and the authentication parameters of the GSM (triplet) substantially simultaneously and transmits them to the visitor location register VLR. If the serving network SN is not according to the UMTS (an MAP version according to the GSM system, for example), or on the basis of the IMSI identifier only the SIM application can be used, the authentication centre AuC calculates preferably the GSM authentication parameters only. Furthermore, characteristics of the mobile station MS may also set requirements for the calculation of the GSM parameters, i.e. whether the mobile station supports the GSM system. Then, correspondingly, when the mobile station only supports the UMTS system or when, on the basis of the IMSI identifier, only the USIM application can be used, the AUC can calculate the authentication parameters of the UMTS only.

Alternatively, it is possible for the visitor location register VLR to request authentication information according to a desired system or systems in connection with a (send authentication info, arrow 31) message. This can be implemented, for example, by adding bits indicating the type of authentication requested to the authentication information request (send authentication info, arrow 31).

In order to avoid unnecessary processing power consumption, GSM authentication is carried out in the UMTS network only if the mobile station comprises the SIM application and the GSM functionality (dual-mode mobile station). The UMTS network can discern from the classmark identifier, for example, whether the mobile station supports the GSM system. In such a case, the visitor location register can, the classmark identifier and/or the IMSI identifier having indicated that the mobile station supports the GSM system, request authentication both according to the GSM system and the UMTS system of the authentication centre AuC in connection with the (send authentication info, arrow 31) message.

The authentication centre AuC transmits the calculated authentication information to the visitor location register VLR (authentication info, arrow 32), wherein the information is stored. Since the authentication centre has calculated the GSM authentication parameters, a cipher key Kc according to the GSM network is available in the serving network SN for later use. After this step, the idea of the invention can be applied at least in two different ways: by implicit or explicit GSM authentication, which will be described next.

An implicit GSM authentication according to a preferred embodiment of the invention will be discussed in the following. In this case, the UMTS random-number parameter RANDu received from the authentication centre AuC is equal in length to the GSM random-number parameter RAND (preferably 128 bits). The VLR transmits to the mobile station an authentication request (authentication request, arrow 33) comprising the random-number parameter RANDu of the length of the RAND parameter in the GSM system. Since the authentication at issue is authentication according to the UMTS system, an authentication token AUTN is also preferably transmitted to the USIM application of the mobile station.

According to a preferred embodiment of the invention, the mobile station MS transmits the random-number parameter RANDu both to the SIM and the USIM applications even though the authentication request

(authentication request, arrow 33) were according to the UMTS system. The mobile station may comprise, for example, means for checking the random-number parameter, in which case, when the random-number parameter is according to the GSM system, it is also transmitted to the SIM application. Then, according to a preferred embodiment of the invention, the SIM application calculates the cipher key Kc by using the secret key Ki and the RANDu parameter by applying A8 algorithm. The SIM application does not, however, have to produce the authentication checking parameter SRES. The SIM application stores the Kc for later use preferably in the memory of the smart card UICC.

The USIM application receives the RANDu parameter, and, if the authentication token AUTN is acceptable, carries out the calculation of the authentication checking parameter XRES. Then, by means of the secret key K and the RANDu parameter and the authentication algorithm of the UMTS, the USIM produces the XRES parameter. The cipher key CK of the UMTS can be calculated simultaneously by means of the secret key K and the calculation algorithm of the cipher key. The authentication checking parameter XRES is transmitted from the USIM application to the visitor location register VLR (authentication response, arrow 34), which compares it with the checking parameter received from the authentication centre AuC. If they match, authentication according to the UMTS has succeeded.

According to a preferred embodiment of the invention, in the implicit GSM authentication it is further assumed that the GSM authentication has been carried out when the UMTS authentication has succeeded. Furthermore, the cipher key according to the GSM system exists both in the UMTS network and in the USIM application for potential handover from the UMTS network to the GSM network. When authentication has been carried out, the UMTS network can transmit an approval, i.e. acknowledgement of the authentication to the mobile station MS (acknowledgement, arrow 35). Necessary procedures at a given time can then be continued according to the prior art; for example, the UMTS network may give the mobile station MS a command to initiate ciphering.

Since in the implicit GSM authentication it is only necessary to calculate the cipher key Kc, the authentication centre AuC does not necessarily have to calculate and transmit all authentication parameters of the visitor location register VLR. Only the cipher key Kc has to be calculated and transmitted

to the visitor location register, preferably applying the same random-number parameter as in calculating the cipher key CK of the UMTS.

According to a preferred embodiment of the invention, so-called explicit GSM authentication can also be carried out. In such a case, the RANDu parameter can be of a different length than the RAND parameter of the GSM. The UMTS network then transmits, preferably in the authentication request (authentication request, arrow 33), information on which authentication is desired, the GSM authentication, the UMTS authentication, or possibly both.

The authentication request (authentication request, arrow 33) comprises, for example, a GSM bit and a UMTS bit. When the GSM bit has a value 1, the mobile station detects that it is the GSM authentication that is requested. Similarly, if the UMTS bit is 1, authentication according to the UMTS system will be carried out. If both bits are 1, authentication according to both systems can be carried out. The MS can detect the desired authentication also from the length of the random-number parameter RAND or RANDu. Furthermore, the mobile station MS can discern that it is the UMTS authentication that is desired if the authentication request (authentication request, arrow 33) comprises the authentication token AUTN.

If the serving network SN has requested GSM authentication, the RAND random-number parameter is transmitted to the SIM application and calculation according to the GSM system of the authentication response SRES and the cipher key Kc is carried out. The authentication response SRES is transmitted to the visitor location register VLR to be checked (authentication response, arrow 34) and the cipher key Kc is stored in the SIM application for potential later use.

If the serving network SN has requested UMTS authentication, the RANDu random-number parameter is transmitted to the USIM application and authentication according to the UMTS system is carried out in a manner described earlier. If the UMTS authentication succeeds, nothing, however, is assumed concerning the GSM authentication on the basis thereof, but the GSM authentication has to be carried out separately if the serving network SN so desires.

If the serving network SN requests authentication according both to the GSM and the UMTS systems, it preferably transmits both the RANDu and the RAND parameters in the authentication request (authentication request, arrow 33). When the mobile station has detected from, for example, the two

different random-number parameters that both the UMTS authentication and the GSM authentication are requested, it transmits the RAND parameter to the SIM application and the RANDu parameter to the USIM application. The SIM and the USIM calculate the authentication responses SRES and XRES and the cipher keys Kc and CK. The mobile station MS transmits the SRES parameter transmitted by the SIM application and the XRES parameter transmitted by the USIM application to the visitor location register VLR (authentication response, arrow 34) possibly in different messages. The visitor location register VLR compares the authentication responses received from the mobile station MS with the ones received from the authentication centre AuC, and if they match, the authentications have succeeded.

The explicit method described above can generally be applied to a mobile communication system which supports several authentication methods. For example, it is possible that a new, alternative authentication and/or ciphering method will be developed for the UMTS system. The network element (e.g. the AuC) which carries out authentication and calculation of the cipher key and the means (e.g. the USIM) which carries out the corresponding functions in the mobile station comprise the same algorithms. If the serving mobile communication network and particularly the network element carrying out the functions of the visitor location register VLR know how to apply the parameters according to the alternative authentication method, the explicit method may be used. Hence, the serving mobile communication system can transmit to the authentication centre AuC an identifier of the authentication algorithm or algorithms used, for example.

On the other hand, it is also possible that the AuC is aware of the characteristics of the mobile station and further, the serving mobile communication network. In such a case, on the basis of the characteristics, it can also transmit the parameters according to the alternative method to the serving mobile communication network, to the visitor location register VLR, for example. Furthermore, the serving mobile communication network can preferably transmit to the mobile station information on the authentication method used in connection with the authentication request. This enables, for example, the cipher method used to be flexibly changed by calculating the cipher key according to the new authentication both at the authentication centre and the subscriber application. The cipher method used can, if necessary, be changed by transmitting the new cipher key to the means responsible for ciphering both

in the mobile communication network and at the mobile station. Preferably, the authentication centre AuC is also informed that the cipher method has been changed successfully.

The great advantage achieved by the above-described GSM authentication according to the implicit or explicit method is that the cipher key Kc according to the GSM system is ready for potential handover from the UMTS system to the GSM system. The cipher key Kc is stored both in the UMTS network, preferably in the visitor location register VLR, and in the mobile station, preferably in the SIM application.

The calculation of the cipher key Kc according to the GSM system can be carried out if the serving network SN so desires. It can be carried out, for example, always in connection with the UMTS authentication.

The calculation of the cipher key Kc can, according to a preferred embodiment of the invention, also be carried out when it is detected from the local radio cells that a need exists to carry out handover to the base station sub-system BSS according to the GSM system. Furthermore, the cipher key Kc can be calculated while handover is being carried out, which, however, may cause delay in carrying out the handover.

The cipher key Kc according to the GSM system can also be determined by separating it from the cipher key CK of the UMTS when, for example, the connection is being handed over to the GSM base station. The CK will probably be longer than the Kc. Then, the mobile station MS and the UMTS network, preferably the VLR, make the CK key as short as the Kc key and preferably store it in memory for later use. Hence, the Kc key according to the GSM system is available for a potential handover situation. It is then unnecessary to calculate the GSM parameters at the authentication centre or in the SIM application.

In the following, by means of Figure 4, a handover process will be described in a circuit-switched connection by way of example, only taking into account parts relevant to the invention. The mobile station MS carries out measurements of base stations located in the neighboring area, measuring also base stations of the GSM system when the UMTS network has preferably so requested. The mobile station MS transmits the measurement information to a serving radio network controller RNC (measurement, arrow 40).

The RNC makes a decision about inter-system handover on the basis of, for example, whether a handover threshold has been exceeded as far

as the signal strength is concerned. The RNC transmits an announcement about the necessity of the handover to an anchor mobile switching centre AMSC of the serving UMTS network SN (handover required, arrow 41). In handover, the AMSC is a so-called source mobile switching centre. The AMSC preferably comprises interworking function IWF, which enables a handover request according the GSM system to be produced. If the cipher key Kc is not yet precalculated, the AMSC can request that it be calculated after, for example, the AMSC has received the handover request (handover required, arrow 41). Before the handover request is transmitted to the GSM network, the cipher key Kc is calculated, for example, in the explicit manner described above.

The AMSC retrieves the precalculated cipher key Kc preferably from the visitor location register VLR. The AMSC transmits the cipher key Kc in the handover request to a relay mobile switching centre RMSC according to the GSM system together with other information according to the GSM system and necessary in the handover, such as the classmark information of the mobile station (prepare ho request, arrow 42). It is possible that the UMTS base station sub-system and the GSM base station sub-system to which handover is to be performed are connected to the same core network, as illustrated in Figure 1. In such a case, both the GSM and the UMTS base station sub-systems can be controlled by the same mobile switching centre MSC, which transmits the handover request to the GSM base station sub-system according to the GSM system.

The RMSC transmits the handover request, which also comprises the cipher key Kc, to a base station controller BSC (handover request, arrow 43). The BSC allocates the necessary resources according to the handover request and transmits the reply to the RMSC (ho request ack, arrow 44). The RMSC transmits the reply to the handover request to the AMSC (prepare ho response, arrow 45). The AMSC transmits a command according to the UMTS system to carry out the handover to the radio network controller RNC (handover command, arrow 46).

The RNC transmits to the mobile station MS the handover command between the UMTS and the GSM systems (inter-system ho command, arrow 47). This message comprises all necessary information on, for example, the radio channel for the mobile station to be able to carry out handover according to the GSM system. The mobile station MS recognizes that the han-

dover is to the GSM system, and it activates the GSM functions. Furthermore, the mobile station preferably detects that a cipher key according to the GSM system is needed, whereby the cipher key Kc according to the GSM system is requested of the SIM application. The SIM application transmits the cipher key Kc to the means of the mobile station which carries out ciphering according to the GSM system.

The mobile station MS transmits a handover access message on a GSM channel allocated thereto as in a typical GSM system (handover access, arrow 48). The mobile station MS typically transmits one or more unciphered [HANDOVER ACCESS] messages determined in the GSM specifications. Next, the connection is handed over be served by the GSM base station subsystem according to the GSM system which is known per se and which needs not be described in closer detail here. Traffic to be transmitted can, according to a preferred embodiment of the invention, be ciphered by using the precalculated cipher key Kc and the ciphering algorithm A5 preferably immediately after the (handover access, arrow 48) message. The GSM network can possibly also carry out the authentication although the traffic can already be ciphered.

The great advantage achieved from the solution of a preferred embodiment of the invention is that the traffic between the mobile station and the mobile communication network can be ciphered immediately after handover by means of the cipher key Kc according to the GSM system. If no cipher key Kc for ciphering were available in the mobile station and the GSM base station, it would be necessary to carry out authentication and calculation of the cipher key after handover in the GSM network. In such a case, some of the traffic to be transmitted would remain unciphered and time would be wasted.

In order to implement a preferred embodiment of the invention compared to the prior art implementation, such as the GSM system, changes are mainly required in the functions of the mobile switching centre MSC/VLR, the visitor location register VLR and the mobile station MS. The functions required by the solution of the invention can be implemented by software.

The above-described authentication, calculation of the cipher key and handover implementation describe by way of example the application of the invention to the UMTS and the GSM systems. The invention can also readily be applied to other mobile communication systems, such as wireless local area networks.

It is obvious to one skilled in the art that as technology advances, the basic idea of the invention can be implemented in several different ways. The invention and its embodiments are thus not restricted to the above-described examples but they can vary within the scope of the claims.

CLAIMS

1. A method of arranging data protection in a telecommunication system comprising a first mobile communication network wherein a first cipher key is used for ciphering traffic between a mobile station and a mobile communication network, a second mobile communication network wherein a second cipher key is used for ciphering traffic between a mobile station and a mobile communication network, and a mobile station supporting said mobile communication networks, **characterized** by

calculating said second cipher key in the first mobile communication network when the mobile station operates in the first mobile communication network,

transmitting information necessary for calculating said second cipher key from the first mobile communication network to the mobile station when the mobile station operates in the first mobile communication network, and

calculating said second cipher key at the mobile station.

2. A method as claimed in claim 1, **characterized** by

using said second cipher key for ciphering the traffic between the mobile station and the second mobile communication network if the mobile station is handed over from the first mobile communication network to the second mobile communication network during an active connection.

3. A method as claimed in claim 1 or 2, **characterized** by

transmitting said second cipher key from the first mobile communication network to the second mobile communication network,

transmitting said second cipher key calculated at the mobile station to a ciphering means of the mobile station in response to the fact that the first mobile communication network transmits a request to the mobile station for handover to the second mobile communication network, and

using said second cipher key in ciphering traffic after the handover in the mobile station and in the second mobile communication network.

4. A method as claimed in any one of the preceding claims, **characterized** by

checking, in the first mobile communication network, whether the mobile station supports the second mobile communication network,

calculating said second cipher key in the first mobile communication network in response to the fact that the mobile station supports the second mobile communication network,

transmitting a request for calculation of said second cipher key from the first mobile communication network to the mobile station, and

calculating at the mobile station said second cipher key in response to said request.

5. A method as claimed in claim 4, **characterized** by

calculating said second cipher key in the first mobile communication network in response to the fact that an identifier transmitted by the mobile station, such as an IMSI subscriber identifier, and/or a classmark identifier indicate that the mobile station supports the second mobile communication network.

6. A method as claimed in any one of the preceding claims, **characterized** by

calculating said second cipher key at a network element in the first mobile communication network, such as an authentication centre, in response to the fact that a network element of the first mobile communication network, such as a visitor location register or a home location register, comprising identifiers transmitted by the mobile station requests calculation of said second cipher key, and

transmitting said second cipher key from said network element calculating the cipher key to said network element comprising the identifiers transmitted by the mobile station.

7. A method as claimed in any one of the preceding claims, **characterized** by

the mobile station comprising a subscriber identification application, such as a USIM application, to the first mobile communication network and a subscriber identification application, such as an SIM application, to the second mobile communication network,

transmitting the information necessary for calculating said second cipher key received by the mobile station to the identification application according to the second mobile communication network.

8. A method as claimed in any one of the preceding claims, **characterized** by

calculating said second cipher key in the first mobile communication network in connection with calculating an authentication response according to the first mobile communication network and the first cipher key,

transmitting the information necessary for calculating the first cipher key and said second cipher key, such as a random-number parameter, from the first mobile communication network to the mobile station,

transmitting the necessary information at the mobile station for calculating said first and second cipher keys to the identification applications according to the first and the second mobile communication networks,

calculating said second cipher key in the identification application according to the second mobile communication network and the authentication response in the identification application according to the first mobile communication network,

transmitting said authentication response according to the first mobile communication network from the mobile station to the first mobile communication network, and

acknowledging the authentication of the mobile station to be performed for the second mobile communication network in response to the fact that the first mobile communication network accepts the authentication response transmitted by the mobile station.

9. A method as claimed in any one of claims 1 to 7, **characterized** by

determining a random-number parameter and calculating the authentication response according to the second mobile communication network in connection with calculating said second cipher key in the first mobile communication network,

transmitting a request to the mobile station for calculation of an authentication response according to the second mobile communication network,

transmitting the information necessary at the mobile station for calculating said second cipher key to the identification application according to the second mobile communication network,

calculating, in the identification application according to the second mobile communication network, the authentication response according to the second mobile communication network in connection with calculating said second cipher key,

transmitting the authentication response according to the second mobile communication network calculated at the mobile station to the first mobile communication network, and

checking said authentication response according to the second mobile communication network transmitted by the mobile station in the first mobile communication network.

10. A method as claimed in any one of claims 1 to 7, **characterized** by

calculating said second cipher key by shortening the first cipher key in the first mobile communication network and at the mobile station before the handover to the second mobile communication network takes place.

11. A method as claimed in any one of the preceding claims, **characterized** by

calculating said second cipher key in response to the fact that a decision has been made in the first mobile communication network to carry out handover to the second mobile communication network.

12. A telecommunication system comprising at least a first mobile communication network arranged to use a first cipher key for ciphering traffic between a mobile station and a mobile communication network, a second mobile communication network arranged to use a second cipher key for ciphering traffic between a mobile station and a mobile communication network, and a mobile station arranged to support said different first and second mobile communication networks, **characterized** in that

the first mobile communication network is arranged to calculate said second cipher key when the mobile station operates in the first mobile communication network,

the first mobile communication network is arranged to transmit information necessary for calculating said second cipher key from the first mobile communication network to the mobile station when the mobile station operates in the first mobile communication network, and

the mobile station is arranged to calculate said second cipher key.

13. A telecommunication system as claimed in claim 12, **characterized** in that

the mobile station and the second mobile communication network are arranged to cipher the traffic between the mobile station and the second mobile communication network by using said second cipher key if the mobile

station is handed over from the first mobile communication network to the second mobile communication network during an active connection.

14. A telecommunication system as claimed in claim 12 or 13, **characterized** in that

the first mobile communication network is arranged to transmit said second cipher key to the second mobile communication network before the handover to the second mobile communication network,

the mobile station is arranged to transmit said second cipher key calculated at the mobile station to a ciphering means of the mobile station in response to the fact that the first mobile communication network transmits a request to the mobile station for handover to the second mobile communication network, and

the mobile station and the second mobile communication network are arranged to use said second cipher key in ciphering traffic after the handover.

15. A telecommunication system as claimed in any one of claims 12 to 14, **characterized** in that

the first mobile communication network is arranged to check whether the mobile station supports the second mobile communication network on the basis of an identifier transmitted by the mobile station, such as an IMSI and/or a classmark identifier,

the first mobile communication network is arranged to calculate said second cipher key in response to the fact that the mobile station supports the second mobile communication network,

the first mobile communication network is arranged to transmit a request to the mobile station for calculation of said second cipher key, and

the mobile station is arranged to calculate said second cipher key on the basis of said request.

16. A telecommunication system as claimed in any one of claims 12 to 15, **characterized** in that

a network element comprising identifiers transmitted by the mobile station of the first mobile communication network, such as a visitor location register or a home location register, is arranged to transmit the request for calculation of said second cipher key to a network element of the first mobile communication network, such as an authentication centre,

the network element of the first mobile communication network, such as the authentication centre, is arranged to calculate said second cipher key in response to the fact that the network element comprising the identifiers transmitted by the mobile station requests calculation of said second cipher key, and

said network element calculating said second cipher key is arranged to transmit the calculated second cipher key to said network element comprising the identifiers transmitted by the mobile station.

17. A telecommunication system as claimed in any one of claims 12 to 16, **characterized** in that

the first mobile communication network is arranged to calculate said second cipher key in connection with calculation of an authentication response according to the first mobile communication network and the first cipher key,

the first mobile communication network is arranged to transmit to the mobile station information necessary for calculating the first cipher key and said second cipher key, such as a random-number parameter,

the mobile station comprises an identification application according to the first mobile communication network, such as a USIM application, and an identification application according to the second mobile communication network, such as an SIM application,

the mobile station is arranged to transmit said information necessary for calculating the first cipher key and said second cipher key to the identification applications according to the first and the second mobile communication networks,

said identification application according to the second mobile communication network is arranged to calculate said second cipher key and said identification application according to the first mobile communication network is arranged to calculate the authentication response according to the first mobile communication network, and

the mobile station is arranged to transmit the authentication response according to the first mobile communication network to the first mobile communication network.

18. A telecommunication system as claimed in any one of claims 12 to 16, **characterized** in that

the first mobile communication network is arranged to determine a random-number parameter according to the second mobile communication

network and to calculate the authentication response in connection with calculating said second cipher key,

the first mobile communication network is arranged to transmit a request to the mobile station for calculating the authentication response according to the second mobile communication network,

the mobile station comprises an identification application according to the first mobile communication network, such as a USIM application, and an identification application according to the second mobile communication network, such as an SIM application,

the mobile station is arranged to transmit the information necessary for calculating said second cipher key to the identification application according to the second mobile communication network,

the identification application according to the second mobile communication network is arranged to calculate said second cipher key and the authentication response according to the second mobile communication network substantially simultaneously,

the mobile station is arranged to transmit the authentication response according to the second mobile communication network to the first mobile communication network, and

the second mobile communication network is arranged to check the authentication response according to the second mobile communication network.

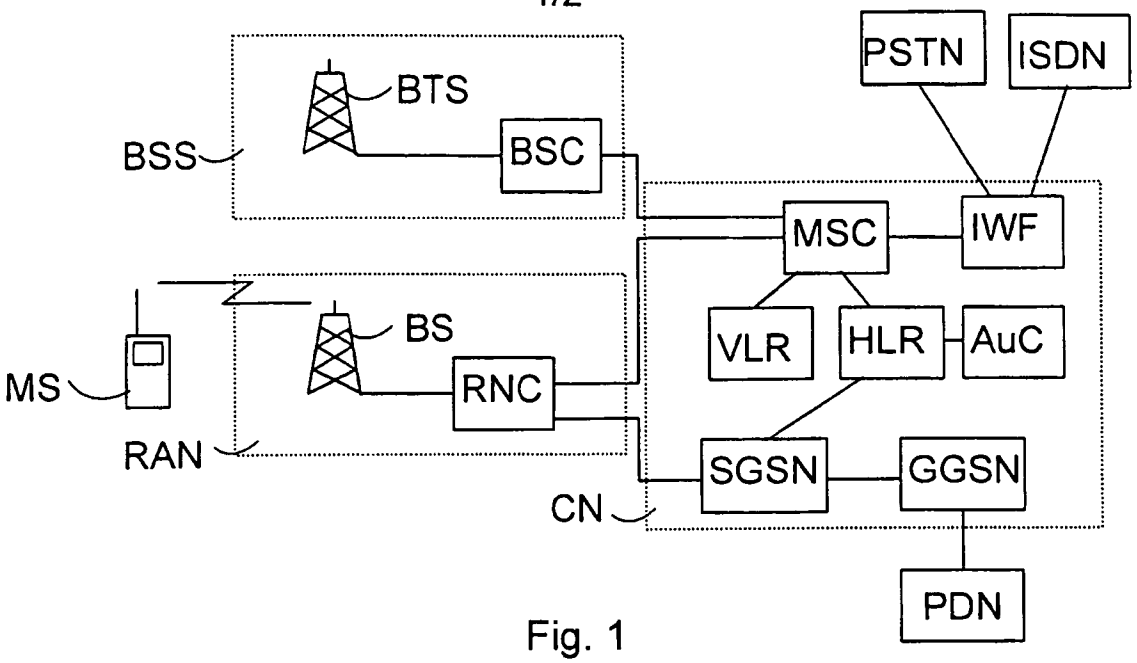

PSTN
ISDN
BTS
BSS
BSC
MSC
IWF
BS
VLR
HLR
AuC
MS
RNC
RAN
SGSN
GGSN
CN
PDN

Fig. 1

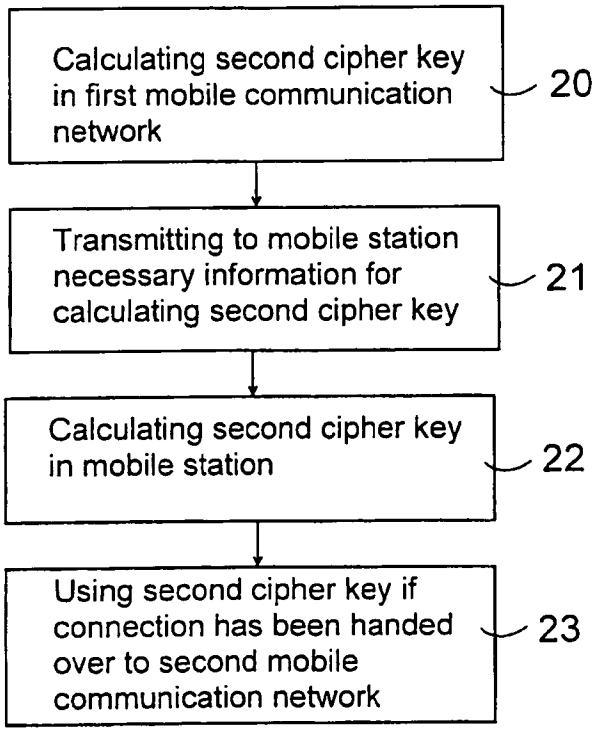

Calculating second cipher key in first mobile communication network
20
Transmitting to mobile station necessary information for calculating second cipher key
21
Calculating second cipher key in mobile station
22
Using second cipher key if connection has been handed over to second mobile communication network
23

Fig. 2

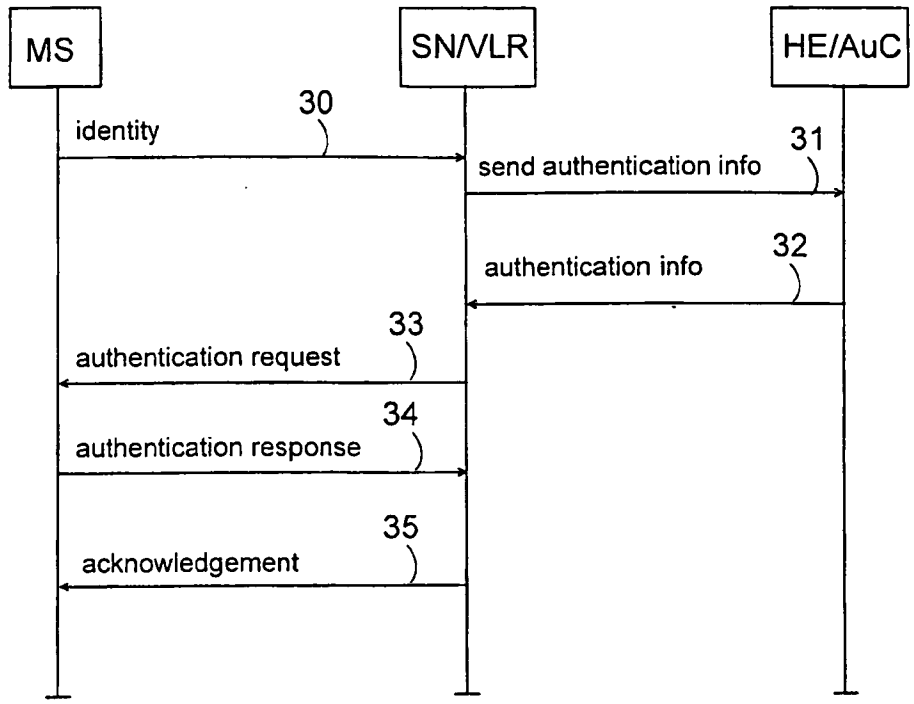

MS
SN/VLR
HE/AuC
30
identity
31
send authentication info
32
authentication info
33
authentication request
34
authentication response
35
acknowledgement

Fig. 3

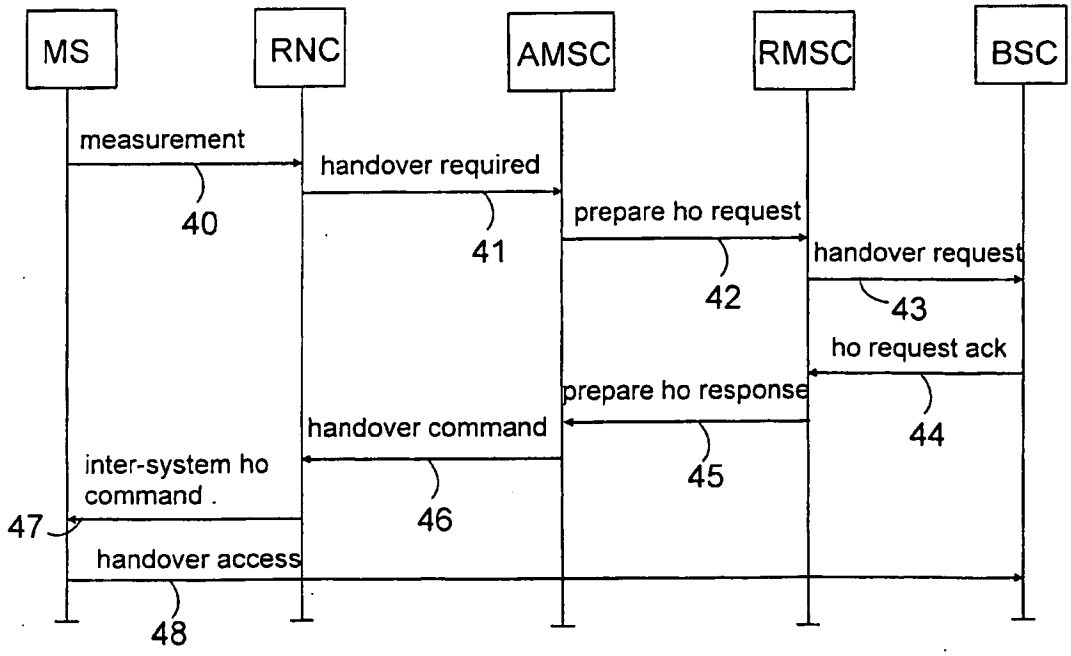

MS
RNC
AMSC
RMSC
BSC
measurement
40
handover required
41
prepare ho request
42
handover request
43
ho request ack
44
prepare ho response
45
handover command
46
inter-system ho command .
47
handover access
48

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/00495

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04M 7/38
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)

IPC7: H04M

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

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9859513 A1 (NOKIA MOBILE PHONES LTD.), 30 December 1998 (30.12.98), page 1, line 3 - page 2, line 24	1-18
	--	
P,A	PUTZ, S.; SCHMITZ, R. "Secure interoperation between 2G and 3G mobile radio networks". In: First International Conference on 3G Mobile Communication Technologies, 2000. (Conf. Publ. No. 471), 27-29 March 2000, pages 28-32. ISBN 0-85296-726-8	1-18
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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

Date of the actual completion of the international search	Date of mailing of the international search report
13 November 2000	16 -11- 2000
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Information on patent family members

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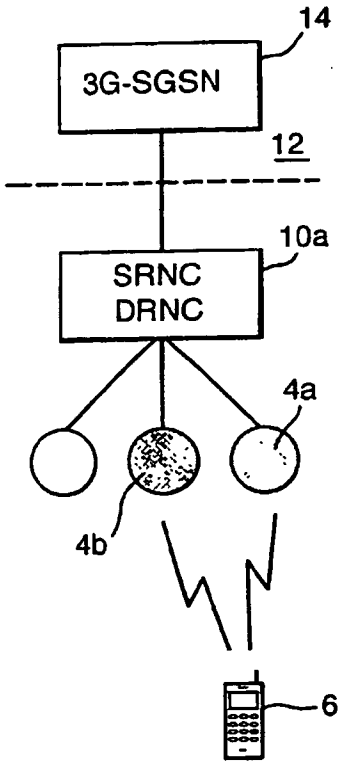
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(54) Title: RELEASING A CONNECTION IN A WIRELESS COMMUNICATION NETWORK



(57) Abstract: A network element (10a), such as a radio network controller, for use in a communication network (e.g. UMTS), said network element (10a) being arranged between an end station (6) and an end element (14), for example an SGSN, wherein connections are established between said end station (6) and said end element (14) via said network element (10a), said network element (10a) comprising means for determining if the connection between said end element (14) and said end station (6) is to be released.

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RELEASING A CONNECTION IN A WIRELESS COMMUNICATION NETWORK

Field of the Invention

The present invention relates to a network element for use in a communications network. In particular, but not exclusively, the network element is a radio network controller in a code division multiple access wireless cellular communications network.

Background of the Invention

The use of code division multiple access (CDMA) is being proposed for the next generation of cellular telecommunication networks. Additionally, code division multiple access is also being used in the IS-95 standard in the USA. CDMA is a direct sequence spread spectrum technique. In a wireless cellular network using CDMA, the mobile stations in one cell associated with a first base station will use the same frequency as mobile stations in an adjacent cell associated with the second base station. The different mobile stations can be distinguished by the respective base stations as each mobile station will be using a different spreading code.

In one of the new CDMA standards which is currently being proposed, connections are made between a mobile station to a base station, from the base station to a radio network controller and from the radio network controller to a core network. The core network is arranged to control the establishment and release of connections between the mobile station and the core network. With "bursty" traffic which consists of packets of data which are sent irregularly, the

core network is unable to predict the traffic which is to be transmitted between the core network and the mobile station and vice versa.

It has been proposed that a timer mechanism be used by the core network in order to control the release of the connection. For example, if a packet of data has not been received for X seconds, then the connection is released.

This method has the problem that the core network may not release this connection at an appropriate time. This is because the core network is not aware of parameters of the radio network controller or the mobile station which might indicate that an earlier break in the connection was appropriate. This may result in connections being maintained longer than required. This unnecessarily uses up resources within the network, which may reduce the amount of traffic which can be supported.

Summary of the Invention

It is an aim of embodiments of the present invention to address this problem.

According to one aspect of the present invention, there is provided a network element for use in a communications network, said network element being arranged between an end station and an end element, wherein connections are established between said end station and said end element via said network element, said network element comprising means for determining if the connection between said end element and said end station is to be released.

Brief Description of the Drawings

For better understanding of the present invention and as to how the same may be carried into effect, reference will now be made by way of example to the accompanying drawings in which:-

Figure 1 shows a cellular telecommunication network in which embodiments of the present invention can be incorporated;

Figure 2A shows a mobile station in communication with two base stations under the control of a single radio network controller;

Figure 2B shows a mobile station in communication with two base stations, each of which is connected to a different radio network controller;

Figure 3A shows the connection before the serving radio network controller is changed;

Figure 3B shows the connections after the serving radio network controller has been changed;

Figure 4 shows the various radio resource control modes;

Figure 5 shows a first embodiment of the present invention; and

Figure 6 shows a second embodiment of the present invention.

Detailed Description of Embodiments of the Present Invention

Reference will first be made to Figure 1 in which three cells 2 of the cellular telecommunications network are shown. Each cell 2 is served by a respective base transceiver station (BTS) 4. The base station is sometimes called node B in CDMA systems. Each base transceiver station is arranged to transmit signals to and receive signals from the mobile stations 6 located in the cell

associated with the given base transceiver station 4. Likewise, each mobile station 6 is able to transmit signals to and receive signals from the respective base transceiver station 4.

The cellular telecommunications network shown in Figure 1 uses a code division multiple access technique.

With the proposed new CDMA standard, macro diversity is possible. This means that a mobile station can be connected to more than one radio network controller RNC at the same time. However, as far as the core network is concerned, these connections are controlled by one radio network controller which is defined as the serving radio network controller SRNC. This serving radio network controller SRNC communicates with a third generation serving GPRS support node 3G-SGSN. This serving GPRS support node is analogous to that of the GPRS standard used in conjunction with the GSM standard but has been modified so as to be usable with the CDMA standard.

Reference is made to Figure 2A. In Figure 2A, a mobile station 6 is in communication with two base stations 4a and 4b. Each of these base stations 4a and 4b is connected to the same radio network controller RNC 10a. The common radio network controller 10a is thus the serving radio network controller and is connected to the core network 12. This core network 12 is represented by the dashed line and is the part of the network upstream of the serving radio network controller. The serving radio network controller 10a is in fact connected to the third generation serving GPRS support node 3G-SGSN 14 of the core network 12.

Reference is now made to Figure 2B which shows the mobile station 6 connected to two base stations 4c and 4d. However, unlike in Figure 2A, one base station 4c is connected to one radio network controller 10c whilst the other base station 4d is connected to a second radio network controller 10b. One of these radio network controllers acts as the serving radio network controller SRNC 10b. In the embodiment shown in Figure 2B, the second radio network controller 10b acts as the serving radio network controller. The other radio network controller 10c is defined as being a drift radio network controller DRNC. The drift radio network controller 10c is connected to the serving radio network controller 10b. The serving radio network controller 10b is, as in the arrangement shown in Figure 2A, connected to the SGSN 14. In the arrangement shown in Figure 2A, the drift radio network controller and the serving radio network controller are the same radio network controller.

The serving radio network controller 10a or b is able to combine information received from the mobile station 6 via the two different base stations 4a-d, regardless of whether or not the base stations are connected to the same radio network controller or different radio network controllers. In the latter situation, the drift radio network controller 10c would forward information from the respective base station 4c to the serving radio network controller 10b. The serving radio network controller 10b also copies information which is intended for a given mobile station 6 to the relevant drift radio network controller 10c so that the base station 4c connected to the serving radio network controller 10b as well as the base station connected to the drift radio

network controller 10c can be transmit the same information, where appropriate, to the mobile station 6.

The serving radio network controller SRNC is arranged to control the information transfer and request for radio resources from the appropriate drift radio network controllers DRNC. The drift radio network controllers only relay information between the mobile station and the serving radio network controller SRNC.

It is preferred that the same serving radio network controller SRNC be used for packet switched traffic (i.e. data transmitted in packet form) and circuit switched traffic i.e. speech.

When a mobile station moves, the base station or base stations with which the mobile station is in communication needs to change. This may mean that a different serving radio network controller may be required. This is described in relation to Figures 3A and 3B. In the arrangement shown in Figure 3A, the mobile station 6 is in communication with a single base station 4. This base station 4 is connected to the drift radio network controller 10c. The drift radio network controller is connected to the serving radio network controller 10b, as shown in Figure 2B. The serving radio network controller is connected to the current SGSN 14 which is in turn connected to the gateway GPRS serving node 16. Accordingly, signals to and from the mobile station follow the following path: mobile station 6 to the base station 4c connected to the drift RNC 10c, to the drift RNC 10c, from the drift RNC 10c to the serving RNC 10b, from the serving RNC 10b to the current SGSN 14 and from the current SGSN 14

to the GGSN 16. The same path is used for signals from the GGSN 16 to the mobile station 6, but in reverse.

The SGSN 14 also has a connection to a home location register 18. Each radio network controller 10b and 10c is connected to respective 3G mobile services switching centres 20a and 20b. The drift radio network controller 10c is connected to a different serving GPRS support node 22, which is not in use in this mode. There is also a connection between the home location register 18 and the third generation mobile services switching center 20a connected to the serving radio network controller 10b.

Reference is now made to Figure 3B which shows the connections which are established once the serving radio network controller has changed. In this arrangement, the drift radio network controller 10c becomes the serving radio network controller. The serving radio network controller 10b may become a drift radio network controller or may not be involved in communications with the mobile station 6. The mobile station continues to send and receive signals from the base station 4c connected to the new serving radio network controller 10c. The new serving radio network controller 10c has established a connection with the SGSN 22 to which it is connected. Signals from the serving GPRS node 22 connected to the new serving radio network controller 10c are passed to the GGSN 16. A connection is established between the home location register HLR 18 and the mobile services switching centre 20b connected to the new serving radio network controller 10c. A connection is also established between the home location register 18 and the SGSN 22 connected to the new serving radio network controller 10c.

This relocation procedure takes place when the target radio network controller (i.e. a drift radio network controller) is controlling all of the communications to and from the mobile station. In other words, the serving radio network controller does not communicate with the mobile station 6 with any of the base stations which it controls.

The connection between the mobile station 6 and the GGSN 16 is now via the base station 4c, the new serving radio network controller 10c, and the new SGSN 22.

Radio resource control provides the common control and signalling between the radio network controller and the mobile station. The same radio resource control connection is used both by speech and packet data traffic. The radio resource control (RRC) modes are illustrated schematically in Figure 4. In the RRC-idle mode 30, there is no connection established between the mobile station and the universal mobile telecommunications system terrestrial radio access network (UTRAN). UTRAN is the combination of RNC(s) and BTS(s). If the user equipment is attached to the network, but in RRC-idle mode (which implies that the mobile is not in active communication), the location is tracked by the SGSN. In this mode, there is no signalling between the UTRAN and the mobile station except for system information that is sent from the network downlink on a broadcast channel to the user equipment. The user equipment can also receive paging messages in this mode. No information on the mobile station is stored in the UTRAN in this state.

In the connected mode 32, the main states are the cell connected state 34 and the UTRAN Registration Area (URA)

connected state 36. One radio network controller will be acting as the serving radio network controller and a radio resource control connection is established between the mobile station and the serving radio network controller. When the position of the mobile station is known on the cell level, the mobile station is in the cell connected state. The radio resource control connection mobility is handled by hand over procedures. In this state, the radio link may be use different channels:-

1. Dedicated Channel (DCH). In this channel, a spreading code is allocated to the mobile station and is solely used by that mobile station.

2. Dedicated Shared Channel (DSCH). In this channel, a spreading code is shared amongst a number of mobile stations. The radio channel is optimised for packet traffic.

3. Common Channel on the downlink and Random Access Channel on the uplink. These are common channels and are suitable for use with short packets.

When the mobile position is known only on the URA level, i.e. which group of cells it is in, the mobile station is in the URA connected state. The URA comprises a set of cells of the network. In other words, the mobile station is in one of a plurality of cells which together define the URA. The URA updating procedures provide the mobility functioning. Paging is performed for downlink packet transfer.

A radio access bearer represents the connection between the SGSN and the mobile station. The radio access bearer comprises two branches. The first branch is the GTP (GPRS tunnelling protocol) tunnel between the radio network controller and the SGSN. The second branch is between the mobile station and the radio network controller. Between one mobile station and the SGSN, there are as many radio access bearers as there are PDP (packet data protocol) context activated when a radio access bearer is established. A radio resource control connection is established between the mobile station and the radio network controller, for signalling. However, no radio access bearer may be established. A radio access bearer is established only when the connection between the radio network controller and the SGSN is also established.

Reference is now made to Figure 5. In this arrangement inside the radio network controller 50, a process determines that the RRC connection of a particular mobile station should be released to optimise the use of resources. By releasing the connection which otherwise uses unnecessary signalling, the radio resources of the network are conserved, thus improving capacity and/or quality. The radio network controller 50 therefore sends an Iu release request 54 to the SGSN 52. Iu is the interface between the radio network controller and the SGSN 52. The request sent to the SGSN 52 indicates the reason why the bearer should be released. In the embodiments of the invention, the connection may be broken in order to optimise resources. This will be described in more detail hereinafter.

It is known to release the connection if the operation and maintenance controller of the network has intervened and

wants the connection to be broken or if there is equipment failure at some point between the mobile station and the SGSN 52.

The SGSN 52 decides whether or not to confirm the request for the release of the radio bearer. If the SGSN 52 agrees that the connection should be broken, a release command 56 is sent to the radio network controller 50 via the Iu interface.

If the radio resource connection between the radio network controller 50 and the mobile station 58 has not already been released, the radio network controller sends a radio resource control connection release message 60 to the mobile station. The mobile station releases the connection and sends a radio resource control connection released message 62 to the radio network controller 50. The radio network controller 50 then sends a confirmation 59 that the connection has been released to the SGSN 52 on the Iu interface.

Reference is now made to Figure 6 which shows an alternative embodiment to that shown in Figure 5. In the embodiment shown in Figure 6, the radio network controller 50 does not send a release request to the SGSN 52. Instead, the RNC 50 sends a release radio connection message 64 to the mobile station 58. The mobile station sends an acknowledgement message 66 to the radio network controller 50 and the connection therebetween is broken. The radio network controller 50 then advises the SGSN 52 via the Iu interface that the connection has been released. The SGSN 52 then releases all of the Iu connections. This alternative signalling is applicable particularly if there is no need of

confirmation from the SGSN. The RNC process which triggers the signalling procedure shown in Figure 5 or 6, should make the decision to release the RRC connection of a particular mobile station based (among other things) on the quality of service profile of the radio access bearer established. The process may only release the RRC connection, if the quality of service profile indicates that this bearer(s) are used for bursty traffic between the SGSN 52 and the mobile station 58. This type of traffic is indicated by the traffic class parameter.

One class of traffic is referred to background traffic whilst the other type of traffic is interactive traffic. Background traffic is, for example message traffic which is not time sensitive whilst interactive traffic is, for example traffic resulting in web browsing. With both of these types of traffic, the SGSN is unable to predict when and what traffic is to be forwarded to the mobile station and likewise when and what traffic is going to be received from the mobile station. The radio network controller carries out a process to control the release of the bearer for one or more of the following reasons:

1. The radio network controller has a timer which measures the time since the last packet was transferred to or received from the mobile station. If a given time lapses without a packet being transferred, then the radio network controller releases the connection. Different times may be used depending on the quality of services profile, in particular whether or not the traffic is interactive or background traffic. A shorter time may be provided for background traffic.

2. The radio network controller can take into account the radio state of the mobile station. For example, the RNC may release the RRC connection only in the URA connected mode.

3. The connection may be kept when another radio bearer is established, for example from the mobile switching centre to the mobile station via the radio network controller. The reason is that the RNC has to keep this mobile RRC-connected for this circuit switched connection, so that it can maintain the radio access bearer for a packet connection without using additional resources.

4. The radio network controller can take into account the movement of the mobile station. If the mobile station is moving above a given speed, the bearer connection may be released. A fast moving mobile station uses up a relatively large amount of radio resources for updates (e.g. URA updates). The radio network controller could set a maximum number of URA updates, for example 10 and if no user data traffic has been received within that time, the connection could be released. This is an elegant way to take into account the mobile movement.

5. The radio network controller may release the connection if the mobile station enters an area controlled by a different radio network controller. In this regard, reference is made to Figures 3a and 3b.

As mentioned hereinbefore, a combination of these methods may be used for determining if a radio network controller should release the bearer. For example, if a mobile station, which is in the URA update state enters a new radio network controller area, the serving radio network

controller can be arranged to release the radio bearer. This may in turn trigger a routing area update from the mobile station. The routing area update is used by mobile to inform the SGSN of its location in RRC-idle mode.

If the bearer is released the internal resources of the radio network controller can be conserved. For example, each time a connection is established, the radio network controller requires some buffer resource to be allocated thereto If a connection is not being used, the buffer resource may be wasted.

In another example, if a mobile station has a circuit switch connection i.e. speech connection, the radio network controller could keep the packet bearer established longer than otherwise. This is because a user is more likely to transfer data during or after a call and the radio network controller would merely have to re-establish that bearer otherwise.

In one modification of the embodiments described hereinbefore, the SGSN could be arranged to give an indication in the bearer set up procedure to the radio network controller whether or not the radio network controller is permitted to suggest the release of the bearer. Rules associated with this may also be transferred from the SGSN to the radio network controller. Those rules may take any suitable form. The indication in the bearer set up may be implicitly derived by the radio network controller from quality of service parameters provided by the SGSN to the radio network controller.

The SGSN could indicate the timer value, or indicate not to release RRC connection if a bearer with particular quality

of service profile is established. The SGSN can thus instruct the RNC as to how it should interpret the rules which it has for determining when to release a connection.

Whilst the present invention has referred to mobile stations, it should be appreciated that embodiments of the present invention are applicable to other types of user equipment, for example computer terminals. These computer terminals may be fixed or mobile.

Embodiments of the present invention have been described in the context of a code division multiple access system. It should be appreciated that embodiments of the present invention can be used with any other suitable spread spectrum access technique, frequency division multiple access techniques, time division multiple access technique or hybrids thereof.

CLAIMS:

1. A network element for use in a communication network, said network element being arranged between an end station and an end element, wherein connections are established between said end station and said end element via said network element, said network element comprising means for determining if the connection between said end element and said end station is to be released.

2. A network element as claimed in claim 1, wherein said network element is arranged to release said connection when the determining means determines that the connection is to be released.

3. A network element is claimed in claim 2, wherein said network element is arranged to release the connection between the network element and said end station.

4. A network element as claimed in claim 2 or 3, wherein said network element is arranged to send a message to the end element indicating that said connection has been released.

5. A network element as claimed in claim 1, wherein said network element is arranged to send a request for the connection to be released to said end station.

6. A network element as claimed in claim 5, wherein the end element sends a connection release command to said network element in response to the release request received by said network element, said network element controlling the release of said connection.

7. A network element as claimed in claim 6, wherein said network element is arranged to send a release request to said end station in response to the release command received from said end element.

8. A network element as claimed in claim 7, wherein said network element is arranged to send a message to said end element advising that the connection has been released.

9. A network element as claimed in any preceding claim, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

10. A network element as claimed in claim 9, wherein the predetermined time depends on the type of traffic for which the connection is intended.

11. A network element as claimed in claim 9, wherein the predetermined time depends on the quality of service profile of the traffic for which the connection is intended.

12. A network element as claimed in any preceding claim, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

13. A network element as claimed in any preceding claim, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

14. A network element as claimed in claim 13, wherein the amount of updating information received in a given time from the end station is used as a measure of the movement of the end station.

15. A network element as claimed in claim 14, wherein said updating information comprises URA updates.

16. A network element as claimed in any preceding claim, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

17. A network element as claimed in claim 16, wherein said determining means determines that the connection should be released if the end station is associated with a different network element.

18. A network element as claimed in any preceding claim, wherein said network element is a radio network controller.

19. A network comprising a network element as claimed in any preceding claim, an end station and an end element.

20. A network as claimed in claim 19, wherein said end station is a mobile station.

21. A network element as claimed in claims 19 or 20, wherein said end element is a SGSN.

22. A network as claimed in claims 19, 20 or 21 wherein said network operates in accordance with the UMTS Standard.

Fig.1.

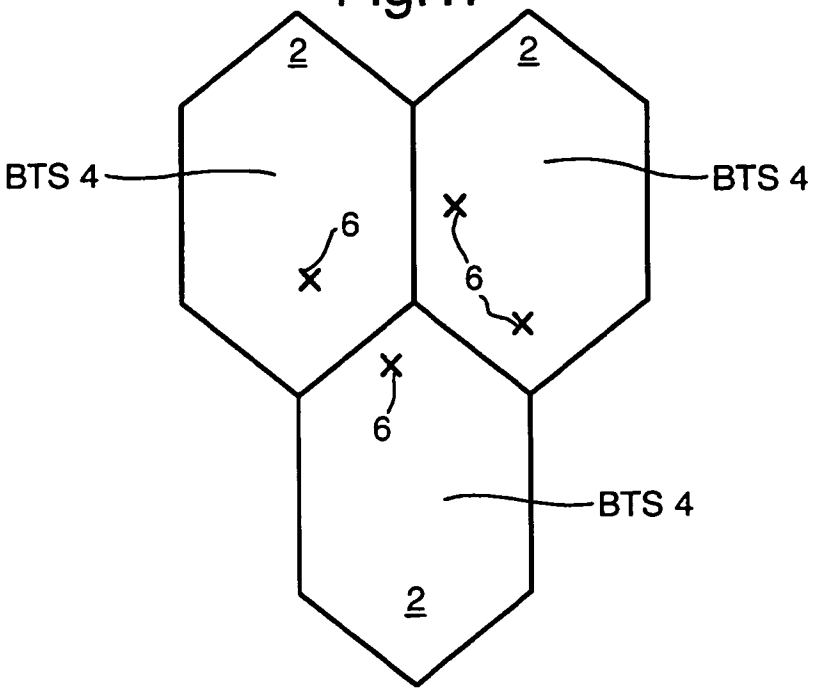


Fig.2A.

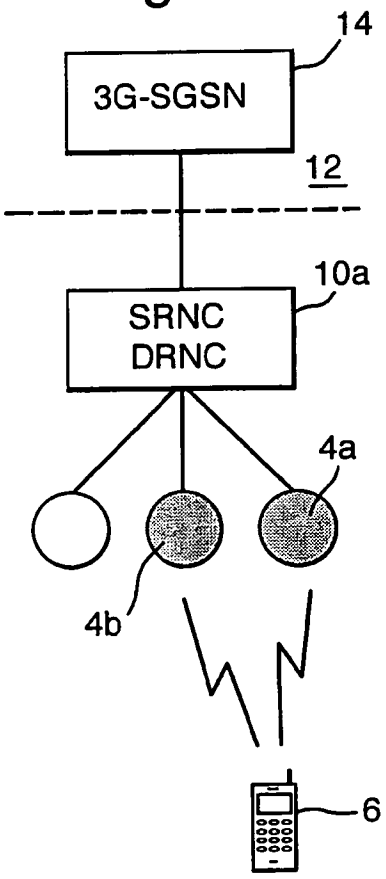


Fig.2B.

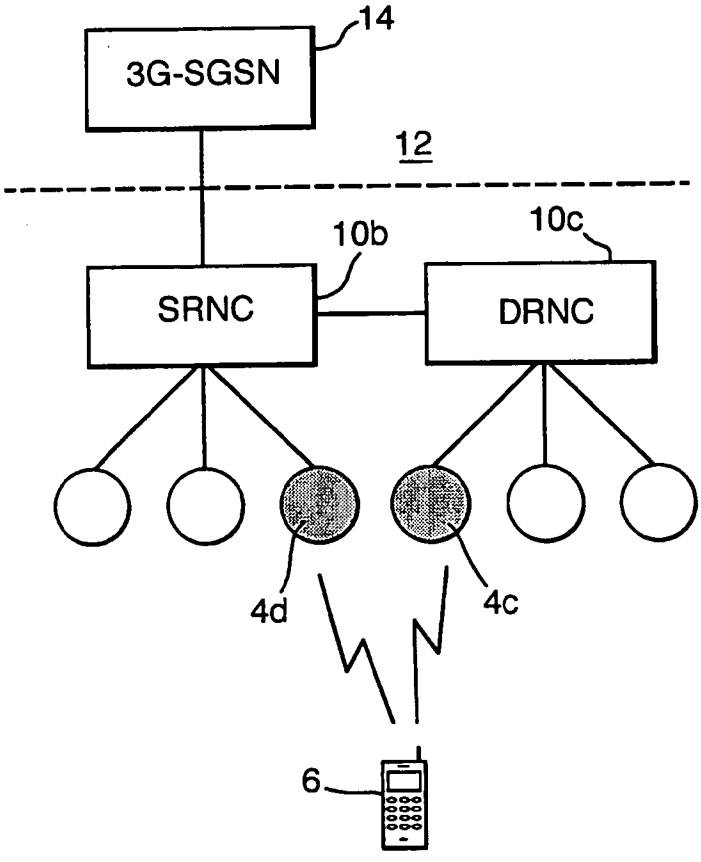


Fig.3A.

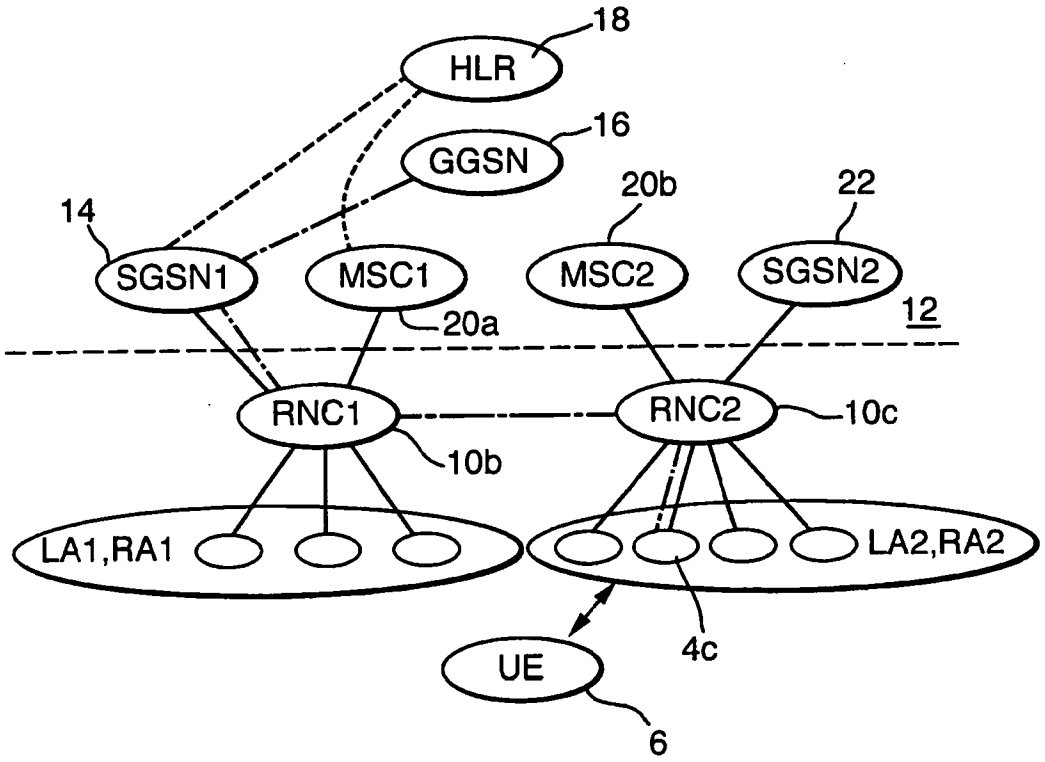

18
HLR
16
GGSN
20b
22
14
SGSN1
MSC1
MSC2
SGSN2
20a
12
RNC1
RNC2
10c
10b
LA1,RA1
LA2,RA2
4c
UE
6

Fig.3B.

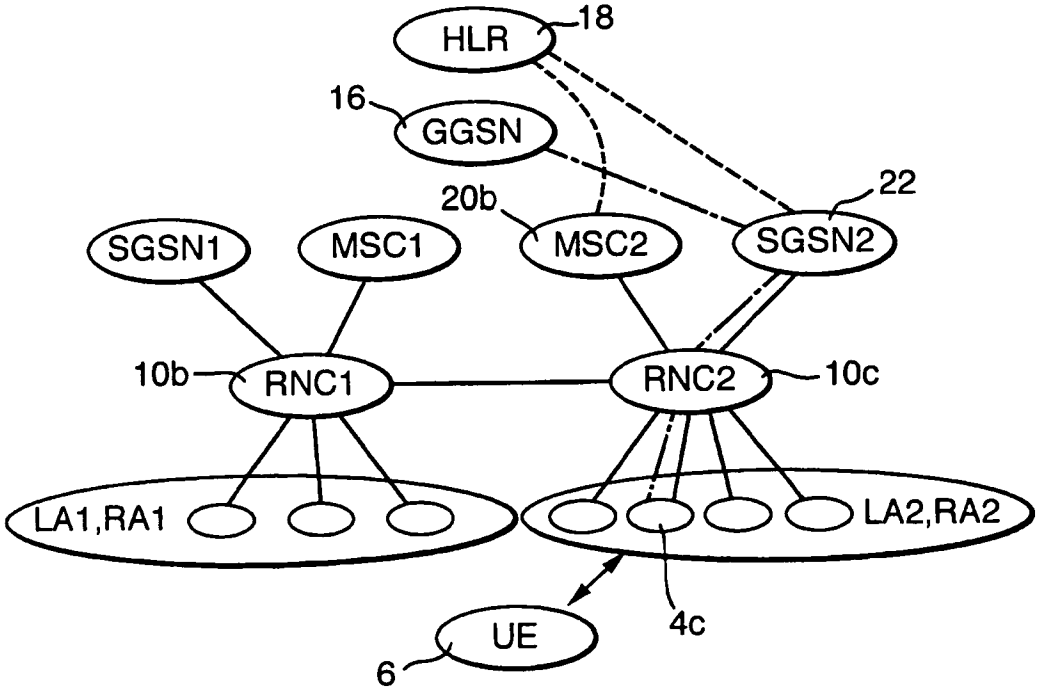

18
HLR
16
GGSN
22
20b
SGSN1
MSC1
MSC2
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4c
UE
6

Fig.4.

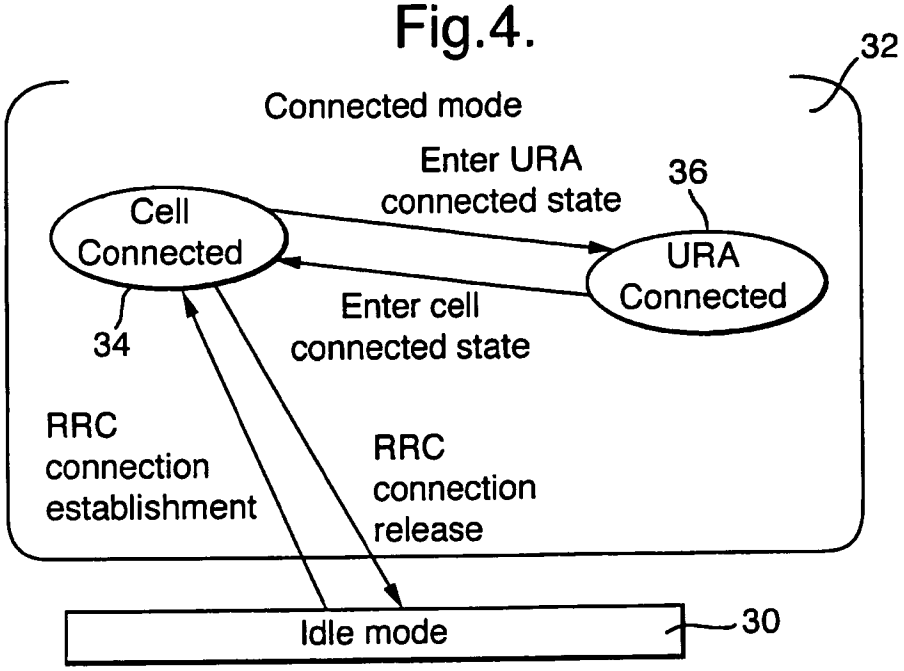


Fig.5.

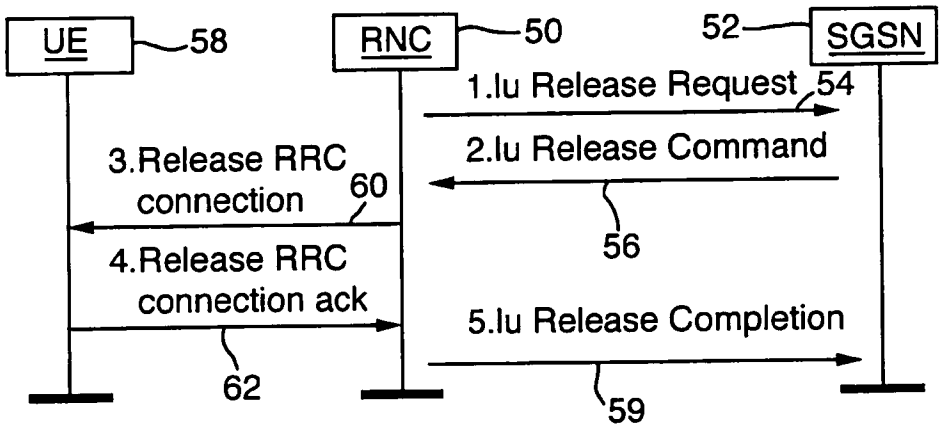
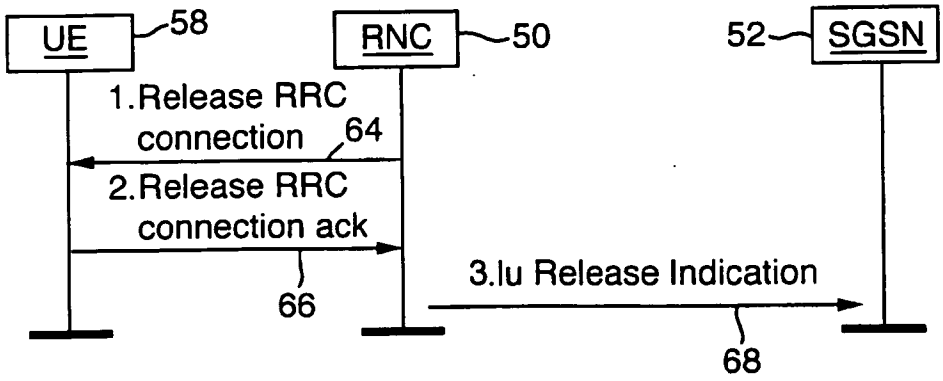


Fig.6.



INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/EP 00/04231

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

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 7 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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP 0 568 212 A (NOKIA MOBILE PHONES LTD) 3 November 1993 (1993-11-03) column 4, line 34 -column 5, line 28	1-3,16, 17,19,20 4
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Inter ...nal Application No
PCT/EP 00/04231

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter ...nal Application No
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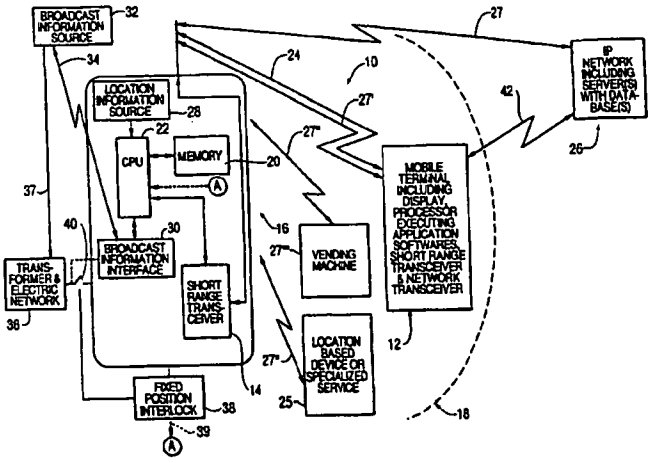
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(54) Title: METHOD AND SYSTEM FOR CONNECTING A MOBILE TERMINAL TO A DATABASE



(57) Abstract: The invention is a communication system (10) and a method of communication. The communication system includes an information source (20); a position transceiver (14) disposed at a broadcast location (16) and coupled to the information source, the position transceiver broadcasting information from the information source within a broadcast area (18) where the position transceiver is located, the information including identification information relating to the information source; a mobile terminal (12) within the broadcast area comprising first and second transceivers (44 and 46), the first transceiver communicating with the position transceiver; a network (42) communicating with the second transceiver; and a database (26), communicating with the network, storing information which is transmitted to the second transceiver associated with the identification information in response to the database receiving at least the identification information by transmission of the network from the mobile terminal to the database.

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

METHOD AND SYSTEM FOR CONNECTING A MOBILE TERMINAL TO A DATABASE

BACKGROUND OF THE INVENTION

The invention relates to a system and method for transmitting information to a mobile terminal from an information source which transmitted information is transmitted by the mobile terminal to a database to fetch information associated with the transmitted information stored in the database for transmission back to the mobile terminal.

BACKGROUND ART

Advertisement media in publicly travelled places have the objective of obtaining the interest of a passerby. Typically, advertisements contain information which is directed to the consumer to obtain the consumers interest and further provide contact information, such as a telephone number or a fax number, where further information about the advertised goods or services may be obtained. Since the advent of IP networks (e.g., the internet), a uniform resource locator (URL) reference is also typically given in advertisements which enables the user to download information to a computer from an IP network about the advertisement to provide a more detailed consideration of the advertised goods or services.

Additionally, systems have been proposed in which the location of a user controls the accessing of an information source, such as a server based service. These systems may use a GPS receiver or a mobile telephone to provide the user's location to a system to control accessing of the information source which is particular to the users location.

Location services and location based services are becoming more important in telecommunication networks. It is possible to localize and indicate the position of a mobile telephone

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used, for example, for emergency calls. Many existing and new telecommunications services will benefit from knowing the position of the terminal being used. The drawback in current and planned telecommunications networks is that it is not possible to determine the position of the terminal being used or in an idle state accurately enough for all types of position dependent services in all circumstances. The achievable position determining accuracy is around 100m within a cellular network and around 10m with GPS. Not all mobile terminals will have GPS functionality.

Mobile terminals, which utilize cellular communications, are suitable for connecting a user to a website or other database to obtain information. The obtaining of information by a mobile terminal typically uses a linkage between a cellular telephone network to which the terminal subscribes and an IP network. However, the user of a mobile terminal, in order to access advertisement information or other sources of information, is required to write down from the advertisement the information for linking the mobile terminal to the website or other database, and use that information to connect the mobile terminal to an IP service provider to fetch information from the website or database. While it is possible to link an advertisement with a mobile terminal using cellular communications, such a cellular linkage has the disadvantage in highly crowded places, such as airports, of requiring substantial network capacity to link the advertisement to a large number of persons carrying mobile terminals which are passing by the advertisement.

Low power RF systems have been proposed, e.g. Bluetooth, for providing communications between a number of transceivers without or in a local area network by a short range radio link having a broadcast range of a few meters. Such systems will be commercially available in the near future and are designed to operate in open spectrum, e.g. 2.4 gigahertz.

Additionally, low power optical communication systems using an infrared carrier have been proposed which will provide

a linkage between a number of transceivers over a short range. These systems will perform functions similar to Bluetooth.

DISCLOSURE OF THE INVENTION

The present invention is a communication system and a method of communication which provides connectivity between at least one information source which provides information, such as information relating to location based services, at least one mobile terminal and at least one database. With the invention, at least one position transceiver is disposed at a broadcast location and is coupled to the information source. The information source provides information to the position transceiver which is broadcast to the at least one mobile terminal.

The position transceiver overcomes the location problems of the prior art by indicating and transmitting its own very exact predefined position to at least one mobile terminal within range and which is able to receive this information. The at least one mobile terminal can then communicate this position to a network and servers connected to the network to access information, such as information related to or part of position dependent services offered to the user of the mobile terminal.

In one preferred embodiment of the invention, the position transceiver is connected to a network server by fixed telephone lines or wireless connections. This connectivity enables the network server to update the information which is broadcasted by the position transceiver.

In another preferred embodiment of the invention, the information which is broadcasted is changed using a keyboard of the position transceiver or a PC connected to the position transmitter. The position transmitter only accepts appropriately authenticated changes.

The position transceiver can broadcast information to the mobile terminal continuously or on request of the user of the mobile terminal or only when the position transceiver

recognizes by any known mechanism that a mobile terminal or a mobile user of the mobile terminal is in the vicinity of the position transceiver.

The at least one position transceiver broadcasts information directed to the user of each mobile terminal to induce the user to communicate with the at least one database to retrieve information stored in each database over a network. The information broadcast by each position transceiver includes identification information which is related to and identifies the information source and which is transmitted by the mobile terminal over the network to the at least one database to address or identify the information in each database which is transmitted by the network back to the mobile terminal to enable the user thereof to use the retrieved information which is associated with the information source at the broadcast location. A display, which is part of each mobile terminal, enables the user to selectively review the information broadcast from a plurality of position transceivers and choose which information sources in each database from which the user wishes to obtain additional information associated with any of the identification information broadcast from the position transceivers. The broadcast information, may without limitation, be diverse types of information such as, but not limited to, advertising information and includes identification information relating to the source of the broadcast information.

Each mobile terminal is located within a broadcast area defined by the broadcast range of the at least one position transceiver located at a broadcast location. The at least one position transceiver preferably has a limited broadcast range so that the broadcast range is limited within the optical view of the users of the mobile terminals as they pass by the broadcast location.

Each mobile terminal is a multimode transceiver which operates in short range and cellular modes, and includes first and second transceivers. The first transceiver communicates

with at least one position transceiver and receives broadcasts therefrom which preferably are of limited range. While not limited thereto, the first transceiver may use a low power optical or RF broadcast communications to connect each position transceiver at the broadcast location to the first transceiver and the information source. A network communicates with the second transceiver which may be, without limitation, a cellular network connected to an IP network. Each database communicates with the network and stores information which is transmitted to the second transceiver of each mobile terminal associated with the identification information.

In a preferred operational mode of the present invention, the user of the mobile terminal passes within the broadcast area of at least one position transceiver disposed at a broadcast location. Each position transceiver either continually broadcasts information to the broadcast area, which permits each user of a mobile terminal to view with a display which is part of the mobile terminal information received by the first transceiver thereof which is being broadcast to the user, such as advertisement information and the identification information, which is used to fetch the information stored in each database by transmission from the second transceiver by the network to each database or broadcasts upon demand of the user of the mobile terminal to the mobile terminal.

Each mobile terminal includes a processor and associated memory. The associated memory stores the information received from each position transceiver by the first transceiver permitting the user of the mobile terminal at the time of reception or at a later time to utilize the second transceiver to connect to addressable areas in each database using the identification information transmitted to the first transceiver.

The identification information which is used to retrieve information for transmission to the second transceiver may be of many different types. For example, the identification information may be a function of a geographic position of the

broadcast location at which each information transceiver is located and may comprise one or more of geographical coordinates, the elevation of the broadcast location, an address of the broadcast location, including street address, or a pointer, or a uniform resource locator, which is an address or provides an identification of the information stored in the database associated with the identification information. While the invention is not limited thereto, the network in a preferred embodiment includes a cellular telephone network which is connected to an IP network which facilitates transmission by the transmission control protocol/internet protocol (TCP/IP).

In a preferred embodiment of the present invention, the broadcast location includes a plurality of information sources and a plurality of position transceivers disposed at the broadcast location respectively coupled to a different one of the plurality of information sources. Each position transceiver broadcasts information including identification information relating to one of the information sources from the broadcast location. The broadcast location includes a display which displays information relating to the information which is broadcast including the identification information broadcasted by each of the plurality of position transceivers. Each database stores information which is transmitted to the second transceiver associated with the identification information of the plurality of position transceivers in response to each database receiving at least the identification information by transmission by the network from the mobile terminal to each database.

A billboard type display may be utilized to display advertisement information or other information from a plurality of information sources which are viewed from a public place, such as an airport, through which multiple users of mobile terminals pass to attract their attention in a classic advertising manner. The billboard may continuously broadcast via the plurality of position transceivers over a limited range

(low power) RF or optical transmission medium information which is directed to the passersby with mobile terminals from each of the information sources. An activation switch may be associated with each of the information sources to permit the passers by to selectively activate the position transceiver associated with the information source to which the passerby is attracted by display of information on the billboard type display. Finally, the broadcast may be activated by detecting the presence of the passersby by a known mechanism, such as a motion detector, to activate the position transceivers to broadcast the information.

There are numerous applications for the position transceiver besides transmitting advertisement information. These additional applications are: emergency calls; navigational services in which the user of the mobile terminal is provided information how to travel from point A to point B; calibration of the location of the mobile terminal in a cellular network and calibration of the cellular network to determine location of mobile terminals; location based services, e.g. printing a document at the closest available printer; informing the user of the mobile terminal of special services available only at the broadcast location of the position transmitters, such as special telecommunications services; transmission of price information about goods and services and payment information, the user of the mobile terminal in response thereto sends the requested payment as a short message service (SMS) to a network server, and the position transceiver in response thereto receives payment acknowledgment from the network server receiving the payment and transmits the payment acknowledgment to the user of the mobile terminal and provides a transmission permitting the user of the mobile terminal to have access to the purchased goods or services.

A method of transmitting data in a communications system including an information source, a position transceiver coupled to the information source and disposed at a broadcast location,

a mobile terminal within a broadcast area, the mobile terminal comprising first and second transceivers with the first transceiver communicating with the position transceiver, a network communicating with the second transceiver and at least one database, communicating with the network and storing information associated with the identification information includes broadcasting information including identification information relating to the information source with the position transceiver to the first transceiver within the broadcast area; transmitting at least the identification information from the second transceiver with the network to the database; and in response to the database receiving at least the identification information, transmitting from the database the stored information associated with the identification information to the second transceiver. The identification information comprises information which is a function of a geographic position of the broadcast location which may be one or more of geographical coordinates, elevation of the broadcast location, an address of the broadcast location, which may be a street address, and further, a location within the street address, or a pointer, or a uniform resource locator which is an address of or identifies the information associated with the identification information in the database.

In a preferred embodiment of the method, the broadcast location comprises a plurality of information sources; a plurality of position transceivers disposed at the broadcast location respectively coupled to a different one of the plurality of information sources, each position transceiver broadcasting information including identification information relating to one of the information sources from the broadcast location; and a display which displays information relating to the information broadcasted by each of the plurality of position transceivers. Information which is stored in the database is transmitted to the second transceiver associated with the identification information of the plurality of position transceivers in response to the database receiving at

least the identification information by transmission by the network from the second transceiver of the mobile terminal to the database. The information which is broadcasted from each of the plurality of position transceivers may include a webpage or application software which is executed by a processor in the mobile terminal which controls the first and second transceivers. The application software may comprise without limitation a program for opening a window or a web browser for searching the information stored in the database identified by the identification information.

The broadcasted information may be encrypted. The position information transmitted from the second transceiver to the database may be signed by the user of the mobile terminal of when the information was transmitted from the information transceiver to the mobile terminal to indicate the user's current location to permit database verification that the user is where the user should be; and the database checks validity of the signature, decrypts the information which is received from the network and checks validity of the time stamp and if the time stamp and signature are valid, the database transmits the stored information associated with the identification information with the network to the second transceiver.

The plurality of position transceivers of the broadcast location may cease to broadcast the information when the plurality of information transceivers are moved. A device may be provided at the broadcast location which senses when the plurality of position transceivers are moved and which disables transmission of the information when movement is sensed. The device for sensing movement may be of diverse designs and may be a mechanical connection between the information transceivers and a physical location at which the information transceivers are located which, when opened, disables their normal function, e.g. by disconnecting electrical power. As an alternative, the position transceiver can start transmitting an error indication if the position transceiver is moved.

In a preferred embodiment of the method, each position transceiver broadcasts the information with a limited range RF carrier or a limited range infrared carrier and the network comprises a cellular telephone network and an IP network.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates a system diagram of an embodiment of the present invention.

Fig. 2 illustrates a schematic diagram of a mobile terminal in accordance with the present invention.

Fig. 3 illustrates a preferred embodiment of the broadcast location at which a plurality of position transceivers are located which are designed to communicate with multiple users of terminals in a public place which pass within broadcast range of the plurality of information transceivers.

Fig. 4 illustrates a memory map of a preferred embodiment of the database of the system of Fig. 1.

Like reference numerals identify like parts throughout the drawings.

BEST MODE FOR CARRYING OUT THE INVENTION

Fig. 1 illustrates a communication system 10 in accordance with the present invention. The communication system 10 provides a mechanism by which a user of a mobile terminal 12 receives information broadcast by a position transceiver 14 which without limitation has a short (limited) range and which is part of a broadcast location 16 which broadcasts information within a broadcast area 18. Only one position transceiver 14 is illustrated, but it should be understood that in a preferred embodiment of the present invention, a plurality of position transceivers are part of the broadcast location as described below in conjunction with Fig. 3. The position transceiver 14 broadcasts information, which is stored in memory 20, under the control of CPU 22, by means of a low power RF or infrared link 24. In a preferred form of the present invention, the link 24 may be in accordance with the Bluetooth specification

which has been proposed in unregulated spectrum, such as 2.4 GHz or known or proposed infrared communication links. In a preferred embodiment of the specification as illustrated in Fig. 2, a plurality of information transceivers 14, simultaneously, on demand or upon detection of a user of the mobile terminal 12 by any known mechanism within broadcast area 18, broadcast information via the low power RF or infrared link 24 to one or more mobile terminals 12 located within the broadcast area.

The information which is broadcast via the link 24 is diverse in nature and includes identification information. The information which is broadcast by at least one position transceiver 14 includes without limitation advertisements, information relating to making emergency calls, information relating to providing navigation services to enable a user of the mobile terminal 12 to move from a first position to a second position, information for calibrating a position of the mobile terminal 12 within a cellular network providing connection to the network transceiver therein or for calibrating the network positioning determination function, information relating to location and location based devices or services 25 which are proximate to the broadcast location and the mobile terminal from which the user of the mobile terminal receives goods or services after communication of the mobile terminal with a database within IP network including servers with database 26, such as printing a document by a closest available printer, information informing a user of the special services, such as telecommunications available only at the location of the position transceiver with the advertisement information including a price of goods or services and a requested form of payment indication with the user sending with the mobile terminal the requested form of payment to the database using a short message system (SMS) format and the network transmitting acknowledgment of payment 27 from the database to the position transmitter 14 and the position transmitter transmitting the acknowledgment 27' of payment to

the user of the mobile terminal and access 27'' location based device or specialized service 25 or to machine 27''' providing the purchased goods or receiver.

Broadcast advertising information may be diverse in nature. Advertising information may be a webpage and identification information which provides the mobile terminal 12 with the ability to access an IP network, including server(s), with database 26 and specifically, information stored in the database associated with the identification information transmitted from the position transceiver 14 to the mobile terminal 12 via link 24. The identification information provides an address of the server, database, or a portion of the database at which the information associated with the identification information is stored.

The broadcast location 16 further includes a location information source 28, which may be a GPS receiver which informs the CPU 22 of the physical location of the position transceiver 14, to provide the CPU with one possible form of the identification information which is a function of the geographic position of the broadcast location, e.g. geographical coordinates, and the elevation of the broadcast location. Alternatively, the physical location may be programmed into the memory 20 at the time of setup of the system and entered by keyboard and a PC. The identification information may be a physical address of the broadcast location, such as the street address, and further information defining the location of the broadcast location 16 within the street address, such as floor and room number at which at least one position transceiver is located which is stored in the memory 20 as a consequence of this information being readily programmable. Furthermore, the identification information may be a pointer, which may be numerically based or a uniform resource locator (URL).

The function of the identification information, regardless of its content as described above, is to provide a linkage between the user of the mobile terminal 12, the information

source of the information transmitted by at least one position transceiver 14 and the information which is transmitted from the database within the IP network including servers with database 26 to the mobile terminal which is associated with the identification information broadcast from the at least one position transceiver 14 by the link 24 to the mobile terminal 12.

The broadcast location 16 facilitates the diverse applications discussed above, including marketing and advertising. The broadcast location obtains the initial interest of the user of the mobile terminal 12 by the displays 50 of information associated with the broadcast location 16 as described below in association with Fig. 3, or from a display 49' in Fig. 2 associated with the mobile terminal indicating the nature of the information being transmitted from the at least one position transceiver 14 to the mobile terminal 12, e.g. a webpage, etc. The user of the terminal 12 is then induced by the initial visual contact with the displays 49' and/or 50 to contact the database within the IP network, including server(s) with database, to obtain more information associated with the identification information.

The broadcast location 16 further includes a broadcast information interface 30. The broadcast information interface 30 is coupled to the CPU 22 and associated memory 20. The memory 20 functions as the source of broadcast information after it is inputted through the broadcast information interface 30. A broadcast information source 32, which may be a server in a network, is coupled to the broadcast information interface 20 by wireline (not illustrated), RF link 34, which may be cellular or other RF communications, or through modulation of information transmitted over the electric mains 37 to transformer and electric network 36. The broadcast information source 32 may be proximate to the broadcast location 16 or remote therefrom and provides the broadcast location with the capability of having the information which is broadcast updated. Alternatively, the broadcast information

source 32 may be eliminated by use of a keyboard or local PC at the location 16 to directly provide the information including identification to the memory 20 which is broadcast by the at least one position transceiver 14. A fixed position interlock 38 may be used to disable the application of electrical power from the transformer and electrical network 36 to the broadcast location 16 by opening switch 40 when the broadcast location 16 is physically moved or to cause an error message to be broadcast in response to signal 39 generated by the fixed position interlock. The fixed position interlock 38 may be, for example without limitation, a mechanical lock, hidden seals, a movement detector or magnetic sensor which, upon movement, causes switch 40 to open to disconnect electric power from the broadcast location 16 or to generate the signal 39 to cause the error message to be broadcast.

The mobile terminal 12 includes first and second transceivers which respectively are a transceiver which is connected to the broadcast location 16 via links 24 and 27 and a network transceiver, which is preferably a cellular transceiver, that is connected by RF link 42 to the IP network, including servers with database 26. However, it should be understood that the present invention is not limited to the use of a cellular network connected to an IP network including server(s) with database 26. Alternatively, the cellular network or other communication network may link the second transceiver directly to a database with or without a server.

Fig. 2 illustrates a block diagram of one form of a mobile terminal 12 which may be used to practice the invention. The mobile terminal 12 is a multimode receiver including a first transceiver 44 which communicates with the position transceiver 14 and may operate as a short range device without limitation in accordance with the Bluetooth RF specification or a limited range infrared specification and a second transceiver which operates as a network transceiver 46 which without limitation may be a cellular transceiver over which the user of the terminal 12 receives voice, PCS, etc.,

communications. The mobile terminal 12 has a main CPU 48 and associated memory 49 which stores the information which is transmitted and received by the first and second transceivers 44 and 46. The main CPU 48 executes software which transfer the information received by the first transceiver 44 to the second transceiver 46 and drives the display 49' which displays the information received from the at least one position transceiver 14 including, but not limited to, the identification information and other information for the above-identified diverse applications including advertising, such as a web page, browser, etc.

As has been described above, identification information, which is transmitted by the link 24, performs the function of addressing or identifying particular blocks of data within the database of the IP network, including servers with database 26, which are transmitted by link 42 to the network transceiver 46 within the mobile terminal 12. The information which is received from the database 26 by the network transceiver 46 enables the user of the mobile terminal 12 to obtain more detailed information about the information which is broadcast by the link 24 including display on display 49'. This function enhances the diverse applications discussed above, including an advertising function, by providing a complete linkage to the detailed source of information associated with the identification information broadcast by the broadcast location 16 stored within the database within the IP network including server(s) with database 26.

In normal operation, each mobile terminal 12, when it is within the broadcast area 18, displays on the display 49' information regarding the information being broadcast from the broadcast location 16. This enables the user of each mobile terminal 12, when multiple short range position transceivers 14 are used, to pick and choose from the information which is most interesting which is being broadcast from a plurality of information sources at the broadcast location 16. This information, which is displayed on the display 49' of the

mobile terminal 12, has associated with it the identification information which is transmitted via links 24 and 42 to the database within the IP network, including server(s) with database 26, to fetch the more detailed information stored in the database which is associated with the identification information for transmission back to the users of each mobile terminal 12 to enable the users to learn of more information regarding the source of the broadcast information from the location 16. This functionality facilitates advertisement and the other applications discussed above by obtaining the attention of users of mobile terminals 12 while at the same time not having to rely upon calls being made to cellular transceivers within the broadcast area 18. With the present invention, the information that is broadcast to each mobile terminal 12 when the users are within the broadcast area 18 contains sufficient information to obtain the attention of the users and to enable the users to obtain complete access to information stored in the remote databases, such as manufacturer's information to induce a sale, which is associated with the information, which is broadcast and/or displayed at the broadcast location 16, as described below in conjunction with Fig. 3.

The CPU 48 within the mobile terminal 12, which controls overall operation thereof, coordinates the transmission of information between the broadcast location 16 and the IP network, including server(s) with database 26. The CPU 48 processes the identification information which is received by the first short range transceiver 44 from the broadcast location 16 and is transmitted by the second network cellular transceiver 46 to the IP network including server(s) with database 26. The CPU 48 provides accessability to the memory 49 therein to both of the first and second transceivers 44 and 46 so as to facilitate transmission of information between the transceivers to provide the requisite information flow.

While the invention is not limited thereto, the identification information sent by the location position 16, may contain added information for security reasons. The information which is transmitted from the broadcast location 16 by link 24 to the mobile terminal 12 may include unencrypted information and encrypted information. The encrypted information may include as part of its identifying information, a time stamp with all of the encrypted information being encrypted by a MLC public key which may be encrypted, for example, with RSA public key cryptography. The encrypted message may be signed by the user with secret key. The server in the IP network, including server(s) with database 26, checks the signature, decrpyts the transmission of information from the mobile terminal 12, and determines if the time stamp is valid. If all of this information is verified, the server within the IP network including server(s) with database 26 may conclude with a high probability that the user of the mobile terminal 12 is in fact an authorized user and provide the user of the mobile terminal 12 with access thereto.

Fig. 3 illustrates a preferred embodiment of the broadcast location 16. The location source 16 includes a plurality of information sources 50 which are N in number. Each information source 50 provides a display of information and has an associated display driver including processor which is designed to attract the attention of the users of the mobile terminal 12 to induce the users to communicate with the databases within the IP network, including server(s) with database 26, to obtain more detailed information associated with the identification information which is transmitted by the communication link 24. Each information source 50 is associated with a particular position transceiver 14 so that the visual impression produced by the display thereof is related to the information which is transmitted to the mobile terminals 12 and displayed on the display 49' thereof and is related to the identification information which performs the function of addressing or identifying particular information stored in the database of

the IP network, including server(s) with database 26. The stored information, which is identified by the identification information, is transmitted by link 42 back to the second transceiver 46, as described below in association with Fig. 4 or via link 27 to the broadcast location 16. Each information transceiver 14 may include an on/off switch 52 which is associated with a correspondingly identified display 50 and which, upon activation by the user of the mobile terminal 12 within the broadcast area 18, causes the information, including identification information, to be transmitted by the link 24 to the user's terminal 12.

The displays 50 are a form of billboard and may contain diverse information but in environments where marketing is to be performed, the information is directed to soliciting the attention of the users of the mobile terminals 12 to obtain more information about the goods or services available for purchase which are described in the display. The particular displays 50 are not limited to any particular configuration and the overall broadcast location 16 of Fig. 3 may be located at a table with each of the individual transceivers 14 being located on the table.

Fig. 4 illustrates a memory map 100 of an individual server in the IP network including server(s) with database 26. The database 102 includes a plurality of bodies of information which are N in number which correspond to the N information sources of the broadcast location 16. Each information source 104 is addressed or identified by the identification information broadcasted over the link 24 to the mobile terminal 12 and transmitted by the network over link 42 to the server including the database 102. The server associated with the database 102, in response to the identification information, fetches a particular block of information 104 associated with the identification information. The fetched information is transmitted over communication link 42 to the mobile terminal 12 to enable the user thereof to learn more about the goods or services or other information associated

with the individual information sources 50 of the broadcast locations of Fig. 2.

While the invention has been described in terms of its preferred embodiments, it should be understood that numerous modifications may be made thereto without departing from the spirit and scope of the invention as defined in the appended claims. It is intended that all such modifications fall within the scope of the appended claims.

CLAIMS

1. A communication system comprising:

an information source;

a position transceiver disposed at a broadcast location and coupled to the information source, the position transceiver broadcasting information from the information source within a broadcast area where the position transceiver is located, the broadcasted information including identification information relating to the information source;

a mobile terminal within the broadcast area comprising first and second transceivers, the first transceiver communicating with the position transceiver;

a network communicating with the second transceiver; and

a database, communicating with the network, storing information which is transmitted to the second transceiver associated with the identification information in response to the database receiving at least the identification information by transmission of the network from the mobile terminal to the database.

2. A communication system in accordance with claim 1 wherein:

the identification information comprises information which is a function of a geographic position of the broadcast location.

3. A communication system in accordance with claim 2 wherein:

the identification information comprises geographical coordinates.

4. A communication system in accordance with claim 3 wherein:

the identification information further comprises elevation of the broadcast location.

5. A communication system in accordance with claim 2 wherein:
the identification information comprises an address of the broadcast location.

6. A communication system in accordance with claim 5 wherein:
the address is a street address.

7. A communication system in accordance with claim 6 wherein:
the identification information further defines a location within the street address.

8. A communication system in accordance with claim 1 wherein:
the identification information is a pointer which identifies a location of the position transceiver associated with corresponding data of the database where the information which is transmitted to the second transceiver is stored.

9. A communication system in accordance with claim 1 wherein:
the identification information, which is broadcasted from the position transceiver, includes a uniform resource locator which is an address of the information associated with the identification information in the database in the network.

10. A communication system in accordance with claim 1 wherein the broadcast location comprises:
a plurality of information sources;
a plurality of position transceivers disposed at the broadcast location respectively coupled to a different one of

the plurality of information sources, each position transceiver broadcasting information including identification information relating to one of the information sources from the broadcast location; and

a display which displays information relating to the information broadcasted by each of the plurality of position transceivers; and wherein

the database stores information which is transmitted to the second transceiver associated with the identification information of the plurality of position transceivers in response to the database receiving at least the identification information by transmission of the network from the mobile terminal to the database.

11. A communication system in accordance with claim 10 wherein:

the identification information, which is broadcasted from each of the plurality of position transceivers, includes a uniform resource locator which is an address of the information associated with the identification information in the database in the network.

12. A communication system in accordance with claim 10 wherein:

the information, which is broadcasted from each of the plurality of position transceivers, includes a web page.

13. A communication system in accordance with claim 10 wherein:

the information, which is broadcasted from each of the plurality of position transceivers, includes application software which is executed by a processor in the mobile terminal.

14. A communication system in accordance with claim 13 wherein:

the application software comprises an application program for opening a window.

15. A communication system in accordance with claim 13 wherein:

the application software comprises a web browser for searching the information stored in the database identified by the identifying information.

16. A communication system in accordance with claim 1 wherein:

the information is encrypted.

17. A communication system in accordance with claim 16 wherein:

the transmission of the information from the mobile terminal to the database is signed by a user of the mobile terminal with a time stamp of when the information was transmitted from the position transceiver to the mobile terminal to indicate the user's current location to permit database verification that the user is where the user should be; and

the database checks validity of the signature, decrypts the encrypted information which is received from the network and checks validity of the time stamp and if the time stamp and signature are valid, the database transmits the stored information associated with the identification information via the network to the second transceiver.

18. A communication system in accordance with claim 10 wherein:

the plurality of position transceivers of the broadcast location cease to broadcast the information when the plurality of position transceivers are moved.

19. A communication system in accordance with claim 18 wherein:

the broadcast location includes a device which senses when the plurality of position transceivers are moved and which disables transmission of the information when movement of the plurality of position transceivers is sensed.

20. A communication system in accordance with claim 1 wherein:

the position transceiver broadcasts the information with a limited range RF carrier.

21. A communication system in accordance with claim 1 wherein:

the position transceiver broadcasts the information with an infrared carrier.

22. A communication system in accordance with claim 10 wherein:

the broadcast location includes a device which senses when the plurality of position transmitters are moved; and

the plurality of position transceivers transmit an error indication when the device senses the plurality of information transceivers are moved.

23. A communication system in accordance with claim 1 wherein:

the broadcasted information includes an advertisement.

24. A communication system in accordance with claim 1 wherein:

the broadcasted information includes an emergency call.

25. A communication system in accordance with claim 1 wherein:

the broadcasted information includes information providing a service to enable a user of the mobile terminal to move from a first location to a second location.

26. A communication system in accordance with claim 1 wherein:

the broadcasted information provides calibration of where the mobile terminal is located in the network.

27. A communication system in accordance with claim 1 wherein:

the broadcasted information provides position calibration of the network.

28. A communication system in accordance with claim 1 wherein:

the broadcasted information relates to services which are available to a user of the mobile terminal when the user is in a vicinity of the broadcast location.

29. A communication system in accordance with claim 1 wherein:

the broadcasted information relates to communication services which are available to a user of the mobile terminal only when the user is in a vicinity of the broadcast location.

30. A communication system in accordance with claim 1 wherein:

the broadcasted information relates to a price for goods or services and an indication where payment may be transmitted if a user of the mobile terminal wishes to purchase the goods or services; and

the mobile terminal transmits payment for purchasing the goods or services to the database.

31. A communication system in accordance with claim 30 wherein:

acknowledgment of the payment is transmitted to the position transmitter and;

the position transceiver transmits the payment acknowledgment to the mobile terminal.

32. A communication system in accordance with claim 31 wherein:

the transmission of the payment acknowledgment to the mobile terminal also permits the user of the mobile terminal to have access to the purchased goods or services.

33. A method of transmitting data in a communication system including an information source, a position transceiver coupled to the information source and disposed at a broadcast location, a mobile terminal within a broadcast area comprising first and second transceivers with the first transceiver communicating with the position transceiver, a network communicating with the second transceiver and a database, communicating with the network, storing information associated with the identification information comprising:

broadcasting with the position transceiver information including identification information relating to the information source to the first transceiver within the broadcast area;

transmitting at least the identification information from the second transceiver with the network to the database; and

in response to the database receiving at least the identification information, transmitting from the database the stored information associated with the identification information to the second transceiver.

34. A method in accordance with claim 33 wherein:

the identification information comprises geographical coordinates.

35. A method in accordance with claim 34 wherein:
the identification information further comprises an elevation of the broadcast location.

36. A method in accordance with claim 35 wherein:
the identification information comprises an address of the broadcast location.

37. A method in accordance with claim 36 wherein:
the identification information further defines a location within a street address.

38. A method in accordance with claim 33 wherein:
the identifying information is a pointer which identifies a location of the position transceiver associated with corresponding data of the database where the information which is transmitted to the second transceiver is stored.

39. A method in accordance with claim 33 wherein:
the broadcast location comprises a plurality of information sources, a plurality of position transceivers disposed at the broadcast location respectively coupled to a different one of the plurality of information sources, each position transceiver broadcasting information including identification information relating to one of the information sources from the broadcast location;
a display which displays information relating to the information broadcasted by each of the plurality of position transceivers; and
information, stored in the database associated with the identification information of the plurality of position transceivers, is transmitted to the second transceiver in response to the database receiving at least the identification

information by transmission by the network from the mobile terminal to the database.

40. A method in accordance with claim 33 wherein:

the identification information, which is broadcasted from the position transceiver, includes a uniform resource locator which is an address of the information associated with the identification information in the database in the network.

41. A method in accordance with claim 39 wherein:

the identification information, which is broadcasted from each of the plurality of position transceivers, includes a uniform resource locator which is an address of the information associated with the identification information in the database in the network.

42. A method in accordance with claim 39 wherein:

the information, which is broadcasted from each of the plurality of position transceivers, includes a web page.

43. A method in accordance with claim 39 wherein:

the information, which is broadcasted from each of the plurality of position transceivers, includes application software which is executed by a processor in the mobile terminal.

44. A method in accordance with claim 43 wherein:

the application software comprises an application program for opening a window.

45. A method in accordance with claim 43 wherein:

the application software comprises a web browser for searching the information stored in the database identified by the identifying information.

46. A method in accordance with claim 33 wherein:
the information is encrypted.

47. A method in accordance with claim 46 wherein:
the transmission of the information from the second transceiver to the database is signed by a user of the mobile terminal with a secret key and includes a time stamp of when the information was transmitted from the position transceiver to the mobile terminal; and
the database checks validity of the signature, decrypts the information which is received from the network and checks validity of the time stamp and if the time stamp and signature are valid, the database transmits the stored information associated with the identification information via the network to the second transceiver.

48. A method in accordance with claim 39 wherein:
the plurality of position transceivers of the broadcast location cease to broadcast the information when the plurality of information transceivers are moved.

49. A method in accordance with claim 48 wherein:
the broadcast location includes a device which senses when the plurality of position transceivers are moved and which disables transmission of the information when movement is sensed.

50. A method in accordance with claim 33 wherein:
the position transceiver broadcasts the information with a limited range RF carrier.

51. A method in accordance with claim 33 wherein:
the position transceiver broadcasts the information with a limited range infrared carrier.

52. A method in accordance with claim 33 wherein

the network comprises a cellular telephone network and an IP network.

53. A method in accordance with claim 33 wherein:
the broadcast location includes a device which senses when the plurality of position transmitters are moved; and
the plurality of position transceivers transmit an error indication when the device senses the plurality of information transceivers are moved.

54. A method in accordance with claim 33 wherein:
the broadcasted information includes an advertisement.

55. A method in accordance with claim 33 wherein:
the broadcasted information includes an emergency call.

56. A method in accordance with claim 33 wherein:
the broadcasted information includes information providing a service to move from a first location to a second location.

57. A method in accordance with claim 33 wherein:
the broadcasted information provides calibration of where the mobile terminal is located in the network.

58. A method in accordance with claim 33 wherein:
the broadcasted information provides calibration of the network.

59. A method in accordance with claim 33 wherein:
the broadcasted information provides calibration of position determination by the network.

60. A method in accordance with claim 33 wherein:

the broadcasted information relates to services which are available to a user of the mobile terminal when the user is in a vicinity of the broadcast location.

61. A method in accordance with claim 33 wherein:
the broadcasted information relates to communication services which are available to a user of the mobile terminal only when the user is in a vicinity of the broadcast location.

62. A method in accordance with claim 33 wherein:
the broadcasted information relates to a price for goods or services and an indication where payment may be transmitted if a user of the mobile terminal wishes to purchase the goods or services; and
the mobile terminal transmits payment for purchasing the goods or services to the database.

63. A method in accordance with claim 62 wherein:
acknowledgment of the payment is transmitted to the position transmitter and;
the transceiver transmits the payment acknowledgment to the mobile terminal.

64. A method in accordance with claim 63 wherein:
the transmission of the payment acknowledgment to the mobile terminal also permits the user of the mobile terminal to have access to the purchased goods or services.

65. A method in accordance with claim 33 wherein:
the information broadcasted with the position transceiver is continuously broadcast.

66. A method in accordance with claim 33 wherein:
the information broadcasted with the position transceiver is broadcasted upon activation of the position transmitter by the user of the mobile terminal.

67. A method in accordance with claim 33 wherein:

the information broadcasted with the position transceiver detection is broadcasted when presence of a user of the mobile terminal in a vicinity of the position transmitter is detected.

EX1002 - Page 867

FIG. 1

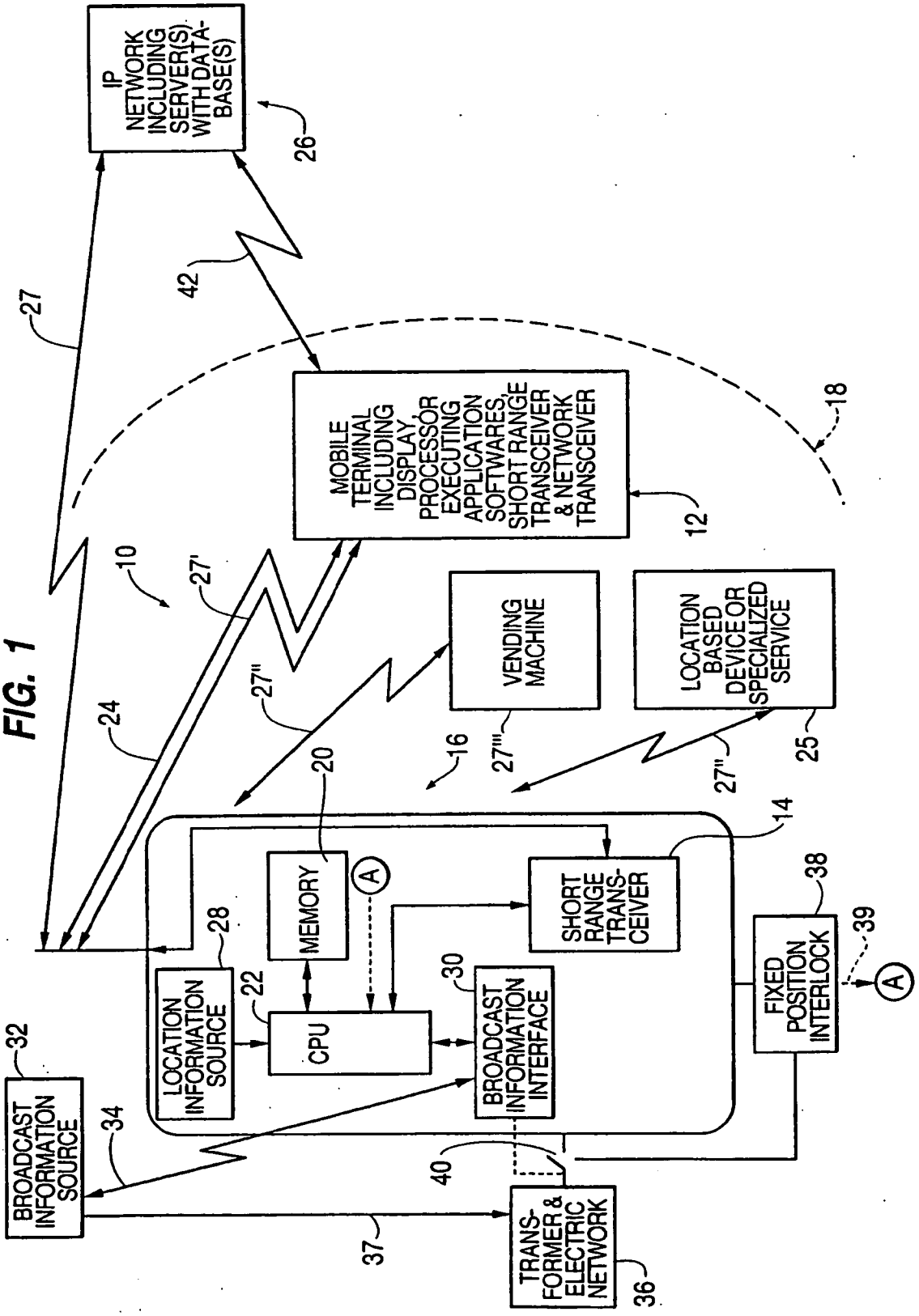

IP NETWORK INCLUDING SERVER(S) WITH DATA-BASE(S)
26
42
27
MOBILE TERMINAL INCLUDING DISPLAY, PROCESSOR EXECUTING APPLICATION SOFTWARES, SHORT RANGE TRANSCEIVER & NETWORK TRANSCEIVER
12
18
10
27'
VENDING MACHINE
LOCATION BASED DEVICE OR SPECIALIZED SERVICE
24
27"
16
27'''
25
20
14
MEMORY
A
SHORT RANGE TRANS-CEIVER
38
28
30
39
LOCATION INFORMATION SOURCE
22
CPU
BROADCAST INFORMATION INTERFACE
FIXED POSITION INTERLOCK
A
32
BROADCAST INFORMATION SOURCE
34
40
37
TRANS-FORMER & ELECTRIC NETWORK
36

FIG. 2

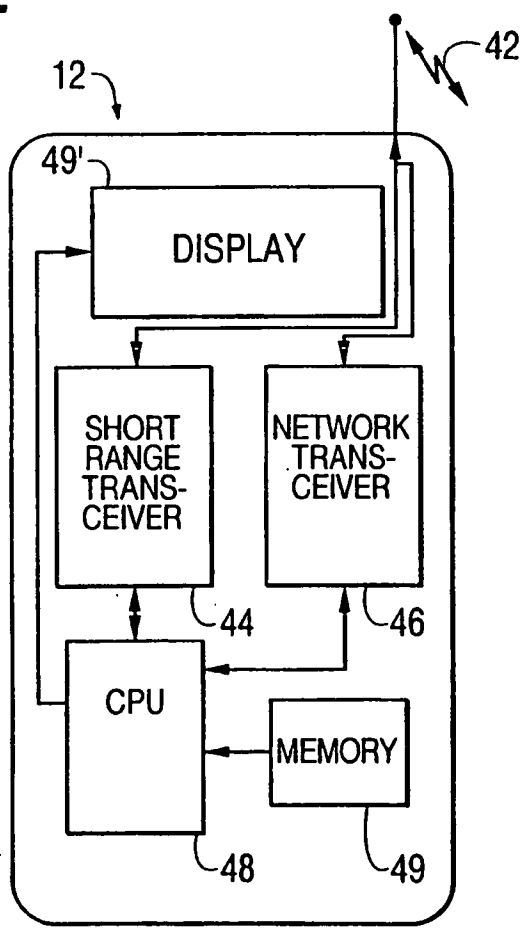

42
12
49'
DISPLAY
SHORT RANGE TRANS-CEIVER
NETWORK TRANS-CEIVER
44
46
CPU
MEMORY
48
49

FIG. 3

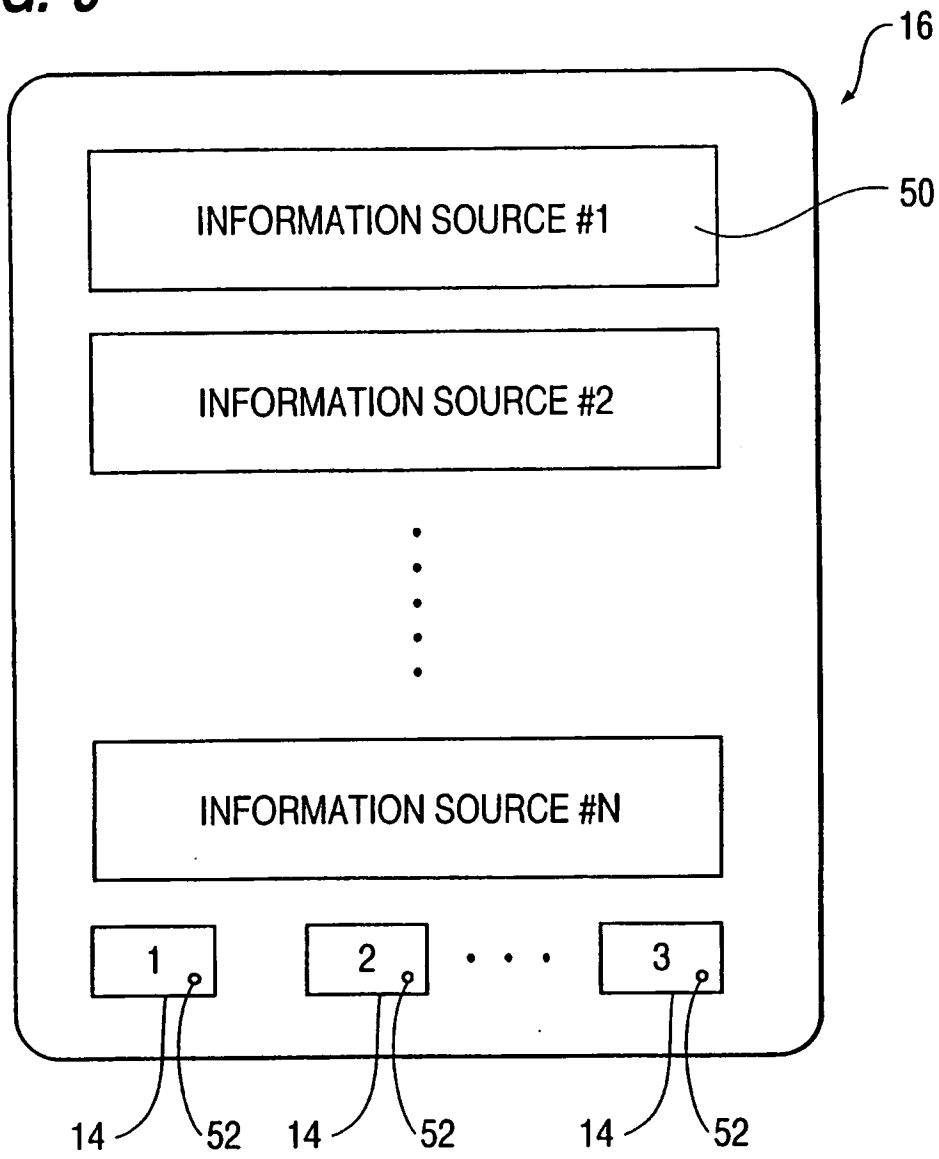
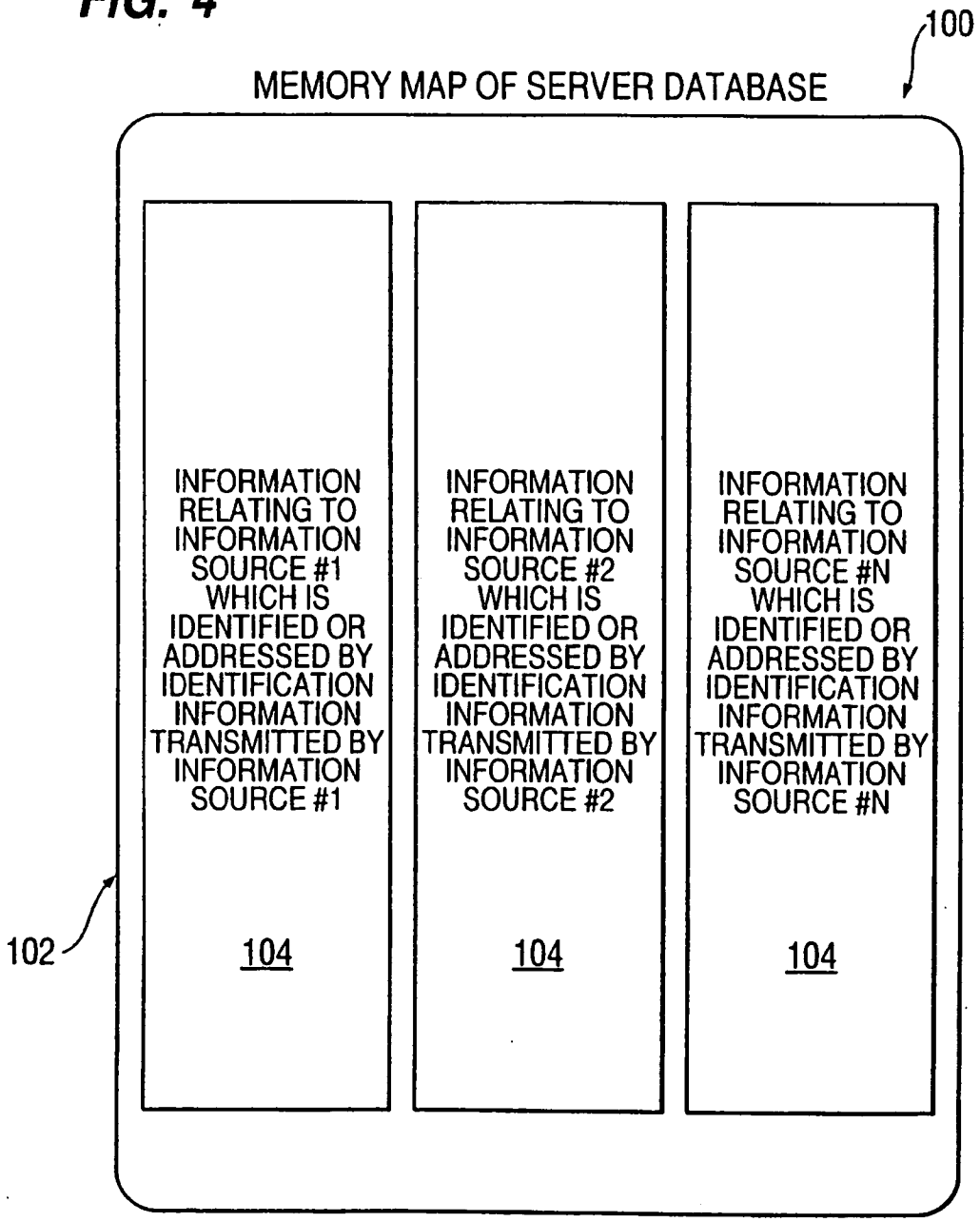

16
50
INFORMATION SOURCE #1
INFORMATION SOURCE #2
INFORMATION SOURCE #N
1
2
3
14
52
14
52
14
52

FIG. 4


100
MEMORY MAP OF SERVER DATABASE
INFORMATION RELATING TO INFORMATION SOURCE #1 WHICH IS IDENTIFIED OR ADDRESSED BY IDENTIFICATION INFORMATION TRANSMITTED BY INFORMATION SOURCE #1
104
INFORMATION RELATING TO INFORMATION SOURCE #2 WHICH IS IDENTIFIED OR ADDRESSED BY IDENTIFICATION INFORMATION TRANSMITTED BY INFORMATION SOURCE #2
104
INFORMATION RELATING TO INFORMATION SOURCE #N WHICH IS IDENTIFIED OR ADDRESSED BY IDENTIFICATION INFORMATION TRANSMITTED BY INFORMATION SOURCE #N
104
102

INTERNATIONAL SEARCH REPORT

Int ional Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/22

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 796 351 A (YABUKI TSUTOMU) 18 August 1998 (1998-08-18) column 1, line 57 -column 2, line 54 figure 1 --- -/--	1-9,16, 20,21, 23, 26-30, 33-38, 40,46, 50-52, 54, 57-62, 65-67

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"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

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"&" document member of the same patent family

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3

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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.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte onal Application No
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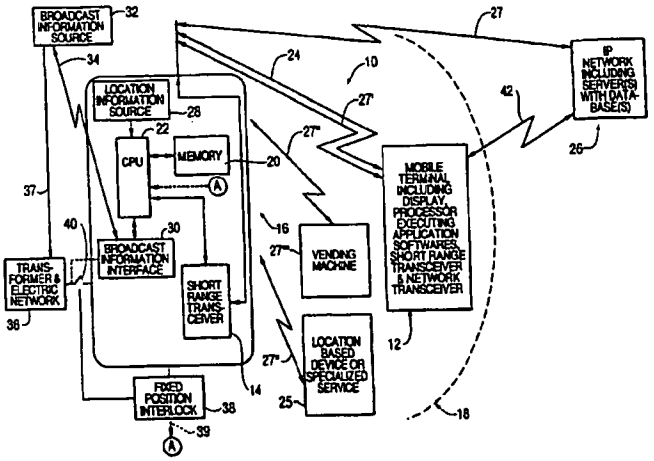
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[Continued on next page]

(54) Title: METHOD AND SYSTEM FOR CONNECTING A MOBILE TERMINAL TO A DATABASE



(57) Abstract: The invention is a communication system (10) and a method of communication. The communication system includes an information source (20); a position transceiver (14) disposed at a broadcast location (16) and coupled to the information source, the position transceiver broadcasting information from the information source within a broadcast area (18) where the position transceiver is located, the information including identification information relating to the information source; a mobile terminal (12) within the broadcast area comprising first and second transceivers (44 and 46), the first transceiver communicating with the position transceiver; a network (42) communicating with the second transceiver; and a database (26), communicating with the network, storing information which is transmitted to the second transceiver associated with the identification information in response to the database receiving at least the identification information by transmission of the network from the mobile terminal to the database.

WO 01/01711 A1

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

METHOD AND SYSTEM FOR CONNECTING A MOBILE TERMINAL TO A DATABASE

BACKGROUND OF THE INVENTION

The invention relates to a system and method for transmitting information to a mobile terminal from an information source which transmitted information is transmitted by the mobile terminal to a database to fetch information associated with the transmitted information stored in the database for transmission back to the mobile terminal.

BACKGROUND ART

Advertisement media in publicly travelled places have the objective of obtaining the interest of a passerby. Typically, advertisements contain information which is directed to the consumer to obtain the consumers interest and further provide contact information, such as a telephone number or a fax number, where further information about the advertised goods or services may be obtained. Since the advent of IP networks (e.g., the internet), a uniform resource locator (URL) reference is also typically given in advertisements which enables the user to download information to a computer from an IP network about the advertisement to provide a more detailed consideration of the advertised goods or services.

Additionally, systems have been proposed in which the location of a user controls the accessing of an information source, such as a server based service. These systems may use a GPS receiver or a mobile telephone to provide the user's location to a system to control accessing of the information source which is particular to the users location.

Location services and location based services are becoming more important in telecommunication networks. It is possible to localize and indicate the position of a mobile telephone

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used, for example, for emergency calls. Many existing and new telecommunications services will benefit from knowing the position of the terminal being used. The drawback in current and planned telecommunications networks is that it is not possible to determine the position of the terminal being used or in an idle state accurately enough for all types of position dependent services in all circumstances. The achievable position determining accuracy is around 100m within a cellular network and around 10m with GPS. Not all mobile terminals will have GPS functionality.

Mobile terminals, which utilize cellular communications, are suitable for connecting a user to a website or other database to obtain information. The obtaining of information by a mobile terminal typically uses a linkage between a cellular telephone network to which the terminal subscribes and an IP network. However, the user of a mobile terminal, in order to access advertisement information or other sources of information, is required to write down from the advertisement the information for linking the mobile terminal to the website or other database, and use that information to connect the mobile terminal to an IP service provider to fetch information from the website or database. While it is possible to link an advertisement with a mobile terminal using cellular communications, such a cellular linkage has the disadvantage in highly crowded places, such as airports, of requiring substantial network capacity to link the advertisement to a large number of persons carrying mobile terminals which are passing by the advertisement.

Low power RF systems have been proposed, e.g. Bluetooth, for providing communications between a number of transceivers without or in a local area network by a short range radio link having a broadcast range of a few meters. Such systems will be commercially available in the near future and are designed to operate in open spectrum, e.g. 2.4 gigahertz.

Additionally, low power optical communication systems using an infrared carrier have been proposed which will provide

a linkage between a number of transceivers over a short range. These systems will perform functions similar to Bluetooth.

DISCLOSURE OF THE INVENTION

The present invention is a communication system and a method of communication which provides connectivity between at least one information source which provides information, such as information relating to location based services, at least one mobile terminal and at least one database. With the invention, at least one position transceiver is disposed at a broadcast location and is coupled to the information source. The information source provides information to the position transceiver which is broadcast to the at least one mobile terminal.

The position transceiver overcomes the location problems of the prior art by indicating and transmitting its own very exact predefined position to at least one mobile terminal within range and which is able to receive this information. The at least one mobile terminal can then communicate this position to a network and servers connected to the network to access information, such as information related to or part of position dependent services offered to the user of the mobile terminal.

In one preferred embodiment of the invention, the position transceiver is connected to a network server by fixed telephone lines or wireless connections. This connectivity enables the network server to update the information which is broadcasted by the position transceiver.

In another preferred embodiment of the invention, the information which is broadcasted is changed using a keyboard of the position transceiver or a PC connected to the position transmitter. The position transmitter only accepts appropriately authenticated changes.

The position transceiver can broadcast information to the mobile terminal continuously or on request of the user of the mobile terminal or only when the position transceiver

recognizes by any known mechanism that a mobile terminal or a mobile user of the mobile terminal is in the vicinity of the position transceiver.

The at least one position transceiver broadcasts information directed to the user of each mobile terminal to induce the user to communicate with the at least one database to retrieve information stored in each database over a network. The information broadcast by each position transceiver includes identification information which is related to and identifies the information source and which is transmitted by the mobile terminal over the network to the at least one database to address or identify the information in each database which is transmitted by the network back to the mobile terminal to enable the user thereof to use the retrieved information which is associated with the information source at the broadcast location. A display, which is part of each mobile terminal, enables the user to selectively review the information broadcast from a plurality of position transceivers and choose which information sources in each database from which the user wishes to obtain additional information associated with any of the identification information broadcast from the position transceivers. The broadcast information, may without limitation, be diverse types of information such as, but not limited to, advertising information and includes identification information relating to the source of the broadcast information.

Each mobile terminal is located within a broadcast area defined by the broadcast range of the at least one position transceiver located at a broadcast location. The at least one position transceiver preferably has a limited broadcast range so that the broadcast range is limited within the optical view of the users of the mobile terminals as they pass by the broadcast location.

Each mobile terminal is a multimode transceiver which operates in short range and cellular modes, and includes first and second transceivers. The first transceiver communicates

with at least one position transceiver and receives broadcasts therefrom which preferably are of limited range. While not limited thereto, the first transceiver may use a low power optical or RF broadcast communications to connect each position transceiver at the broadcast location to the first transceiver and the information source. A network communicates with the second transceiver which may be, without limitation, a cellular network connected to an IP network. Each database communicates with the network and stores information which is transmitted to the second transceiver of each mobile terminal associated with the identification information.

In a preferred operational mode of the present invention, the user of the mobile terminal passes within the broadcast area of at least one position transceiver disposed at a broadcast location. Each position transceiver either continually broadcasts information to the broadcast area, which permits each user of a mobile terminal to view with a display which is part of the mobile terminal information received by the first transceiver thereof which is being broadcast to the user, such as advertisement information and the identification information, which is used to fetch the information stored in each database by transmission from the second transceiver by the network to each database or broadcasts upon demand of the user of the mobile terminal to the mobile terminal.

Each mobile terminal includes a processor and associated memory. The associated memory stores the information received from each position transceiver by the first transceiver permitting the user of the mobile terminal at the time of reception or at a later time to utilize the second transceiver to connect to addressable areas in each database using the identification information transmitted to the first transceiver.

The identification information which is used to retrieve information for transmission to the second transceiver may be of many different types. For example, the identification information may be a function of a geographic position of the

broadcast location at which each information transceiver is located and may comprise one or more of geographical coordinates, the elevation of the broadcast location, an address of the broadcast location, including street address, or a pointer, or a uniform resource locator, which is an address or provides an identification of the information stored in the database associated with the identification information. While the invention is not limited thereto, the network in a preferred embodiment includes a cellular telephone network which is connected to an IP network which facilitates transmission by the transmission control protocol/internet protocol (TCP/IP).

In a preferred embodiment of the present invention, the broadcast location includes a plurality of information sources and a plurality of position transceivers disposed at the broadcast location respectively coupled to a different one of the plurality of information sources. Each position transceiver broadcasts information including identification information relating to one of the information sources from the broadcast location. The broadcast location includes a display which displays information relating to the information which is broadcast including the identification information broadcasted by each of the plurality of position transceivers. Each database stores information which is transmitted to the second transceiver associated with the identification information of the plurality of position transceivers in response to each database receiving at least the identification information by transmission by the network from the mobile terminal to each database.

A billboard type display may be utilized to display advertisement information or other information from a plurality of information sources which are viewed from a public place, such as an airport, through which multiple users of mobile terminals pass to attract their attention in a classic advertising manner. The billboard may continuously broadcast via the plurality of position transceivers over a limited range

(low power) RF or optical transmission medium information which is directed to the passersby with mobile terminals from each of the information sources. An activation switch may be associated with each of the information sources to permit the passers by to selectively activate the position transceiver associated with the information source to which the passerby is attracted by display of information on the billboard type display. Finally, the broadcast may be activated by detecting the presence of the passersby by a known mechanism, such as a motion detector, to activate the position transceivers to broadcast the information.

There are numerous applications for the position transceiver besides transmitting advertisement information. These additional applications are: emergency calls; navigational services in which the user of the mobile terminal is provided information how to travel from point A to point B; calibration of the location of the mobile terminal in a cellular network and calibration of the cellular network to determine location of mobile terminals; location based services, e.g. printing a document at the closest available printer; informing the user of the mobile terminal of special services available only at the broadcast location of the position transmitters, such as special telecommunications services; transmission of price information about goods and services and payment information, the user of the mobile terminal in response thereto sends the requested payment as a short message service (SMS) to a network server, and the position transceiver in response thereto receives payment acknowledgment from the network server receiving the payment and transmits the payment acknowledgment to the user of the mobile terminal and provides a transmission permitting the user of the mobile terminal to have access to the purchased goods or services.

A method of transmitting data in a communications system including an information source, a position transceiver coupled to the information source and disposed at a broadcast location,

a mobile terminal within a broadcast area, the mobile terminal comprising first and second transceivers with the first transceiver communicating with the position transceiver, a network communicating with the second transceiver and at least one database, communicating with the network and storing information associated with the identification information includes broadcasting information including identification information relating to the information source with the position transceiver to the first transceiver within the broadcast area; transmitting at least the identification information from the second transceiver with the network to the database; and in response to the database receiving at least the identification information, transmitting from the database the stored information associated with the identification information to the second transceiver. The identification information comprises information which is a function of a geographic position of the broadcast location which may be one or more of geographical coordinates, elevation of the broadcast location, an address of the broadcast location, which may be a street address, and further, a location within the street address, or a pointer, or a uniform resource locator which is an address of or identifies the information associated with the identification information in the database.

In a preferred embodiment of the method, the broadcast location comprises a plurality of information sources; a plurality of position transceivers disposed at the broadcast location respectively coupled to a different one of the plurality of information sources, each position transceiver broadcasting information including identification information relating to one of the information sources from the broadcast location; and a display which displays information relating to the information broadcasted by each of the plurality of position transceivers. Information which is stored in the database is transmitted to the second transceiver associated with the identification information of the plurality of position transceivers in response to the database receiving at

least the identification information by transmission by the network from the second transceiver of the mobile terminal to the database. The information which is broadcasted from each of the plurality of position transceivers may include a webpage or application software which is executed by a processor in the mobile terminal which controls the first and second transceivers. The application software may comprise without limitation a program for opening a window or a web browser for searching the information stored in the database identified by the identification information.

The broadcasted information may be encrypted. The position information transmitted from the second transceiver to the database may be signed by the user of the mobile terminal of when the information was transmitted from the information transceiver to the mobile terminal to indicate the user's current location to permit database verification that the user is where the user should be; and the database checks validity of the signature, decrypts the information which is received from the network and checks validity of the time stamp and if the time stamp and signature are valid, the database transmits the stored information associated with the identification information with the network to the second transceiver.

The plurality of position transceivers of the broadcast location may cease to broadcast the information when the plurality of information transceivers are moved. A device may be provided at the broadcast location which senses when the plurality of position transceivers are moved and which disables transmission of the information when movement is sensed. The device for sensing movement may be of diverse designs and may be a mechanical connection between the information transceivers and a physical location at which the information transceivers are located which, when opened, disables their normal function, e.g. by disconnecting electrical power. As an alternative, the position transceiver can start transmitting an error indication if the position transceiver is moved.

In a preferred embodiment of the method, each position transceiver broadcasts the information with a limited range RF carrier or a limited range infrared carrier and the network comprises a cellular telephone network and an IP network.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates a system diagram of an embodiment of the present invention.

Fig. 2 illustrates a schematic diagram of a mobile terminal in accordance with the present invention.

Fig. 3 illustrates a preferred embodiment of the broadcast location at which a plurality of position transceivers are located which are designed to communicate with multiple users of terminals in a public place which pass within broadcast range of the plurality of information transceivers.

Fig. 4 illustrates a memory map of a preferred embodiment of the database of the system of Fig. 1.

Like reference numerals identify like parts throughout the drawings.

BEST MODE FOR CARRYING OUT THE INVENTION

Fig. 1 illustrates a communication system 10 in accordance with the present invention. The communication system 10 provides a mechanism by which a user of a mobile terminal 12 receives information broadcast by a position transceiver 14 which without limitation has a short (limited) range and which is part of a broadcast location 16 which broadcasts information within a broadcast area 18. Only one position transceiver 14 is illustrated, but it should be understood that in a preferred embodiment of the present invention, a plurality of position transceivers are part of the broadcast location as described below in conjunction with Fig. 3. The position transceiver 14 broadcasts information, which is stored in memory 20, under the control of CPU 22, by means of a low power RF or infrared link 24. In a preferred form of the present invention, the link 24 may be in accordance with the Bluetooth specification

which has been proposed in unregulated spectrum, such as 2.4 GHz or known or proposed infrared communication links. In a preferred embodiment of the specification as illustrated in Fig. 2, a plurality of information transceivers 14, simultaneously, on demand or upon detection of a user of the mobile terminal 12 by any known mechanism within broadcast area 18, broadcast information via the low power RF or infrared link 24 to one or more mobile terminals 12 located within the broadcast area.

The information which is broadcast via the link 24 is diverse in nature and includes identification information. The information which is broadcast by at least one position transceiver 14 includes without limitation advertisements, information relating to making emergency calls, information relating to providing navigation services to enable a user of the mobile terminal 12 to move from a first position to a second position, information for calibrating a position of the mobile terminal 12 within a cellular network providing connection to the network transceiver therein or for calibrating the network positioning determination function, information relating to location and location based devices or services 25 which are proximate to the broadcast location and the mobile terminal from which the user of the mobile terminal receives goods or services after communication of the mobile terminal with a database within IP network including servers with database 26, such as printing a document by a closest available printer, information informing a user of the special services, such as telecommunications available only at the location of the position transceiver with the advertisement information including a price of goods or services and a requested form of payment indication with the user sending with the mobile terminal the requested form of payment to the database using a short message system (SMS) format and the network transmitting acknowledgment of payment 27 from the database to the position transmitter 14 and the position transmitter transmitting the acknowledgment 27' of payment to

the user of the mobile terminal and access 27'' location based device or specialized service 25 or to machine 27''' providing the purchased goods or receiver.

Broadcast advertising information may be diverse in nature. Advertising information may be a webpage and identification information which provides the mobile terminal 12 with the ability to access an IP network, including server(s), with database 26 and specifically, information stored in the database associated with the identification information transmitted from the position transceiver 14 to the mobile terminal 12 via link 24. The identification information provides an address of the server, database, or a portion of the database at which the information associated with the identification information is stored.

The broadcast location 16 further includes a location information source 28, which may be a GPS receiver which informs the CPU 22 of the physical location of the position transceiver 14, to provide the CPU with one possible form of the identification information which is a function of the geographic position of the broadcast location, e.g. geographical coordinates, and the elevation of the broadcast location. Alternatively, the physical location may be programmed into the memory 20 at the time of setup of the system and entered by keyboard and a PC. The identification information may be a physical address of the broadcast location, such as the street address, and further information defining the location of the broadcast location 16 within the street address, such as floor and room number at which at least one position transceiver is located which is stored in the memory 20 as a consequence of this information being readily programmable. Furthermore, the identification information may be a pointer, which may be numerically based or a uniform resource locator (URL).

The function of the identification information, regardless of its content as described above, is to provide a linkage between the user of the mobile terminal 12, the information

source of the information transmitted by at least one position transceiver 14 and the information which is transmitted from the database within the IP network including servers with database 26 to the mobile terminal which is associated with the identification information broadcast from the at least one position transceiver 14 by the link 24 to the mobile terminal 12.

The broadcast location 16 facilitates the diverse applications discussed above, including marketing and advertising. The broadcast location obtains the initial interest of the user of the mobile terminal 12 by the displays 50 of information associated with the broadcast location 16 as described below in association with Fig. 3, or from a display 49' in Fig. 2 associated with the mobile terminal indicating the nature of the information being transmitted from the at least one position transceiver 14 to the mobile terminal 12, e.g. a webpage, etc. The user of the terminal 12 is then induced by the initial visual contact with the displays 49' and/or 50 to contact the database within the IP network, including server(s) with database, to obtain more information associated with the identification information.

The broadcast location 16 further includes a broadcast information interface 30. The broadcast information interface 30 is coupled to the CPU 22 and associated memory 20. The memory 20 functions as the source of broadcast information after it is inputted through the broadcast information interface 30. A broadcast information source 32, which may be a server in a network, is coupled to the broadcast information interface 20 by wireline (not illustrated), RF link 34, which may be cellular or other RF communications, or through modulation of information transmitted over the electric mains 37 to transformer and electric network 36. The broadcast information source 32 may be proximate to the broadcast location 16 or remote therefrom and provides the broadcast location with the capability of having the information which is broadcast updated. Alternatively, the broadcast information

source 32 may be eliminated by use of a keyboard or local PC at the location 16 to directly provide the information including identification to the memory 20 which is broadcast by the at least one position transceiver 14. A fixed position interlock 38 may be used to disable the application of electrical power from the transformer and electrical network 36 to the broadcast location 16 by opening switch 40 when the broadcast location 16 is physically moved or to cause an error message to be broadcast in response to signal 39 generated by the fixed position interlock. The fixed position interlock 38 may be, for example without limitation, a mechanical lock, hidden seals, a movement detector or magnetic sensor which, upon movement, causes switch 40 to open to disconnect electric power from the broadcast location 16 or to generate the signal 39 to cause the error message to be broadcast.

The mobile terminal 12 includes first and second transceivers which respectively are a transceiver which is connected to the broadcast location 16 via links 24 and 27 and a network transceiver, which is preferably a cellular transceiver, that is connected by RF link 42 to the IP network, including servers with database 26. However, it should be understood that the present invention is not limited to the use of a cellular network connected to an IP network including server(s) with database 26. Alternatively, the cellular network or other communication network may link the second transceiver directly to a database with or without a server.

Fig. 2 illustrates a block diagram of one form of a mobile terminal 12 which may be used to practice the invention. The mobile terminal 12 is a multimode receiver including a first transceiver 44 which communicates with the position transceiver 14 and may operate as a short range device without limitation in accordance with the Bluetooth RF specification or a limited range infrared specification and a second transceiver which operates as a network transceiver 46 which without limitation may be a cellular transceiver over which the user of the terminal 12 receives voice, PCS, etc.,

communications. The mobile terminal 12 has a main CPU 48 and associated memory 49 which stores the information which is transmitted and received by the first and second transceivers 44 and 46. The main CPU 48 executes software which transfer the information received by the first transceiver 44 to the second transceiver 46 and drives the display 49' which displays the information received from the at least one position transceiver 14 including, but not limited to, the identification information and other information for the above-identified diverse applications including advertising, such as a web page, browser, etc.

As has been described above, identification information, which is transmitted by the link 24, performs the function of addressing or identifying particular blocks of data within the database of the IP network, including servers with database 26, which are transmitted by link 42 to the network transceiver 46 within the mobile terminal 12. The information which is received from the database 26 by the network transceiver 46 enables the user of the mobile terminal 12 to obtain more detailed information about the information which is broadcast by the link 24 including display on display 49'. This function enhances the diverse applications discussed above, including an advertising function, by providing a complete linkage to the detailed source of information associated with the identification information broadcast by the broadcast location 16 stored within the database within the IP network including server(s) with database 26.

In normal operation, each mobile terminal 12, when it is within the broadcast area 18, displays on the display 49' information regarding the information being broadcast from the broadcast location 16. This enables the user of each mobile terminal 12, when multiple short range position transceivers 14 are used, to pick and choose from the information which is most interesting which is being broadcast from a plurality of information sources at the broadcast location 16. This information, which is displayed on the display 49' of the

mobile terminal 12, has associated with it the identification information which is transmitted via links 24 and 42 to the database within the IP network, including server(s) with database 26, to fetch the more detailed information stored in the database which is associated with the identification information for transmission back to the users of each mobile terminal 12 to enable the users to learn of more information regarding the source of the broadcast information from the location 16. This functionality facilitates advertisement and the other applications discussed above by obtaining the attention of users of mobile terminals 12 while at the same time not having to rely upon calls being made to cellular transceivers within the broadcast area 18. With the present invention, the information that is broadcast to each mobile terminal 12 when the users are within the broadcast area 18 contains sufficient information to obtain the attention of the users and to enable the users to obtain complete access to information stored in the remote databases, such as manufacturer's information to induce a sale, which is associated with the information, which is broadcast and/or displayed at the broadcast location 16, as described below in conjunction with Fig. 3.

The CPU 48 within the mobile terminal 12, which controls overall operation thereof, coordinates the transmission of information between the broadcast location 16 and the IP network, including server(s) with database 26. The CPU 48 processes the identification information which is received by the first short range transceiver 44 from the broadcast location 16 and is transmitted by the second network cellular transceiver 46 to the IP network including server(s) with database 26. The CPU 48 provides accessability to the memory 49 therein to both of the first and second transceivers 44 and 46 so as to facilitate transmission of information between the transceivers to provide the requisite information flow.

While the invention is not limited thereto, the identification information sent by the location position 16, may contain added information for security reasons. The information which is transmitted from the broadcast location 16 by link 24 to the mobile terminal 12 may include unencrypted information and encrypted information. The encrypted information may include as part of its identifying information, a time stamp with all of the encrypted information being encrypted by a MLC public key which may be encrypted, for example, with RSA public key cryptography. The encrypted message may be signed by the user with secret key. The server in the IP network, including server(s) with database 26, checks the signature, decrpyts the transmission of information from the mobile terminal 12, and determines if the time stamp is valid. If all of this information is verified, the server within the IP network including server(s) with database 26 may conclude with a high probability that the user of the mobile terminal 12 is in fact an authorized user and provide the user of the mobile terminal 12 with access thereto.

Fig. 3 illustrates a preferred embodiment of the broadcast location 16. The location source 16 includes a plurality of information sources 50 which are N in number. Each information source 50 provides a display of information and has an associated display driver including processor which is designed to attract the attention of the users of the mobile terminal 12 to induce the users to communicate with the databases within the IP network, including server(s) with database 26, to obtain more detailed information associated with the identification information which is transmitted by the communication link 24. Each information source 50 is associated with a particular position transceiver 14 so that the visual impression produced by the display thereof is related to the information which is transmitted to the mobile terminals 12 and displayed on the display 49' thereof and is related to the identification information which performs the function of addressing or identifying particular information stored in the database of

the IP network, including server(s) with database 26. The stored information, which is identified by the identification information, is transmitted by link 42 back to the second transceiver 46, as described below in association with Fig. 4 or via link 27 to the broadcast location 16. Each information transceiver 14 may include an on/off switch 52 which is associated with a correspondingly identified display 50 and which, upon activation by the user of the mobile terminal 12 within the broadcast area 18, causes the information, including identification information, to be transmitted by the link 24 to the user's terminal 12.

The displays 50 are a form of billboard and may contain diverse information but in environments where marketing is to be performed, the information is directed to soliciting the attention of the users of the mobile terminals 12 to obtain more information about the goods or services available for purchase which are described in the display. The particular displays 50 are not limited to any particular configuration and the overall broadcast location 16 of Fig. 3 may be located at a table with each of the individual transceivers 14 being located on the table.

Fig. 4 illustrates a memory map 100 of an individual server in the IP network including server(s) with database 26. The database 102 includes a plurality of bodies of information which are N in number which correspond to the N information sources of the broadcast location 16. Each information source 104 is addressed or identified by the identification information broadcasted over the link 24 to the mobile terminal 12 and transmitted by the network over link 42 to the server including the database 102. The server associated with the database 102, in response to the identification information, fetches a particular block of information 104 associated with the identification information. The fetched information is transmitted over communication link 42 to the mobile terminal 12 to enable the user thereof to learn more about the goods or services or other information associated

with the individual information sources 50 of the broadcast locations of Fig. 2.

While the invention has been described in terms of its preferred embodiments, it should be understood that numerous modifications may be made thereto without departing from the spirit and scope of the invention as defined in the appended claims. It is intended that all such modifications fall within the scope of the appended claims.

CLAIMS

1. A communication system comprising:

an information source;

a position transceiver disposed at a broadcast location and coupled to the information source, the position transceiver broadcasting information from the information source within a broadcast area where the position transceiver is located, the broadcasted information including identification information relating to the information source;

a mobile terminal within the broadcast area comprising first and second transceivers, the first transceiver communicating with the position transceiver;

a network communicating with the second transceiver; and

a database, communicating with the network, storing information which is transmitted to the second transceiver associated with the identification information in response to the database receiving at least the identification information by transmission of the network from the mobile terminal to the database.

2. A communication system in accordance with claim 1 wherein:

the identification information comprises information which is a function of a geographic position of the broadcast location.

3. A communication system in accordance with claim 2 wherein:

the identification information comprises geographical coordinates.

4. A communication system in accordance with claim 3 wherein:

the identification information further comprises elevation of the broadcast location.

5. A communication system in accordance with claim 2 wherein:
the identification information comprises an address of the broadcast location.

6. A communication system in accordance with claim 5 wherein:
the address is a street address.

7. A communication system in accordance with claim 6 wherein:
the identification information further defines a location within the street address.

8. A communication system in accordance with claim 1 wherein:
the identification information is a pointer which identifies a location of the position transceiver associated with corresponding data of the database where the information which is transmitted to the second transceiver is stored.

9. A communication system in accordance with claim 1 wherein:
the identification information, which is broadcasted from the position transceiver, includes a uniform resource locator which is an address of the information associated with the identification information in the database in the network.

10. A communication system in accordance with claim 1 wherein the broadcast location comprises:
a plurality of information sources;
a plurality of position transceivers disposed at the broadcast location respectively coupled to a different one of

the plurality of information sources, each position transceiver broadcasting information including identification information relating to one of the information sources from the broadcast location; and

a display which displays information relating to the information broadcasted by each of the plurality of position transceivers; and wherein

the database stores information which is transmitted to the second transceiver associated with the identification information of the plurality of position transceivers in response to the database receiving at least the identification information by transmission of the network from the mobile terminal to the database.

11. A communication system in accordance with claim 10 wherein:

the identification information, which is broadcasted from each of the plurality of position transceivers, includes a uniform resource locator which is an address of the information associated with the identification information in the database in the network.

12. A communication system in accordance with claim 10 wherein:

the information, which is broadcasted from each of the plurality of position transceivers, includes a web page.

13. A communication system in accordance with claim 10 wherein:

the information, which is broadcasted from each of the plurality of position transceivers, includes application software which is executed by a processor in the mobile terminal.

14. A communication system in accordance with claim 13 wherein:

the application software comprises an application program for opening a window.

15. A communication system in accordance with claim 13 wherein:

the application software comprises a web browser for searching the information stored in the database identified by the identifying information.

16. A communication system in accordance with claim 1 wherein:

the information is encrypted.

17. A communication system in accordance with claim 16 wherein:

the transmission of the information from the mobile terminal to the database is signed by a user of the mobile terminal with a time stamp of when the information was transmitted from the position transceiver to the mobile terminal to indicate the user's current location to permit database verification that the user is where the user should be; and

the database checks validity of the signature, decrypts the encrypted information which is received from the network and checks validity of the time stamp and if the time stamp and signature are valid, the database transmits the stored information associated with the identification information via the network to the second transceiver.

18. A communication system in accordance with claim 10 wherein:

the plurality of position transceivers of the broadcast location cease to broadcast the information when the plurality of position transceivers are moved.

19. A communication system in accordance with claim 18 wherein:

the broadcast location includes a device which senses when the plurality of position transceivers are moved and which disables transmission of the information when movement of the plurality of position transceivers is sensed.

20. A communication system in accordance with claim 1 wherein:

the position transceiver broadcasts the information with a limited range RF carrier.

21. A communication system in accordance with claim 1 wherein:

the position transceiver broadcasts the information with an infrared carrier.

22. A communication system in accordance with claim 10 wherein:

the broadcast location includes a device which senses when the plurality of position transmitters are moved; and

the plurality of position transceivers transmit an error indication when the device senses the plurality of information transceivers are moved.

23. A communication system in accordance with claim 1 wherein:

the broadcasted information includes an advertisement.

24. A communication system in accordance with claim 1 wherein:

the broadcasted information includes an emergency call.

25. A communication system in accordance with claim 1 wherein:

the broadcasted information includes information providing a service to enable a user of the mobile terminal to move from a first location to a second location.

26. A communication system in accordance with claim 1 wherein:

the broadcasted information provides calibration of where the mobile terminal is located in the network.

27. A communication system in accordance with claim 1 wherein:

the broadcasted information provides position calibration of the network.

28. A communication system in accordance with claim 1 wherein:

the broadcasted information relates to services which are available to a user of the mobile terminal when the user is in a vicinity of the broadcast location.

29. A communication system in accordance with claim 1 wherein:

the broadcasted information relates to communication services which are available to a user of the mobile terminal only when the user is in a vicinity of the broadcast location.

30. A communication system in accordance with claim 1 wherein:

the broadcasted information relates to a price for goods or services and an indication where payment may be transmitted if a user of the mobile terminal wishes to purchase the goods or services; and

the mobile terminal transmits payment for purchasing the goods or services to the database.

31. A communication system in accordance with claim 30 wherein:

acknowledgment of the payment is transmitted to the position transmitter and;

the position transceiver transmits the payment acknowledgment to the mobile terminal.

32. A communication system in accordance with claim 31 wherein:

the transmission of the payment acknowledgment to the mobile terminal also permits the user of the mobile terminal to have access to the purchased goods or services.

33. A method of transmitting data in a communication system including an information source, a position transceiver coupled to the information source and disposed at a broadcast location, a mobile terminal within a broadcast area comprising first and second transceivers with the first transceiver communicating with the position transceiver, a network communicating with the second transceiver and a database, communicating with the network, storing information associated with the identification information comprising:

broadcasting with the position transceiver information including identification information relating to the information source to the first transceiver within the broadcast area;

transmitting at least the identification information from the second transceiver with the network to the database; and

in response to the database receiving at least the identification information, transmitting from the database the stored information associated with the identification information to the second transceiver.

34. A method in accordance with claim 33 wherein:

the identification information comprises geographical coordinates.

35. A method in accordance with claim 34 wherein:
the identification information further comprises an elevation of the broadcast location.

36. A method in accordance with claim 35 wherein:
the identification information comprises an address of the broadcast location.

37. A method in accordance with claim 36 wherein:
the identification information further defines a location within a street address.

38. A method in accordance with claim 33 wherein:
the identifying information is a pointer which identifies a location of the position transceiver associated with corresponding data of the database where the information which is transmitted to the second transceiver is stored.

39. A method in accordance with claim 33 wherein:
the broadcast location comprises a plurality of information sources, a plurality of position transceivers disposed at the broadcast location respectively coupled to a different one of the plurality of information sources, each position transceiver broadcasting information including identification information relating to one of the information sources from the broadcast location;
a display which displays information relating to the information broadcasted by each of the plurality of position transceivers; and
information, stored in the database associated with the identification information of the plurality of position transceivers, is transmitted to the second transceiver in response to the database receiving at least the identification

information by transmission by the network from the mobile terminal to the database.

40. A method in accordance with claim 33 wherein:

the identification information, which is broadcasted from the position transceiver, includes a uniform resource locator which is an address of the information associated with the identification information in the database in the network.

41. A method in accordance with claim 39 wherein:

the identification information, which is broadcasted from each of the plurality of position transceivers, includes a uniform resource locator which is an address of the information associated with the identification information in the database in the network.

42. A method in accordance with claim 39 wherein:

the information, which is broadcasted from each of the plurality of position transceivers, includes a web page.

43. A method in accordance with claim 39 wherein:

the information, which is broadcasted from each of the plurality of position transceivers, includes application software which is executed by a processor in the mobile terminal.

44. A method in accordance with claim 43 wherein:

the application software comprises an application program for opening a window.

45. A method in accordance with claim 43 wherein:

the application software comprises a web browser for searching the information stored in the database identified by the identifying information.

46. A method in accordance with claim 33 wherein:
the information is encrypted.

47. A method in accordance with claim 46 wherein:
the transmission of the information from the second transceiver to the database is signed by a user of the mobile terminal with a secret key and includes a time stamp of when the information was transmitted from the position transceiver to the mobile terminal; and
the database checks validity of the signature, decrypts the information which is received from the network and checks validity of the time stamp and if the time stamp and signature are valid, the database transmits the stored information associated with the identification information via the network to the second transceiver.

48. A method in accordance with claim 39 wherein:
the plurality of position transceivers of the broadcast location cease to broadcast the information when the plurality of information transceivers are moved.

49. A method in accordance with claim 48 wherein:
the broadcast location includes a device which senses when the plurality of position transceivers are moved and which disables transmission of the information when movement is sensed.

50. A method in accordance with claim 33 wherein:
the position transceiver broadcasts the information with a limited range RF carrier.

51. A method in accordance with claim 33 wherein:
the position transceiver broadcasts the information with a limited range infrared carrier.

52. A method in accordance with claim 33 wherein

the network comprises a cellular telephone network and an IP network.

53. A method in accordance with claim 33 wherein:
the broadcast location includes a device which senses when the plurality of position transmitters are moved; and
the plurality of position transceivers transmit an error indication when the device senses the plurality of information transceivers are moved.

54. A method in accordance with claim 33 wherein:
the broadcasted information includes an advertisement.

55. A method in accordance with claim 33 wherein:
the broadcasted information includes an emergency call.

56. A method in accordance with claim 33 wherein:
the broadcasted information includes information providing a service to move from a first location to a second location.

57. A method in accordance with claim 33 wherein:
the broadcasted information provides calibration of where the mobile terminal is located in the network.

58. A method in accordance with claim 33 wherein:
the broadcasted information provides calibration of the network.

59. A method in accordance with claim 33 wherein:
the broadcasted information provides calibration of position determination by the network.

60. A method in accordance with claim 33 wherein:

the broadcasted information relates to services which are available to a user of the mobile terminal when the user is in a vicinity of the broadcast location.

61. A method in accordance with claim 33 wherein:
the broadcasted information relates to communication services which are available to a user of the mobile terminal only when the user is in a vicinity of the broadcast location.

62. A method in accordance with claim 33 wherein:
the broadcasted information relates to a price for goods or services and an indication where payment may be transmitted if a user of the mobile terminal wishes to purchase the goods or services; and
the mobile terminal transmits payment for purchasing the goods or services to the database.

63. A method in accordance with claim 62 wherein:
acknowledgment of the payment is transmitted to the position transmitter and;
the transceiver transmits the payment acknowledgment to the mobile terminal.

64. A method in accordance with claim 63 wherein:
the transmission of the payment acknowledgment to the mobile terminal also permits the user of the mobile terminal to have access to the purchased goods or services.

65. A method in accordance with claim 33 wherein:
the information broadcasted with the position transceiver is continuously broadcast.

66. A method in accordance with claim 33 wherein:
the information broadcasted with the position transceiver is broadcasted upon activation of the position transmitter by the user of the mobile terminal.

67. A method in accordance with claim 33 wherein:

the information broadcasted with the position transceiver detection is broadcasted when presence of a user of the mobile terminal in a vicinity of the position transmitter is detected.

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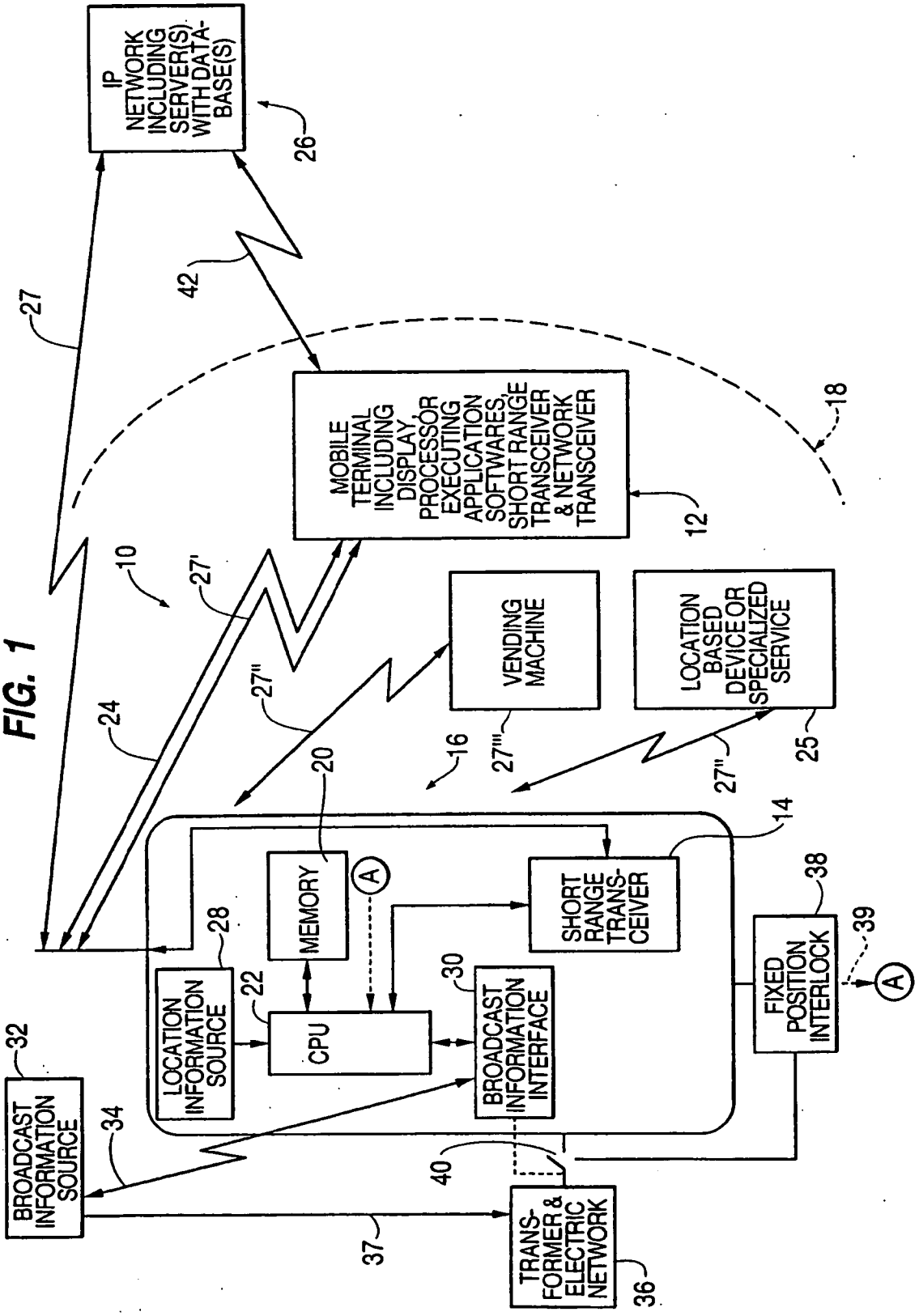

IP NETWORK INCLUDING SERVER(S) WITH DATA-BASE(S)
26
42
27
MOBILE TERMINAL INCLUDING DISPLAY, PROCESSOR EXECUTING APPLICATION SOFTWARES, SHORT RANGE TRANSCEIVER & NETWORK TRANSCEIVER
12
18
10
27'
24
27"
VENDING MACHINE
LOCATION BASED DEVICE OR SPECIALIZED SERVICE
16
27'''
27''
25
20
14
MEMORY
A
SHORT RANGE TRANS-CEIVER
38
28
30
22
LOCATION INFORMATION SOURCE
CPU
BROADCAST INFORMATION INTERFACE
FIXED POSITION INTERLOCK
39
A
32
BROADCAST INFORMATION SOURCE
34
40
37
TRANS-FORMER & ELECTRIC NETWORK
36

FIG. 1

FIG. 2

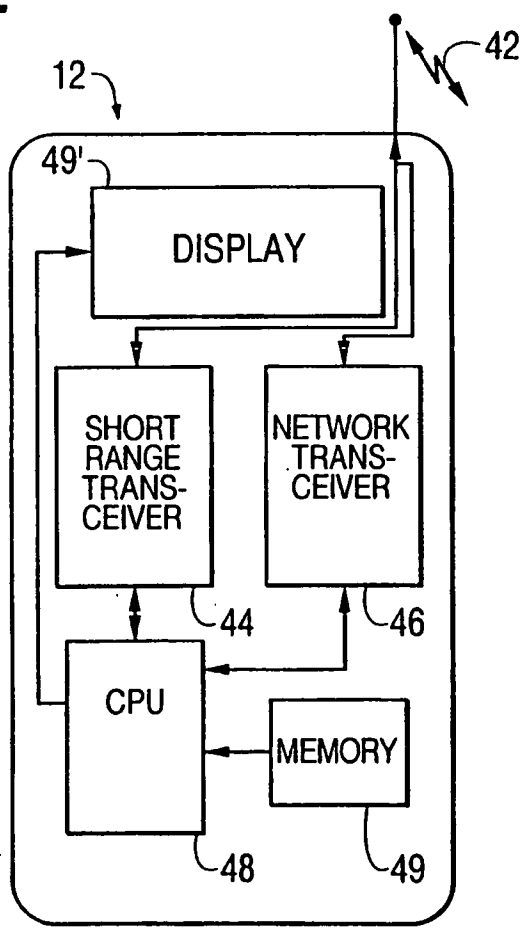

42
12
49'
DISPLAY
SHORT RANGE TRANS-CEIVER
NETWORK TRANS-CEIVER
44
46
CPU
MEMORY
48
49

FIG. 3

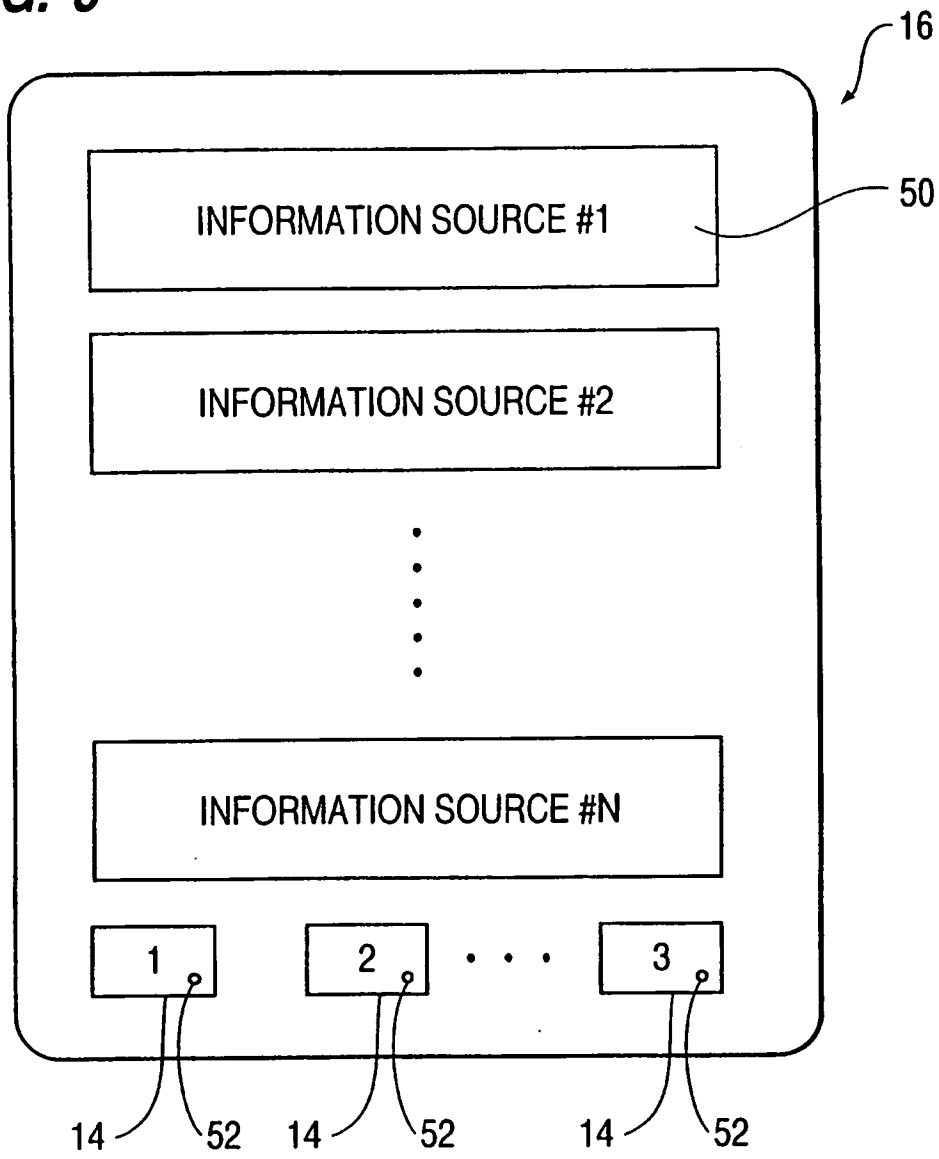
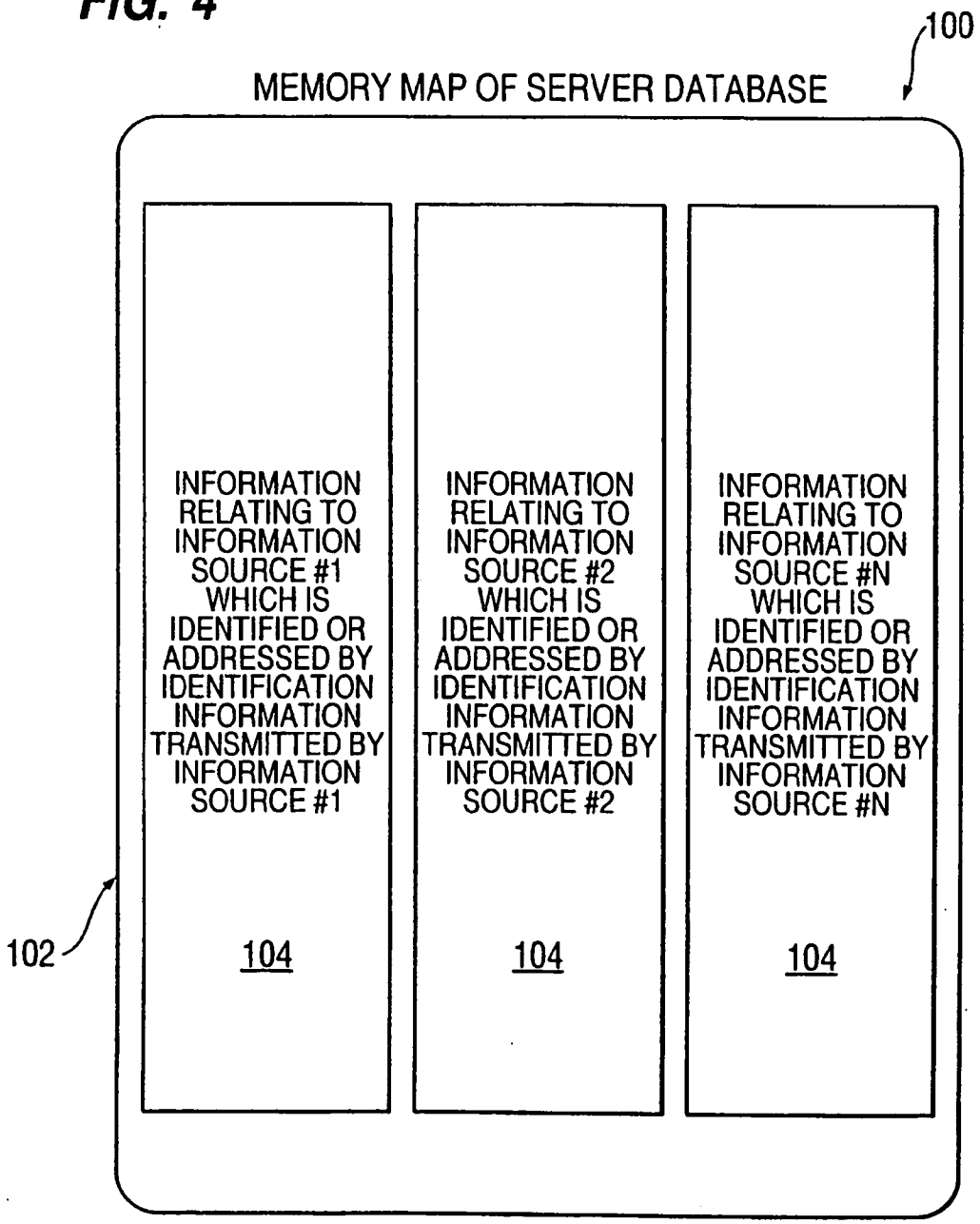

16
50
INFORMATION SOURCE #1
INFORMATION SOURCE #2
INFORMATION SOURCE #N
1
2
3
14
52
14
52
14
52

FIG. 4


100
MEMORY MAP OF SERVER DATABASE
INFORMATION RELATING TO INFORMATION SOURCE #1 WHICH IS IDENTIFIED OR ADDRESSED BY IDENTIFICATION INFORMATION TRANSMITTED BY INFORMATION SOURCE #1
104
INFORMATION RELATING TO INFORMATION SOURCE #2 WHICH IS IDENTIFIED OR ADDRESSED BY IDENTIFICATION INFORMATION TRANSMITTED BY INFORMATION SOURCE #2
104
INFORMATION RELATING TO INFORMATION SOURCE #N WHICH IS IDENTIFIED OR ADDRESSED BY IDENTIFICATION INFORMATION TRANSMITTED BY INFORMATION SOURCE #N
104
102

INTERNATIONAL SEARCH REPORT

Int ional Application No
PCT/IB 00/00770

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/22

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 7 H04Q G01S H04M

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 796 351 A (YABUKI TSUTOMU) 18 August 1998 (1998-08-18) column 1, line 57 -column 2, line 54 figure 1 --- -/--	1-9,16, 20,21, 23, 26-30, 33-38, 40,46, 50-52, 54, 57-62, 65-67

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 November 2000	20/11/2000

Name and mailing address of the ISA	Authorized officer
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3

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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.
X	EP 0 848 564 A (BOSCH GMBH ROBERT) 17 June 1998 (1998-06-17) column 2, line 24 - line 57 column 4, line 18 - line 24 figure 1	1-9,16, 20,21, 23, 26-30, 33-38, 40,46, 50-52, 54, 57-62,65
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A	EP 0 785 535 A (MITSUBISHI ELECTRIC CORP) 23 July 1997 (1997-07-23) column 4, line 15 -column 5, line 50 column 7, line 31 -column 8, line 16 claims 1,4,6,7,9 figures 2,3,8-10	1-3, 9-15,33, 34,40-44
A	WO 98 47116 A (ERICSSON TELEFON AB L M) 22 October 1998 (1998-10-22) page 3, line 24 -page 4, line 6 page 23, line 24 -page 24, line 1 figure 1	1,16,17, 33,46,62

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte onal Application No
PCT/IB 00/00770

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5796351 A	18-08-1998	JP 8279004 A	22-10-1996
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		NO 995031 A	16-12-1999

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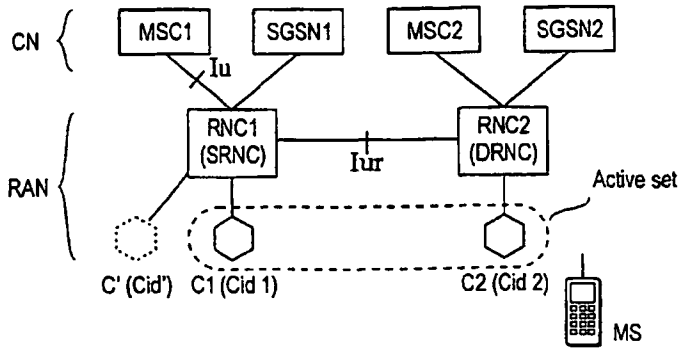
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Published:
— *With international search report.*

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

(54) Title: LOCATION MANAGEMENT FOR CELLULAR SYSTEMS



(57) Abstract: A method for indicating a mobile station's (MS) location. A first radio network controller, RNC, acts as the mobile station's serving RNC (SRNC), for reporting the mobile station's location to the core network (CN). A second RNC acts as the mobile station's drift RNC (DRNC), for maintaining a radio connection with the mobile station. In response to fulfilment of at least one criterion in a first set of criteria, the mobile station (MS) sends location information about its location to the second RNC (DRNC) which forwards the location information to the first RNC (SRNC) for reporting to the core network (CN). There is also a second set of criteria for transforming the location information. In response to fulfilment of at least one criterion in the second set, the first RNC (SRNC) sends falsified information about the mobile station's location to the core network (CN).

WO 01/01718 A1

Location management for cellular systems

Background of the invention

The invention relates to methods and equipment for reporting a mobile terminal's location. The invention can be used e.g. for implementing handover in a mobile communications system. The invention is particularly useful in a system which is at least partly a third generation (3G) mobile communications system. 3G mobile communications systems, such as the UMTS (Universal Mobile Telecommunications System) are being standardised by the UMTS Forum and the European Telecommunication Standard Institute ETSI. The current vision is that 3G systems will include both circuit-switched and packet-switched components.

Fig. 1 is a block diagram of a telecommunications system showing the components which are essential for understanding the invention. A UMTS Mobile Station MS consists of Mobile Equipment ME and a USIM card (User and Services and Identity Module). There is a radio interface Uu between the MS and a Radio Access Network RAN, which comprises Base Stations BS under control of Radio Network Controllers RNC. For circuit-switched services, the RNCs are connected, via an Iu interface, to Mobile services Switching Centres MSC, and for packet-switched services, there is a connection, via a Gb interface, to Serving GPRS Support Nodes SGSN (GPRS = General Packet Radio Service). The MSC and SGSN elements may include separate UMTS addition sections. Subscriber data related to the MS is stored permanently in a Home Location Register HLR and for circuit-switched operation, the data is transferred to the Visitor Location Register VLR of the MSC which currently serves the MS. There may be separate Interworking units IWU for adapting the A and Gb interfaces of GSM/GPRS systems to the Iu interface of the UMTS. For storing equipment-related data, the network comprises an Equipment Identity Register EIR. For entering and updating subscriber-specific data, there is an Operation and Maintenance O&M section having a Man-Machine Interface MMI. For creating and managing supplementary services, there is typically a dedicated Service Control Node SCN which can be seen as an evolved version of a Service Control Point (SCP) of Intelligent Networks.

Only the packet-switched section will be described in more detail, and it is assumed that this section will resemble a GPRS system. The GPRS infrastructure comprises support nodes such as a GPRS gateway support node (GGSN) and a GPRS serving support node (SGSN). The main functions

of the GGSN nodes involve interaction with the external data network. The GGSN updates the location directory using routing information supplied by the SGSNs about an MS's path and routes the external data network protocol packet encapsulated over the GPRS backbone to the SGSN currently serving the MS. It also decapsulates and forwards external data network packets to the appropriate data network and handles the billing of data traffic.

The main functions of the SGSN are to detect new GPRS mobile stations in its service area, handle the process of registering the new MSs along with the GPRS registers, send/receive data packets to/from the GPRS MS, and keep a record of the location of the MSs inside of its service area. The subscription information is stored in a GPRS register (HLR) where the mapping between a mobile's identity (such as MS-ISDN or IMSI) and the PSPDN address is stored. The GPRS register acts as a database from which the SGSNs can ask whether a new MS in its area is allowed to join the GPRS network.

The GPRS gateway support nodes GGSN connect an operator's GPRS network to external systems, such as other operators' GPRS systems, data networks 11, such as an IP network (Internet) or a X.25 network, and service centres. Fixed hosts 14 can be connected to the data network 11 e.g. by means of a local area network LAN and a router 15. A border gateway BG provides access to an inter-operator GPRS backbone network 12. The GGSN may also be connected directly to a private corporate network or a host. The GGSN includes GPRS subscribers' PDP (Packet Data Protocol) addresses and routing information, i.e. SGSN addresses. Routing information is used for tunnelling protocol data units PDU from data network 11 to the current switching point of the MS, i.e. to the serving SGSN. The functionalities of the SGSN and GGSN can be connected to the same physical node.

The home location register HLR of the GSM network contains GPRS subscriber data and routing information and it maps the subscriber's IMSI into an SGSN address and one or more pairs of the PDP type and PDP address. The HLR also maps each PDP type and PDP address pair into a GGSN node. The SGSN has a Gr interface to the HLR (a direct signalling connection or via an internal backbone network 13). The HLR of a roaming MS and its serving SGSN may be in different mobile communication networks.

The intra-operator backbone network 13, which interconnects an operator's SGSN and GGSN equipment, can be implemented, for example, by

means of a local network, such as an IP network. It should be noted that an operator's GPRS network can also be implemented without the intra-operator backbone network, e.g. by providing all features in one computer.

Fig. 2 shows the protocol stacks used at various points in a 3G network.

A mobile station (MS) engaged in GPRS traffic sends a CELL UPDATE (CU) message after detecting that it has changed its cell. A number of cells constitute a routing area (RA), and when the routing area changes, the MS sends a ROUTING AREA UPDATE (RAU) message. In the UMTS the cell update messages are not sent to the SGSN, only to the RNC. Therefore the SGSN is not aware of the exact cell of the MS. For an active MS, the SGSN only knows an identifier of the RNC which handles the MS. For an idle MS, the SGSN only knows the MS's routing area identifier.

A first problem underlying the invention will now be described with reference to Fig. 3. A 3G system may pose certain problems which do not exist in 2G systems, such as the GSM and the GPRS. For example, when the MS is changing its cell, it is possible that a connection-oriented connection is not handled by the RNC controlling the MS's active cells but by another RNC. The former RNC is called a 'drift RNC' and the latter RNC is called a 'serving RNC'. In Fig. 3, RNC1 is the serving RNC (SRNC) and RNC2 is the drift RNC (DRNC). In such a case, the CU and RAU messages are transmitted over the air interface piggybacked to the channel which is reserved for the circuit-switched connection (connection-oriented connection), and they terminate at the serving RNC. In a GPRS core network, if the Radio Access Network (RAN) inserts a cell ID (identifier) into the CU or RAU messages, thereby indicating where the MS is actually located, and if that cell is not controlled by the serving RNC, the SGSN may use another RNC for the packet-switched connections. This is not possible, however, because all simultaneous connections for one user should be handled by one RNC. In other words, there may be an ambiguity concerning the RNC which the SGSN should use. The same holds in a UMTS system if the Radio Access Network (RAN) inserts a cell ID (identifier) into a RAU message or an equivalent.

A second, related problem is that current GPRS or 3G systems do not offer a smooth Inter-SGSN routing area update (RAU) procedure. A lot of signalling is needed between the new SGSN and the old SGSN, the HLR, MSC and the GGSN(s). In particular, the new SGSN must receive the sub-

scriber data from the old SGSN before it can be sure that it can accept the RAU and continue signalling. This signalling causes a delay of up to several seconds, which in some cases could be unacceptable. Moreover, in packet traffic a virtual connection can last for several days. Therefore, the existing concepts of an anchor-MSC and float-MSC are not appropriate.

Disclosure of the invention

It is an object of the invention to provide a method and equipment for eliminating the first problem associated with prior art systems. The object is attained with the method and equipment which are characterized by what is disclosed in the characerizing part of the appended independent claims. Solutions to the second problem and preferred solutions to the first problem are disclosed in the appended dependent claims.

The invention is based on the idea that for a terminal sending information on the basis of which its location can be determined (such as a mobile station having a connection-oriented connection while sending a CU or RAU message), the terminal's location information (e.g. its cell ID) can betransformed, e.g. by using a masked or falsified (faked) location information, such as a fake cell ID. The fake location information is preferably chosen so that the SGSN assumes the location of the MS to be under the serving RNC. A certain pool or group of cell addresses can be used for this purpose. It might be beneficial to choose the addresses so that the SRNC (or SGSN) can detect that the traffic has been forwarded.

According to various preferred embodiments of the invention, the information about the MS's location indicates one or more of the following:

a location (e.g. a cell) which is controlled by the SRNC and which is part of the MS's active set, if such a cell exists;

a virtual location (e.g. cell), which is not controlled by either RNC, in case the MS's active set does not comprise a cell which is controlled by the SRNC;

the last location (e.g. a cell) which is controlled by the SRNC and which has been part of the MS's active set in case the MS's active set does not comprise a cell which is controlled by the SRNC;

a location (e.g. a cell) controlled by the DRNC in case the MS's active set does not comprise a cell controlled by the SRNC; and/or

a location (e.g. a cell) whose location information the MS received last.

The fact that the MS's location information indicates one of these cells has two possible interpretations. The MS's location information may indicate such a cell either explicitly or implicitly. An explicit indication means that the location information contains actual cell identifiers. An implicit indication means that the location information contains some information (e.g. one or more routing or location area identifiers) on the basis of which a cell can be identified (if so desired). It is also feasible to transfer only some location-related data and use it for calculating the MS's location.

The criteria for sending location information preferably comprises a change of the MS's location, activation of a PDP context for the MS and expiry of a recurring period of time.

As briefly noted above, the information about the MS's location may indicate a location, such as a cell, whose location information the MS received last. When a mobile station has at least one active connection, it receives system information only via its dedicated signalling connection. This system information comprises e.g. current location (such as routing area, location area and cell identity) of the mobile station. The system information is similar in nature to the information which the MS receives via a broadcast control channel BCCH when it does not have any active connections. The SRNC only sends system information about the cells controlled by it. In other words, it does not send system information about cells controlled by the DRNC. Based on the system information, the MS can determine whether or not it has moved into a new routing or location area. The SRNC sends this information as necessary. One suitable criterion for sending it is that the MS has moved and its active set does not contain the cell whose system information the SRNC has sent last, or after an SRNC handover (relocation).

Use of the transformed location, such as a fake cell ID, causes another problem, however. When the MS's last connection-oriented connection is terminated and the serving RNC deleted from the MS-URAN connection, the SGSN must be informed about the new (correct) RNC. This holds also for cases where the serving RNC is changed. This problem can be solved as follows. If the MS's last connection-oriented connection is terminated or if the serving RNC is changed, an additional CU or RAU must be performed for the MS, even if the MS's location information has not changed.

The location reporting functionality performed by a serving RNC can be summarised as follows:

1. Check if RNC handover should be performed. If not, then:

2. Select a location, such as a cell which is controlled by the serving RNC and which is part of the MS's active set, if such a cell exists. (N.B. The active set must also comprise at least one cell controlled by the drift RNC, otherwise the concept of drift RNC would not exist.)

If no handover was performed in step 1 or no cell was found in step 2, then do one of the following:

3A. Select a virtual location, such as a cell. A virtual cell is not a real cell (i.e. it is not covered by radio transceivers); or

3B. Select, among the cells controlled by the serving RNC, the last one used by the MS.

If step 3A is taken, i.e. a virtual location is selected, the core network elements (the MSC and/or the SGSN) must determine that the location information does not refer to reallocation. Such a determination can be made on the basis of a suitable cell ID numbering plan or a translation table.

Brief description of the drawings

The invention will now be described in connection with its preferred embodiments, with reference to the accompanying drawings, in which:

Fig. 1 is a block diagram of a telecommunications system showing the components which are essential for understanding the invention;

Fig. 2 shows the protocol stacks used at various points in a 3G network;

Fig. 3 is a simplified block diagram for pointing out the problem more clearly;

Fig. 4 shows a routing area update (RAU) procedure for a GPRS network; and

Fig. 5 shows an alternative Inter-SGSN routing area update procedure according to a preferred embodiment of the invention.

Detailed description of the invention

Fig. 4 shows a routing area update (RAU) procedure for a GPRS network. In step 4-1 the MS sends a ROUTING AREA UPDATE REQUEST via RNC2 (drift RNC) to RNC1 (serving RNC). In step 4-2 RNC1 adds the MS's location information and forwards the RAU Request to SGSN1. In step 4-3 SGSN2 requests the MS's PDP context from SGSN1 which responds in step 4-4. In step 4-5 SGSN1 begins to forward MS-terminated (MT) packets to

SGSN2. Security functions have been shown as step 4-6. In step 4-7 SGSN2 sends an UPDATE PDP CONTEXT REQUEST to the GGSN node which responds in step 4-8. In step 4-9 the MS's location is updated in the HLR. In step 4-10 the HLR cancels the MS's location in SGSN1 which acknowledges this in step 4-11. In step 4-12 the HLR sends an INSERT SUBSCRIBER DATA to SGSN2 which acknowledges in step 4-13. In step 4-14 the HLR sends to SGSN2 an acknowledgement to the message sent in step 4-9. In step 4-15, if the MS is IMSI-attached and does not have a circuit-switched connection, the SGSN-VLR association must be updated. SGSN2 updates the MS's location and SGSN number in the VLR, which acknowledges these in step 4-16. In steps 4-17 and 4-18 the RAU process is completed.

Fig. 5 shows an alternative Inter-SGSN routing area update procedure according to a preferred embodiment of the invention. This embodiment and its alternative modifications solve the second problem underlying the invention.

Due to macrodiversity, the triggering of a RAU is less clear than in 2G systems. A RAU could be triggered e.g. if all cells in the MS's active set belong to the new RA, or if more than half of the cells belong to it. In step 5-1 the MS sends a ROUTING AREA UPDATE REQUEST via RNC2 (drift RNC) to RNC1 (serving RNC). The MS sends the RAU request via its uplink connection, if one exists. Because of the coexistence of the drift RNC and the serving RNC, the update is received by the SRNC which does not control the MS's new routing area. The MS should suspend its session management procedures. In step 5-2 RNC1 adds the MS's location information and forwards the RAU REQUEST to SGSN1. This is in contrast to prior art GPRS systems where the RAU REQUEST is sent to SGSN2. In step 5-3 security functions may be performed, as usual. A benefit of sending the RAU REQUEST to SGSN1 is that SGSN1 already knows the MS's digital signature (PTMSI signature in GPRS terms), and it is likely to have authentication triplets for it. Thus there is no need to fetch these separately, whereby the delays due to the inter-SGSN handover can be shortened.

In step 5-4, if the security functions are completed successfully, the SGSN1 sends a FORWARD RAU REQUEST to SGSN2. This message includes parameters for resuming the connection(s) after the RAU. Such parameters include session management data and eventually Iu information (address of

RNC2). SGSN1 may start a timing period during which it will keep the MS's data in its memory.

In step 5-5 SGSN2 updates the MS's location (IMSI, SGSN address) in the HLR. In step 5-6 the HLR inserts the subscriber data (IMSI, subscription details) into SGSN2 which validates the MS's presence in the new RA. If all regional and other checks are passed, SGSN2 establishes an MM (Mobility Management) context for the MS and returns an acknowledgement to the HLR in step 5-7.

In step 5-8 SGSN2 may establish an Iu link to RNC2 which may send some radio parameters to resume quickly a connection with the MS. This feature is especially useful if the MS has a delay-sensitive application (this can be determined by checking the MS's session management context).

In step 5-9 SGSN2 returns an accept message to the message sent in step 5-4. The accept message includes the new RA index, the MS's new temporary identity (P-TMSI in GPRS terms) and/or its new digital signature. Additionally, some radio parameters or codes obtained from RNC2 may be sent. SGSN1 should immediately acknowledge this message to facilitate error handling. In step 5-10 SGSN1 sends to the MS an RAU ACCEPT message which preferably contains the same parameters as the message of step 5-9. Additionally, if an acknowledgement transmission is active, it may contain some protocol state information known by SGSN1 (this corresponds to LLC acknowledgement in GPRS).

In step 5-11 SGSN1 suspends downlink data transmission for acknowledged mode, in order to keep the protocol state intact. Depending on the QoS, SGSN1 may continue data transmission for unacknowledged mode.

In step 5-12 the MS acknowledges with a RAU COMPLETE message which contains the new temporary identity (P-TMSI) and some protocol state information known by the MS, such as an LLC acknowledgement for each LLC connection used by the MS (which confirms all MT N-PDUs transferred succesfully before the start of the update procedure. If the packet acknowledgement (equivalent to LLC acknowledgement in GPRS) confirms reception of certain N-PDUs, these N-PDUs will be discarded by SGSN1. This message will trigger RNC relocation (which in this embodiment is triggered by the MS).

In step 5-13 the MS establishes a radio connection with RNC2. If radio parameters were sent in step 5-10 (RAU ACCEPT), the MS could set up a radio connection immediately with these parameters. Otherwise, the MS

should re-establish the radio connection by accessing the common channel, which causes a longer break in the connection. This is why sending the radio parameters in step 5-10 may be QoS-dependent. The MS should send an uplink packet (not shown) to SGSN2 in case the RAU COMPLETE message was lost because of error handling. An alternative embodiment, omitting step 5-13, will be described later.

In step 5-14 SGSN1 sends a FORWARD RAU COMPLETE message to SGSN2. In step 5-15 SGSN1 cancels the Iu links towards RNC1 and begins to forward downlink packets to SGSN2. It may keep the MS's context and forward MT packets until the expiry of the optional timing period which was started in step 5-4. In step 5-16, when SGSN2 receives the FORWARD RAU COMPLETE message, it resumes data transmission towards the MS.

In step 5-17 SGSN2 sends to the relevant GGSN(s) an UPDATE PDP CONTEXT REQUEST (SGSN2 address, Tunnel Identifier, QoS Negotiated). The GGSNs update their PDP context fields and return a response in step 5-18. N.B: Steps 5-17 and 5-18 may take place any time after step 5-5.

In step 5-19 the HLR cancels the MS's location in SGSN1. This message contains the MS's IMSI, and the cancellation type is set to Update procedure. If the optional timer was not set in step 5-4, SGSN1 deletes the MS's MM and PDP contexts. Otherwise it waits until the timer expires. The timing period allows SGSN1 to complete forwarding of N-PDUs. It also ensures that the MS's MM and PDP contexts are kept in case the MS initiates another Inter-SGSN RAU before completing the ongoing RAU. In step 5-20 SGSN1 acknowledges with a CANCEL LOCATION ACK.

According to an alternative embodiment step 5-13 is omitted. Instead, during step 5-15 RNC1 receives an indication from SGSN1 that the RNC could now be relocated. RNC1 will inform RNC2 which will start handling the MS directly.

In general, the invention is equally applicable if the SGSN is replaced by a 3G MSC (or an MSC/SGSN combination). For this embodiment, the MSC and/or SGSN could be called 'switching elements' since they route packets and/or establish circuit-switched connections.

In GSM systems no location area updates are performed during connection, in order not to confuse the relay and anchor MSCs. With macro diversity the LAU could reach the old MSC directly, whereby it is possible to have a LAU during a call. However, in a hard inter-MSC handover, a special

message (LAU with an active call indication) may be needed. Such a message could trigger the new MSC to establish a connection with the old MSC and try to resume the call. A problem is that this would happen especially between the GSM and the UMTS, which means that a GSM MSC would need to interpret this special LAU message.

It should be noted that figures 4 and 5 illustrate worst-case scenarios in the sense that both RNCs are under different SGSN nodes or MSCs. If the SGSNs or the MSCs are the same, these scenarios could be simplified accordingly.

Claims

1. A method for indicating a terminal's (MS) location in a telecommunications system comprising:

a core network (CN); and

an access network (RAN) comprising a first network controller, which at least temporarily acts as the terminal's serving network controller (SRNC), for reporting the terminal's location to the core network, and a second network controller, which at least temporarily acts as the terminal's drift network controller (DRNC), for maintaining a connection with the terminal; wherein

there is a first set of predetermined criteria for sending information about the terminal's (MS) location to the core network (CN); and

in response to fulfilment of at least one criterion in the first set, the terminal (MS) sends to the second network controller (DRNC) location information (4-1, 5-1) on the basis of which the terminal's location can be determined; and the second network controller (DRNC) forwards the location information to the first network controller (SRNC) for reporting to the core network (CN);

characterized in that

there is a second set of at least one predetermined criterion for transforming the location information;

the first network controller (SRNC) checks whether at least one criterion in the second set is fulfilled; and

in response to fulfilment of at least one criterion in the second set, the first network controller (SRNC) sends transformed information (4-2, 5-2) about the terminal's location to the core network (CN).

2. A method according to claim 1, characterized in that in response to terminating the last connection-oriented connection with the terminal, the first network controller (SRNC) reports the terminal's correct location to the core network (CN).

3. A method according to claim 1 or 2, characterized in that the information about the terminal's (MS) location indicates a location which is controlled by the first network controller (SRNC) and which is part of the terminal's active set, if such a location exists.

4. A method according to claim 3, characterized in that if the terminal's active set does not comprise a location which is controlled by the first network controller (SRNC), the information about the terminal's (MS) location indicates a virtual location, which is not controlled by either of said network controllers.

5. A method according to claim 3, characterized in that if the terminal's active set does not comprise a location which is controlled by the first network controller (SRNC), the information about the terminal's (MS) location indicates the last location which is controlled by the first network controller and which has been part of the terminal's active set.

6. A method according to claim 3, characterized in that if the terminal's active set does not comprise a location which is controlled by the first network controller (SRNC), said information about the terminal's (MS) location indicates a location which is at least partially controlled by the first network controller.

7. A method according to any one of the preceding claims, characterized in that the information about the terminal's (MS) location indicates a location the location information of which the terminal received last.

8. A method according to any one of the preceding claims, characterized in that if the terminal's (MS) active set does not comprise a location controlled by the first network controller (SRNC), the information about the terminal's (MS) location indicates a location controlled by the second network controller (DRNC).

9. A method according to any one of the preceding claims, characterized in that said information about the terminal's (MS) location indicates at least one cell identifier, routing area identifier or location area identifier.

10. A method according to any one of the preceding claims, characterized in that said first set of criteria comprises a change of the terminal's location, activation of a PDP context for the terminal and expiry of a recurring period of time.

11. A method according to any one of the preceding claims, characterized in that

the first and the second network controller (RNC1, RNC2) are associated, respectively, with a first and a second switching element (SGSN1, SGSN2) for maintaining subscription information related to the terminal (MS); and

information about the terminal's location is received by the first switching element (SGSN1) sends (5-4) information about the terminal's location to the second switching element (SGSN2) without a separate request.

12. A method according to claim 11, characterized in that said information about the terminal's location comprises the terminal's Packet Data Protocol and/or Mobility Management context.

13. A method according to claim 11 or 12, characterized in that each of the first and the second switching element (SGSN1, SGSN2) is substantially an SGSN node, a Mobile services Switching Centre or a combination of both.

14. A method according to any one of the preceding claims, characterized in that said terminal is a mobile station, said access network is a radio access network and said network controller is a radio network controller.

15. A first network controller for supporting a terminal (MS) in a telecommunications system which comprises a core network (CN) and an access network (RAN);

wherein said first network controller is adapted to act, at least temporarily, as the terminal's serving network controller (SRNC) in said access network (RAN), for reporting the terminal's location to the core network (CN); and

the first network controller (SRNC) is adapted to receive location information from a drift network controller (DRNC) and to report it to the core network (CN) for determining the terminal's (MS) location;

characterized in that

the first network controller (SRNC) is adapted to transform said information about the terminal's location before reporting it to the core network (CN).

Fig. 1

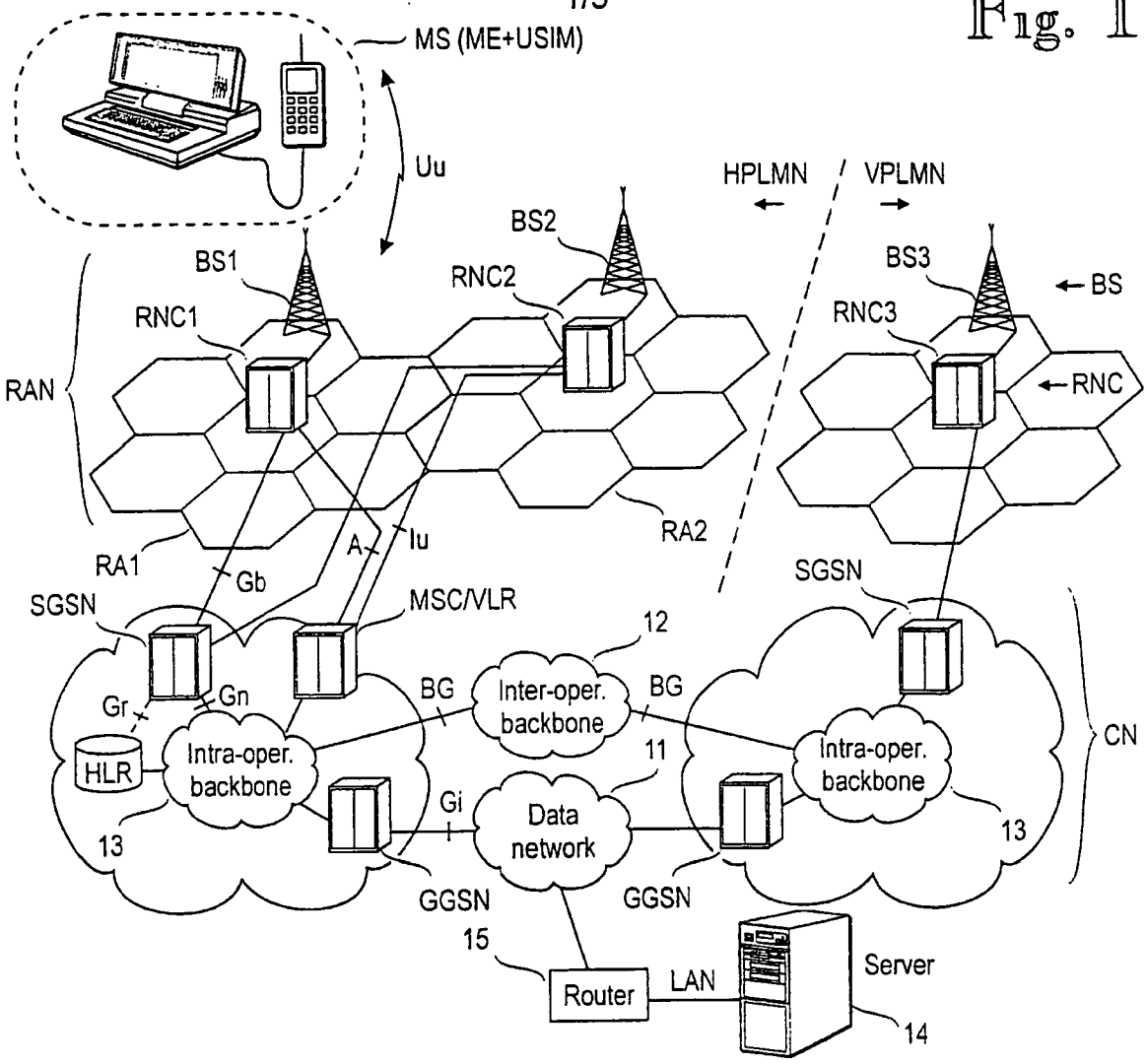
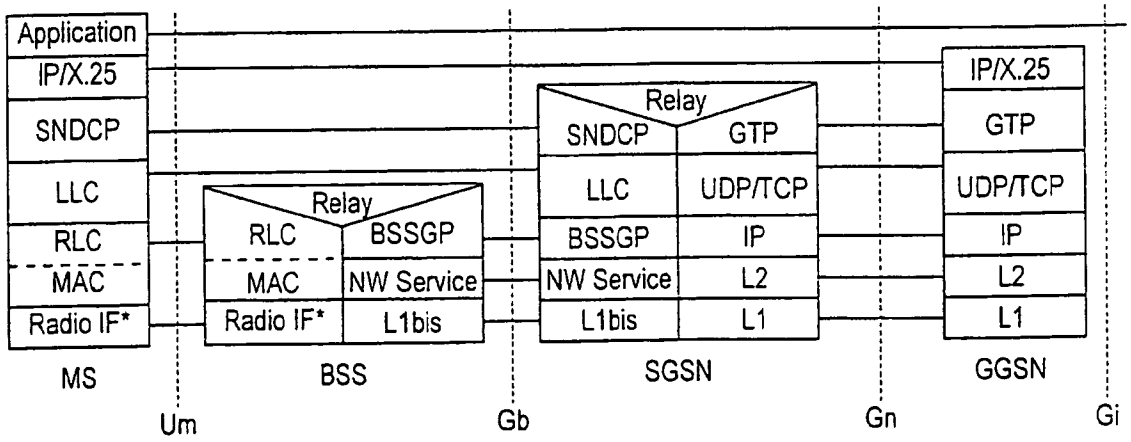


Fig. 2



*WCDMA in 3G

Fig. 3

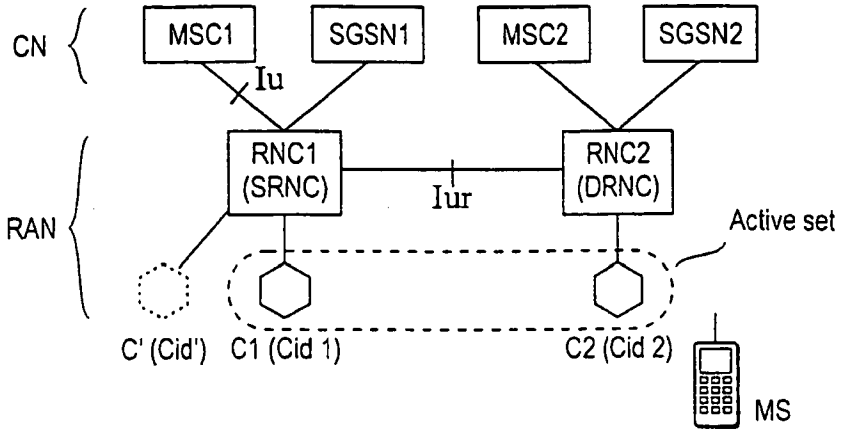

CN
MSC1
SGSN1
MSC2
SGSN2
Iu
RNC1
(SRNC)
Iur
RNC2
(DRNC)
RAN
Active set
C' (Cid')
C1 (Cid 1)
C2 (Cid 2)
MS

Fig. 4

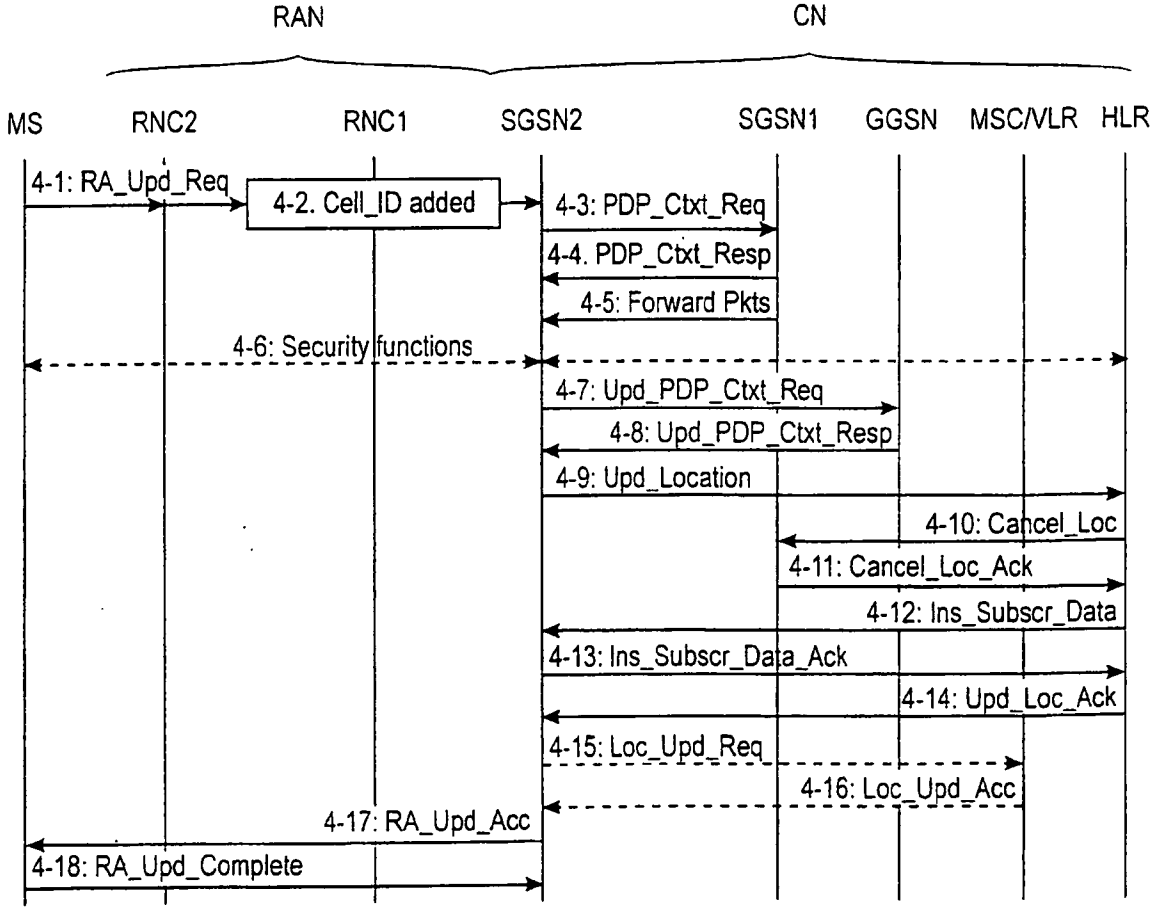
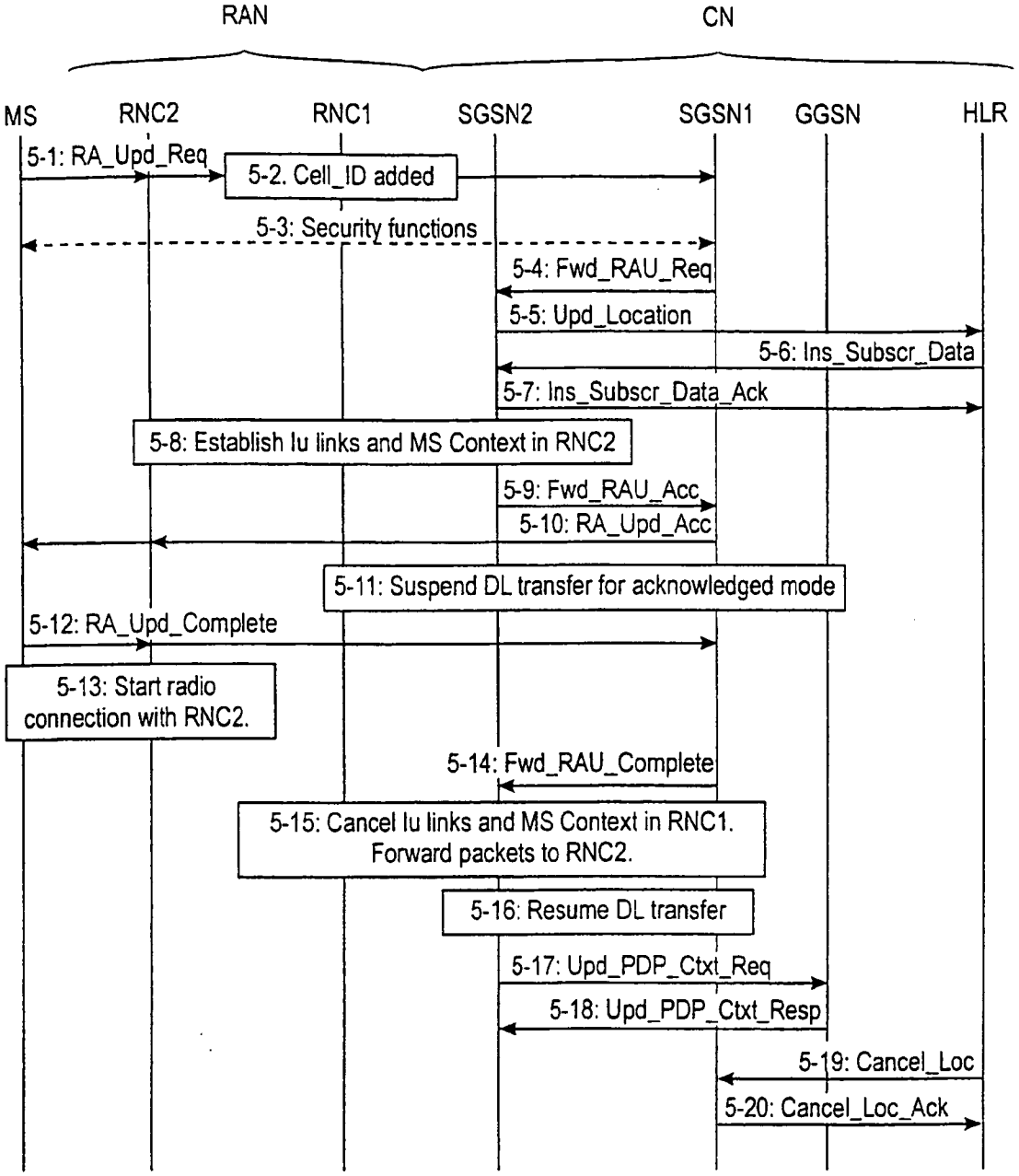

RAN
CN
MS
RNC2
RNC1
SGSN2
SGSN1
GGSN
MSC/VLR
HLR
4-1: RA_Upd_Req
4-2. Cell_ID added
4-3: PDP_Ctxt_Req
4-4. PDP_Ctxt_Resp
4-5: Forward Pkts
4-6: Security functions
4-7: Upd_PDP_Ctxt_Req
4-8: Upd_PDP_Ctxt_Resp
4-9: Upd_Location
4-10: Cancel_Loc
4-11: Cancel_Loc_Ack
4-12: Ins_Subscr_Data
4-13: Ins_Subscr_Data_Ack
4-14: Upd_Loc_Ack
4-15: Loc_Upd_Req
4-16: Loc_Upd_Acc
4-17: RA_Upd_Acc
4-18: RA_Upd_Complete

Fig. 5


RAN
CN
MS
RNC2
RNC1
SGSN2
SGSN1
GGSN
HLR
5-1: RA_Upd_Req
5-2. Cell_ID added
5-3: Security functions
5-4: Fwd_RAU_Req
5-5: Upd_Location
5-6: Ins_Subscr_Data
5-7: Ins_Subscr_Data_Ack
5-8: Establish Iu links and MS Context in RNC2
5-9: Fwd_RAU_Acc
5-10: RA_Upd_Acc
5-11: Suspend DL transfer for acknowledged mode
5-12: RA_Upd_Complete
5-13: Start radio connection with RNC2.
5-14: Fwd_RAU_Complete
5-15: Cancel Iu links and MS Context in RNC1. Forward packets to RNC2.
5-16: Resume DL transfer
5-17: Upd_PDP_Ctxt_Req
5-18: Upd_PDP_Ctxt_Resp
5-19: Cancel_Loc
5-20: Cancel_Loc_Ack

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/00357

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/38
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)

IPC7: H04Q

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

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 9966740 A2 (EINOLA), 23 December 1999 (23.12.99), page 3, line 7 - page 7, line 24	15
P,A	--	1-14
P,A	WO 0011878 A2 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 2 March 2000 (02.03.00), page 6, line 18 - page 8, line 13	1-15
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A	WO 9920071 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 22 April 1999 (22.04.99), page 5, line 6 - page 7, line 3, abstract	1-15
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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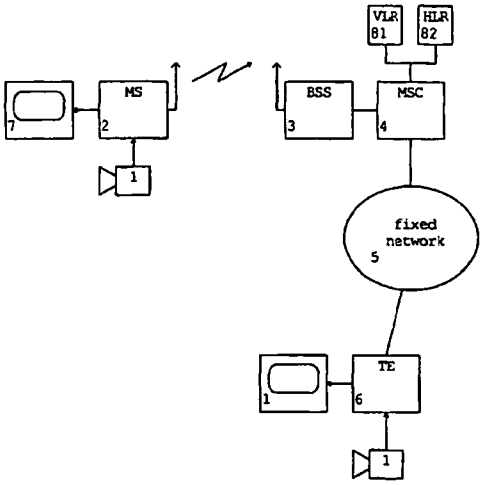
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Published:
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND SYSTEM FOR PROVIDING A CALLER PICTURE



(57) Abstract: The present invention relates to a method and system for providing a caller picture via a telecommunication network to a called party. When the calling party makes a call, the caller picture is transferred to the network and further to the terminal of the called party. The caller picture is generated and transmitted to a network element at the beginning of the call. Then, the network element stores the caller picture. Thereby, it is possible to achieve a better quality and to generate any caller picture at the terminal of the calling party in real-time, so as to provide an up-to-date picture. Alternatively, the caller picture can be stored in advance, such that the user may edit the caller picture before it is sent to the network. Furthermore, the caller picture presentation can be defined as a supplementary service which subscribers can subscribe to.

WO 01/03406 A1

Method and System for Providing a Caller Picture

FIELD OF THE INVENTION

The present invention relates to a method and system for providing a caller picture via a telecommunication network to a called party.

BACKGROUND OF THE INVENTION

Conventionally, multi-media communication apparatuses capable of performing speech and image communication via a communication line are known.

Document US 5,414,457, for example, discloses a communication apparatus, wherein, in a reception state, an image of a calling party and a selection signal for a telephone number are registered in a volatile memory in correspondence with each other, and the registered image is displayed on an image display section. When a calling operation is performed to a party corresponding to the registered image, an operator need only designate the image of the party to be called from displayed images, and a CPU automatically outputs a selection signal for a telephone number corresponding to the designated image. Therefore, the image of a party to be called can be visually recognized before calling. Thus, since calling can be made after confirmation of an image such as a face of a party to be called, a dialing error can be prevented. However, a subscriber B may only store an image information transmitted from a subscriber A and to be used when the subscriber B is about to make a call to the subscriber A. Thus, the subscriber B does not receive a caller picture

from the subscriber A, before answering to the phone, if the subscriber A has not phoned him up before.

Furthermore, document US 5,761,279 discloses a system for displaying a graphic information such as a facial representation on a communication's terminal. The facial representation is digitized, compressed and stored in a memory at an appropriate control center of a communication network. Upon receipt of a display command, the digitized data is retrieved from a memory and transmitted to the called party's display terminal using a modem technology. However, the user has to provide a photo to the service provider in advance, who digitizes it. Thus, the caller pictures are not real-time pictures and their quality is not very high.

Thus, a drawback of the above prior art ist that the caller picture is determined in advance and cannot be changed according to the actual needs of the calling party.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a method and system for providing a caller picture to a called party in a more flexible manner.

This object is achieved by a method for providing a caller picture via a telecommunication network to a called party, comprising the steps of:

generating the caller picture at a terminal of a calling party;

transmitting the caller picture to the telecommunication network at the beginning of a call;

storing the caller picture at a network element of the telecommunication network; and
transmitting the caller picture from the network element to a terminal of the called party.

Furthermore, the above object is achieved by a system for providing a caller picture to a called party via a telecommunication network, having a plurality of terminals and at least one network element for routing calls, wherein said plurality of terminals comprise camera means for generating the caller picture, display means for displaying the caller picture, and transmitting means for transmitting the caller picture to the at least one network element at the beginning of a call; and wherein the network element comprises receiving means for receiving the caller picture, storing means for storing the caller picture, and transmitting means for transmitting the caller picture to a terminal of the called party.

Accordingly, a camera function is provided at the terminal of a calling party, such that the terminal both digitizes a caller picture and transmits it to the network element of the telecommunication network. Then, the network element which may be a switching means, stores the picture. Thereby, a much better quality of the caller picture can be achieved, and not only a facial representation, but anything just like post cards can be transmitted in real-time to the called party. Therefore, the picture is up-to-date and a selection function for selecting one of a plurality of centrally stored caller pictures based on the calling person is not required.

Preferably, the transmission of the caller picture to the network element, the storing of the caller picture at the

network element, and the transmission of the caller picture from the network element to the terminal of the called party are performed in response to a subscriber information indicating a subscription of a supplementary service for providing the caller picture. Thus, the user may subscribe a supplementary service if he wishes to provide or receive a caller picture. The subscriber information may either indicate a caller picture presentation or a caller picture presentation restriction.

Preferably, the caller picture is taken by the camera function at the beginning of the call. Additionally, the caller picture may selectively be stored in a memory of the terminal of the calling party, and may be transmitted from the memory to the telecommunication network at the beginning of the call. In this case, the selective storing operation of the caller picture in the memory of the terminal of the calling party may be performed in accordance with a selection input operation at the terminal of the called party. Thereby, the calling person may store any picture taken in advance, wherein the stored picture may then be transmitted via the network element to the called party at the beginning of the call.

Preferably, the network element comprises a control means for checking a subscriber information of the called party stored in a subscriber data base, and for controlling the storing means based on the subscriber information. In particular, the data base may be a location register of a mobile network. The telecommunication network may be a GSM or a UMTS network. The network element may be a switching means such as a mobile switching center or a serving GPRS support node (SGSN).

The terminal of the calling party may comprise a switching means for selectively connecting a transmitting means to a camera means or to a memory means in accordance with a selection operation of a selection means for selecting a direct transmission operation in which the caller picture is generated and transmitted at the beginning of the call, or a memory operation in which the caller picture is generated and stored in the memory means from which it can be transmitted later. Thereby, a flexible generation timing of the caller picture can be provided.

The subscriber terminal may be a mobile terminal of a mobile communication network. Furthermore, the terminal of the called party as well as a terminal of a calling party may both be mobile terminals.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, the present invention will be described in greater detail on the basis of a preferred embodiment with reference to the accompanying drawings, in which:

Fig. 1 shows a principle block diagram of a mobile telecommunication network in which the method and system according to the present invention is implemented;

Fig. 2 shows a principle block diagram of a mobile terminal according to the preferred embodiment of the present invention;

Fig. 3 shows a principle block diagram of a mobile switching center according to the preferred embodiment of the present invention; and

Fig. 4 shows a flow diagram of an operation of the mobile switching center according to the preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the following, the preferred embodiment of the method and system according to the present invention will be described on the basis of a mobile telecommunication network such as a GSM or UMTS network.

Fig. 1 shows a principle block diagram of a mobile communication network comprising a mobile terminal or mobile station (MS) 2 having an integrated or separate camera 1 and an integrated or separate display 7 for displaying a picture taken at a terminal of a calling party. In the following, this picture is referred to as caller picture.

The MS 2 is radio-connected to a Base Station Subsystem (BSS) 3 which is connected to a Mobile Switching Center (MSC) 4 arranged to provide a switching function for switching or routing received calls according to the location of the called party. Furthermore, subscriber data bases such as a Visitor Location Register (VRL) 81 and a Home Location Register (HLR) 82 are connected to the MSC 4 so as to provide a file system for storing subscriber information such as a location information of mobile terminals, an information about supplementary (operator) services subscribed by individual subscribers, and the like.

The MSC 4 is connected via an interworking function to a fixed network 5 such as a Public Switched Telephone Network (PSTN) or an IN network. Thereby, a connection can be established between a multi-media end terminal (TE) 6 of the fixed network 5 and the MS 2. The TE 6 also comprises an external or internal camera 1 and an external or internal display 7.

According to the communication system shown in Fig. 1, a caller picture can be supplied to a called mobile station of the mobile telecommunication network or to the end terminal TE 6 of the fixed network 5. In particular, a caller picture taken by the camera 1 is transferred via the MSC 4 to the display 7 at the terminal of the called party at the beginning of the call. The calling party may selectively store the picture into a memory provided in the calling terminal, such as the MS 2 or the TE 6. Alternatively, the caller may take a picture just at the beginning of the call and may directly transmit the generated caller picture to the terminal of the called party. There are no limitations for the coding system of the picture, as long as the terminal of the called party is able to decode and display the image information received from the terminal of the calling party.

Furthermore, a supplementary service can be applied both to telephone calls and video calls. The supplementary service may be arranged to define a Caller Picture Presentation / Caller Picture Presentation Restriction (CPP/CPPR), wherein the subscriber defines by a corresponding service subscription whether a CPP or a CPPR is to be established for desired connections. The subscriber information defining the CPP/CPPR can be stored in the HLR 82 or the VLR 81, depending on the location of the MS 2.

Alternatively, a separate storing means may be provided in the MSC 4 for storing the above subscriber information. In the fixed network 5, the subscriber information may be stored in a corresponding data base of a switching means of the fixed network 5.

Thus, according to the preferred embodiment, both caller picture presentation and caller picture presentation restriction are defined as a supplementary service that can be applied to a telephone call (teleservice) or video call. These services can be subscribed to e.g. in GSM, UMTS or any other telecommunication system.

Fig. 2 shows a principle block diagram of the MS 2. It is to be noted that the same components are also included in the end terminal TE 6 of the fixed network 5. Therefore, the description of the present invention is restricted to the block diagram of the MS 2.

According to Fig. 2, the camera 1 which may be a separate or an integrated camera is connected via an I/O interface 26 to a signal processing unit 21 arranged for performing e.g. an encoding, encryption and/or compressing operation required for transmitting the generated caller picture via the communication network. The signal processing unit 21 is connected via a switch 23 either to a transceiver (TRX) 24 or to a volatile or non-volatile memory 22. Thus, a picture taken by the camera 1 may selectively be stored in the memory 22 or directly transmitted via the TRX 24 to the MSC 4.

The switch 23 is controlled by a control unit 27 connected to the TRX 24 and the I/O interface 26. The I/O interface 26 is further connected to the display 7 which may be an

LCD or the like, and to an operating unit such as a key pad 25. In particular, the key pad 25 and the display 7 may correspond to the conventional input/output units of a multi-media end terminal.

In the block diagram shown in Fig. 2, a memory storing operation for storing a picture received from the camera 1 in the memory 22, a direct transmission operation for directly transmitting the picture received from the camera 1 to a called party, or a memory transmission operation for transmitting a caller picture stored in the memory 22 may be selected by a corresponding input operation at the key pad 25. Based on this input operation, the control unit 27 controls the switch 23 so as to selectively store the picture received from the camera 1 in the memory 22 or transmit an actual or stored picture via the TRX 24 to the called party. Furthermore, the control unit 27 may receive a subscriber information via the TRX 24 from the telecommunication network, wherein the subscriber information indicates a restriction of the supplementary CPP service. Based on this subscriber information, the control unit 27 may control the switch 23 so as to switch a picture taken by the camera 1 to the memory 22 irrespective of an input operation at the key pad 25. In this case, a corresponding error message indicating that the CPP service is not subscribed to can be displayed on the display 7.

Thus, at the beginning of a call, e.g. before or after the dialing operation, a calling person performs the above selection by a corresponding input operation at the key pad 25. The input operation may be controlled by the control unit 27 on the basis of a control menue displayed at the display 7. Additionally, a default operation may be provided, if a selection is not performed. The

corresponding control program may be stored in a non-volatile program memory (not shown) provided in the control unit 27.

Fig. 3 shows a principle block diagram of the MSC 4. According to Fig. 3, the MSC 4 comprises a transceiver (TRX) 41 connected to the BSS 3. The TRX 41 is connected to a switch 42 arranged to perform switching according to the location of the desired called party. Furthermore, the switch 42 is connected to the VLR 81 and the HLR 82, such that the MSC 4 may refer to the subscriber information of a calling party or a called party.

Furthermore, the MSC 4 comprises a control unit 43 arranged for controlling a storing function of a caller picture received from a calling party in a corresponding memory 44. Thus, in case a call is received by the MSC 4, it refers to the VLR 81 or HLR 82 in order to retrieve the corresponding subscriber information of the called party and/or the calling party. In case the subscriber information of the called party indicates that the CPPR has been activated, i.e. the caller picture presentation is restricted, the control unit 43 inhibits the storing of the received caller picture in the memory 44. Furthermore, a function may be provided according to which the MSC 4 transmits a subscriber information to the calling party so as to indicate that the caller picture presentation is restricted at the called terminal. Based on this subscriber information, the terminal of the calling party may inhibit the transmission of the caller picture. The same operations indicated above may be performed if the MSC 4 determines based on the retrieved subscriber information that the calling party has restricted the caller picture presentation.

In case the subscriber information retrieved from the VLR 81 or the HLR 82 indicates that the caller picture presentation is subscribed or activated by the called party, the control unit 43 controls the memory 44 so as to store the received caller picture. After the connection has been established between the calling party and the called party, the stored caller picture is transmitted from the MSC 4 to the called party, so as to be displayed at the terminal of the called party. Based on the displayed caller picture, the called party may decide whether to respond to the call or not.

Fig. 4 shows a principle block diagram of a processing performed by the control unit 43 of the MSC 4.

Initially, it is determined in step S100 whether a call has been received. If not, the control unit waits in step S100 until a call has been received from the mobile network. If a call has been received, the control unit 43 initiates a checking operation so as to refer to the subscriber data base, e.g. the VLR 81 or the HLR 82 (S101). In case the checking step indicates that the CPPR is activated for the called party, the flow branches to an optional step S105 where a corresponding CPPR information is transmitted to the calling party so as to indicate the restricted caller picture presentation. In case the CPP is activated, i.e. the called party has subscribed to the caller picture presentation, the image data of the caller picture are received and stored in the memory 44 (step S102). Thereafter, the connection between the called party and the calling party is established in step S103, and the stored image data of the caller picture are transmitted in step S104 to the called party.

Then, the control unit 43 waits in step S106 for a signaling indicating the end of the call. If such a signaling has been received, the connection is released in step S107 and the flow returns to step S100 in order to wait for the receipt of a new call.

As already mentioned, the checking operation in step S101 may also be performed for the calling party, wherein the storing and transmission of the caller picture at the MSC 4 is only performed if both parties have not restricted the caller picture presentation service.

It is to be pointed out that the caller picture may be stored in any network element having a switching or routing function. In particular, the control operation according to Fig. 4 may be performed in a Service GPRS Support Node (SGSN) of a General Packet Radio System (GPRS), or in any switching means of the fixed network 5. Furthermore, the present invention may be applied to any telecommunication network to which multi-media communication apparatuses can be connected. The subscriber terminal may be a terminal or device connected to a fixed lines telecommunications network, such as a PSTN, ISDN or a local area (data) network.

As an alternative, the caller picture may be transferred between two mobile terminals, wherein a service is provided for transmitting the caller picture via the MSC 4 to a called mobile terminal at the beginning of a mobile connection.

The above description of the preferred embodiment and the accompanying drawings are only intended to illustrate the

present invention. The preferred embodiment of the invention may thus vary within the scope of the attached claims.

In summary, the present invention relates to a method and system for providing a caller picture via a telecommunication network to a called party. When the calling party makes a call, the caller picture is transferred to the network and further to the terminal of the called party. The caller picture is generated and transmitted to an network element at the beginning of the call. Then, the network element stores the caller picture. Thereby, it is possible to achieve a better quality and to generate any caller picture at the terminal of the calling party in real-time, so as to provide an up-to-date picture. Alternatively, the caller picture can be stored in advance, such that the user may edit the caller picture before it is sent to the network. Furthermore, the caller picture presentation can be defined as a supplementary service which subscribers can subscribe to. (Fig. 1)

Claims

1. A method for providing a caller picture via a telecommunication network to a called party, comprising the steps of:

a) generating said caller picture at a terminal of a calling party;

b) transmitting said caller picture to said telecommunication network at the beginning of a call;

c) storing said caller picture at a network element of said telecommunication network; and

d) transmitting said caller picture from said network element to a terminal of said called party.

2. A method according to claim 1, wherein steps b) to d) are performed in response to a subscriber information indicating a subscription of a supplementary service for providing said caller picture.

3. A method according to claim 2, wherein said subscriber information indicates a caller picture presentation or a caller picture presentation restriction.

4. A method according to any one of the preceding claims, wherein said caller picture is taken by a camera function at the beginning of the call.

5. A method according to anyone of claims 1 to 4, wherein said caller picture is selectively stored in a memory of said terminal of said calling party, and transmitted from said memory to said telecommunication network at the beginning of the call.

6. A method according to claim 5, wherein said selective storing operation of said caller picture in said memory of said terminal of said calling party is performed in accordance with a selection input operation at said terminal of said calling party.

7. A system for providing a caller picture to a called party via a telecommunication network having a plurality of terminals **(2, 6)** and at least one network element **(4)** for routing calls,

a) wherein each of said plurality of terminal **(2, 6)** comprises camera means **(1)** for generating said caller picture, display means **(7)** for displaying said caller picture, and transmitting means **(24)** for transmitting said caller picture to said at least one network element **(4)** at the beginning of a call; and

b) wherein said network element **(4)** comprises receiving means **(41)** for receiving said caller picture, storing means **(44)** for storing said caller picture, and transmitting means **(42)** for transmitting said caller picture to a terminal of said called party.

8. A system according to claim 7, wherein each of said plurality of terminals **(2, 6)** comprises memory means **(22)** for storing said caller picture; and selecting means **(25)** for selecting a direct transmission operation in which said caller picture is generated and transmitted at the beginning of the call, or a memory operation in which said caller picture is generated and stored in said memory means **(22)**.

9. A system according to claim 7 or 8, wherein said network element **(4)** comprises control means **(43)** for checking a subscriber information of said called party, stored in a

subscriber data base **(81, 82)**, and for controlling said storing means **(44)** based on said subscriber information.

10. A system according to claim 9, wherein said subscriber information indicates a subscription of a caller picture presentation service.

11. A system according to claim 9 or 10, wherein said data base is a location register **(81, 82)**.

12. A system according to any one of claims 7 to 11, wherein said network element **(4)** is a switching means of said telecommunication network.

13. A system according to claim 12, wherein said switching means is a mobile switching center **(4)** or an SGSM.

14. A system according to any one of claims 7 to 13, wherein said telecommunication network is a GSM or a UMTS network.

15. A system according to claim 14, wherein said terminal of said called party and a terminal of a calling party are both mobile terminals.

16. A network element for a telecommunication network, comprising:

a) receiving means **(41)** for receiving a caller picture from a terminal **(2)** of a calling party at the beginning of a call;
b) storing means **(44)** for storing said caller picture; and
c) transmitting means **(42)** for transmitting said caller picture to a terminal **(6)** of a called party.

17. A network element according to claim 16, further comprising control means **(43)** for checking a subscriber information of said called party, stored in a subscriber data base **(81, 82)** and for controlling said storing means **(44)** so as to perform the storing operation based on said subscriber information.

18. A network element according to claim 17, wherein said control means **(43)** is arranged to transmit a restriction information to said calling party, if said subscriber information indicates that the called party is not subscribed to a caller picture presentation service.

19. A network element according to any one of claims 16 to 18, wherein said network element is a switching means **(4)** of said telecommunication network.

20. A subscriber terminal of a telecommunication network having at least one network element for routing calls, said subscriber terminal **(2, 6)** comprising:

a) camera means **(1)** for generating a caller picture;

b) display means **(7)** for displaying a received caller picture; and

c) transmitting means **(24)** for transmitting said generated caller picture to said at least one network element **(4)** at the beginning of a call.

21. A subscriber terminal according to claim 20, further comprising memory means **(22)** for storing said generated caller picture; and selecting means **(25)** for selecting a direct transmission operation in which said caller picture is generated and transmitted at the beginning of the call, or a memory operation in which said caller picture is generated and stored in said memory means **(22)**.

22. A subscriber terminal according to claim 21, further comprising switching means **(23)** for selectively connecting said transmitting means **(24)** to said camera means **(1)** or to said memory means **(22)** in accordance with a selection operation at said selection means **(25)**.

23. A subscriber terminal according to any one of claims 20 to 22, wherein said subscriber terminal is a mobile terminal **(2)**.

24. A subscriber terminal according to any one of claims 20 to 22, wherein said subscriber terminal is a terminal or device connected to a fixed lines telecommunications network.

25. A subscriber terminal according to claim 24, wherein said fixed lines telecommunications network is a PSTN, ISDN or a local area network.

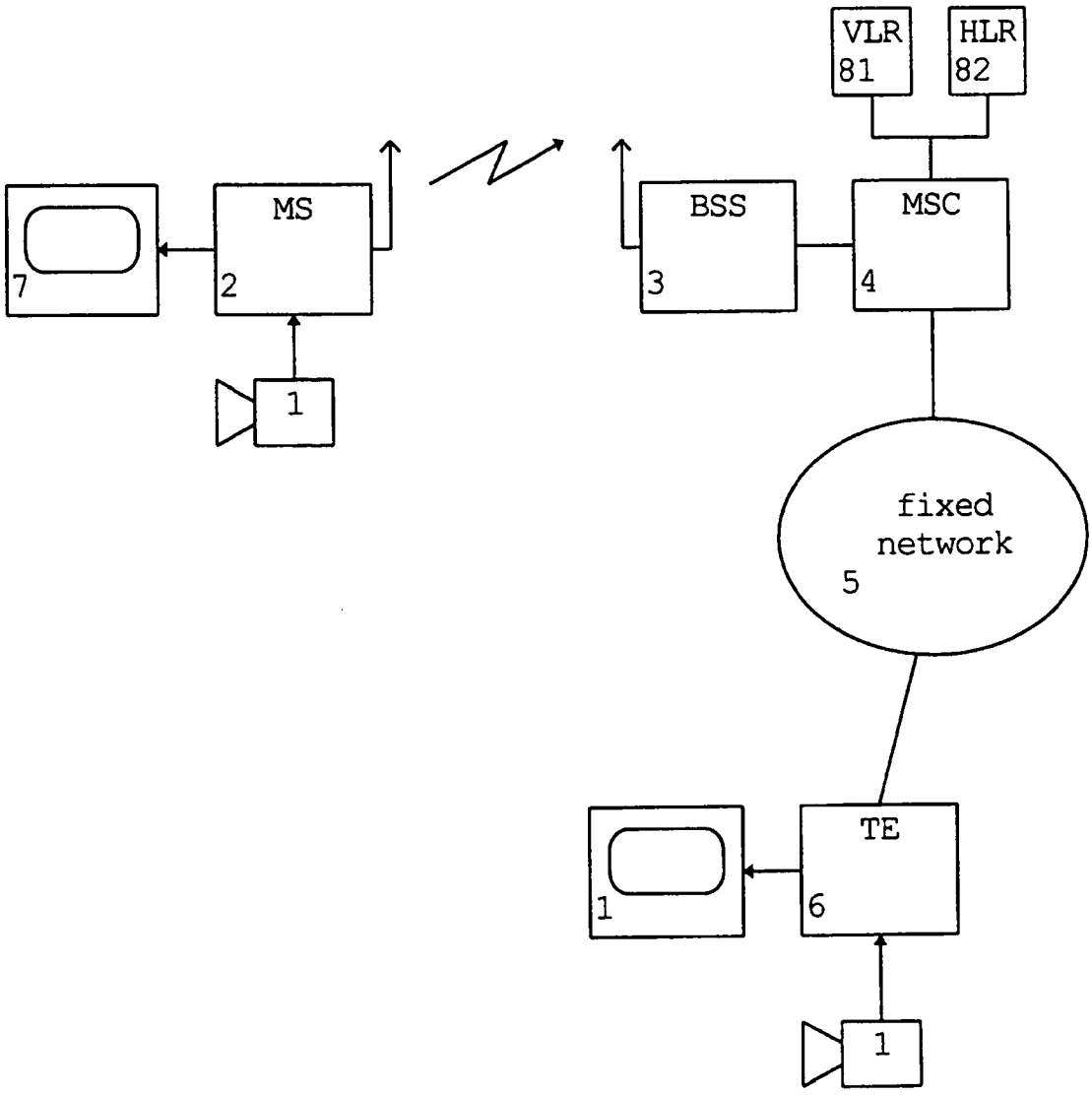


Fig. 1

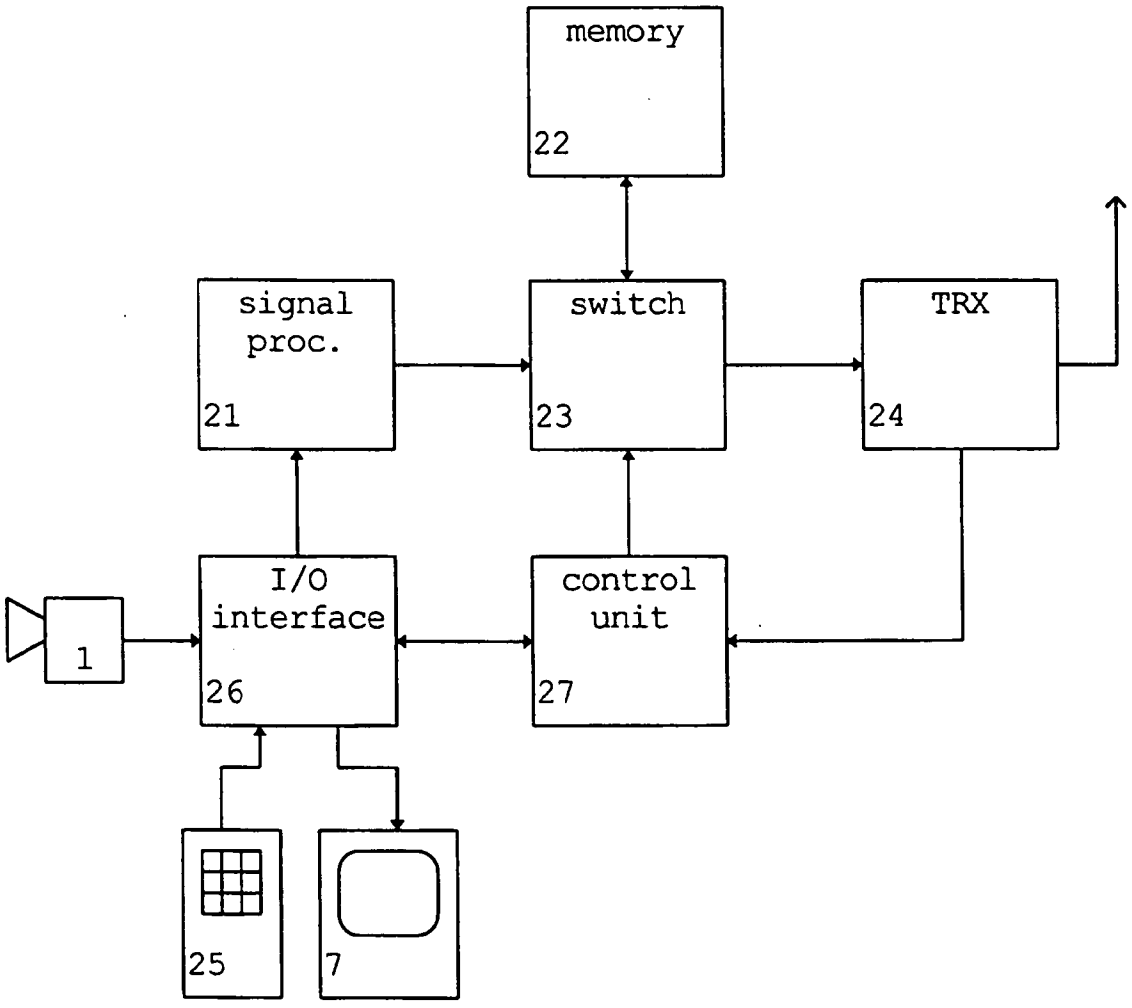

memory
22
signal proc.
21
switch
23
TRX
24
I/O interface
26
control unit
27
1
25
7

Fig. 2

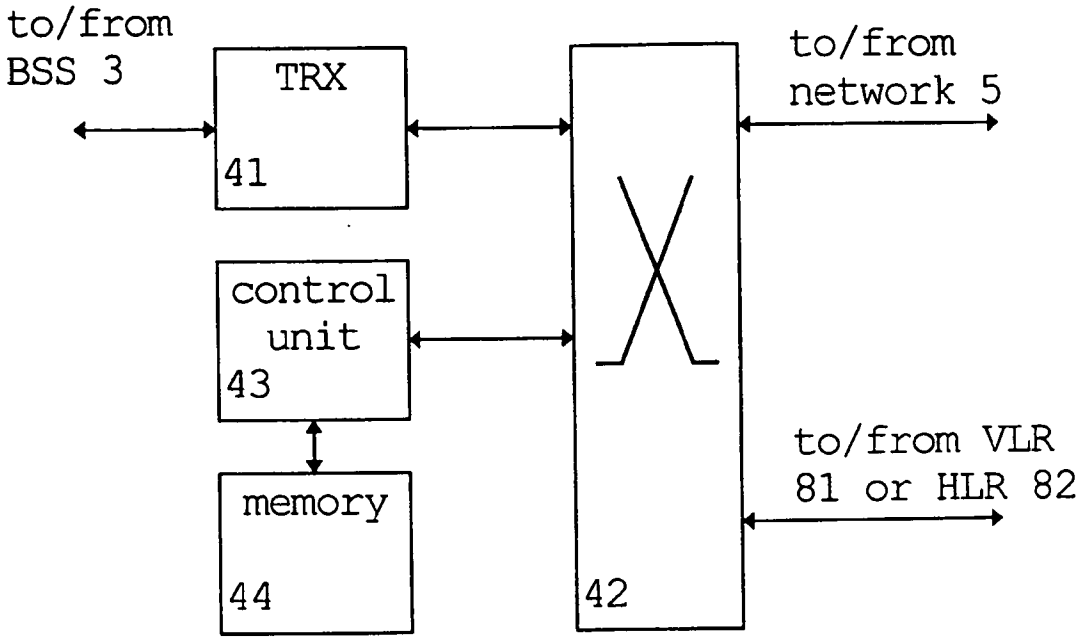

to/from
BSS 3
TRX
41
control
unit
43
memory
44
42
to/from
network 5
to/from VLR
81 or HLR 82

Fig. 3

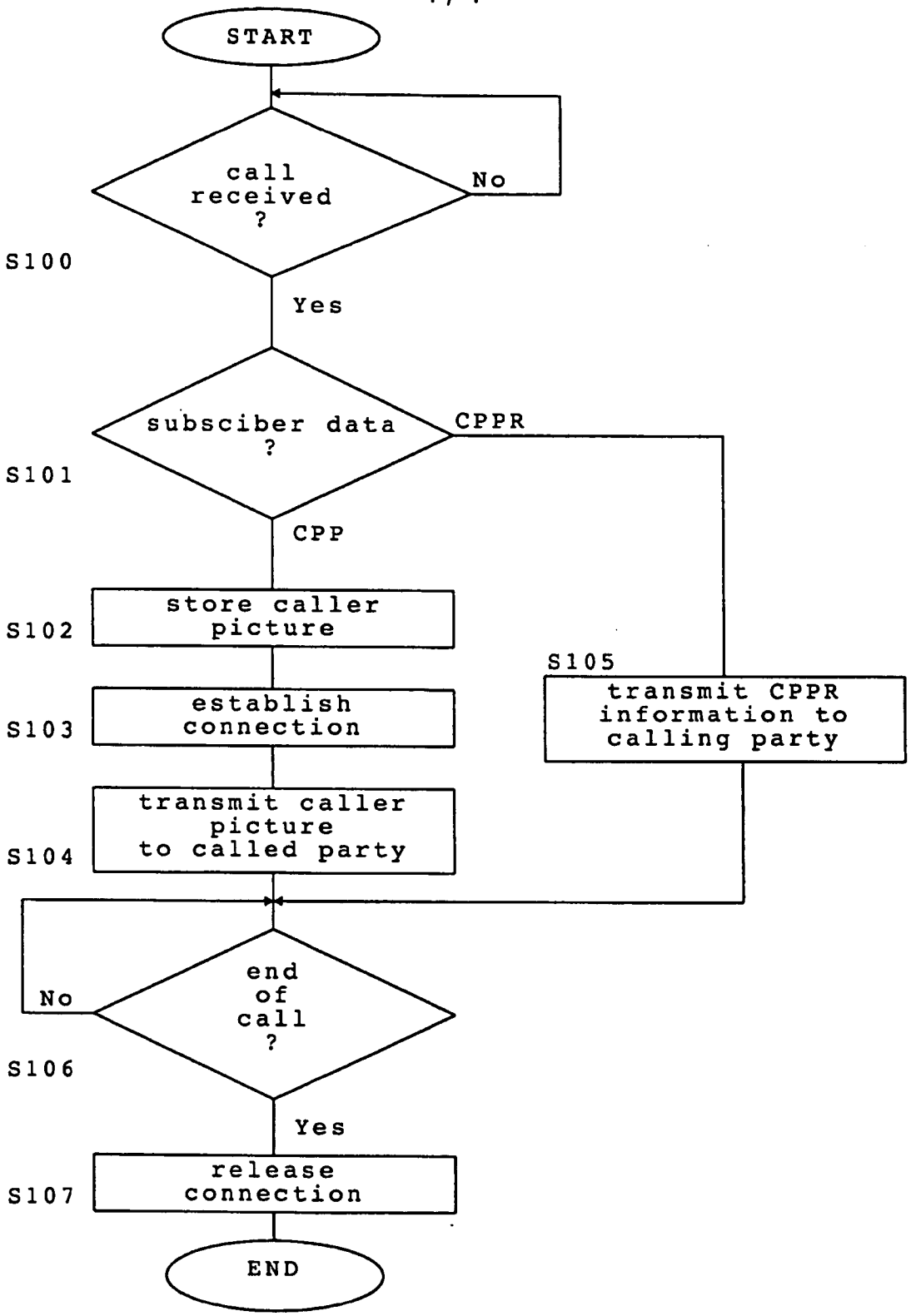

START
call received ?
No
S100
Yes
subsciber data ?
CPPR
S101
CPP
store caller picture
S102
S105
transmit CPPR information to calling party
establish connection
S103
transmit caller picture to called party
S104
end of call ?
No
S106
Yes
release connection
S107
END

Fig. 4

INTERNATIONAL SEARCH REPORT

Intel ional Application No
PCT/EP 99/04519

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04M1/57

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 7 H04M

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 741 484 A (AT & T CORP) 6 November 1996 (1996-11-06) column 1, line 3 -column 3, line 43 column 5, line 10 - line 19	1,4-7, 12,16, 19-22, 24,25
X	EP 0 436 345 A (CANON KK) 10 July 1991 (1991-07-10) column 2, line 14 - line 49 column 4, line 7 - line 43	1,4-7, 12,16, 19-22, 24,25
	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Vaucois, X

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INTERNATIONAL SEARCH REPORT

Intern[illegible]onal Application No
PCT/EP 99/04519

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	EP 0 474 555 A (CANON KK) 11 March 1992 (1992-03-11) column 3, line 28 -column 4, line 47 column 8, line 34 -column 10, line 51	1-25

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

information on patent family members

Inter nal Application No
PCT/EP 99/04519

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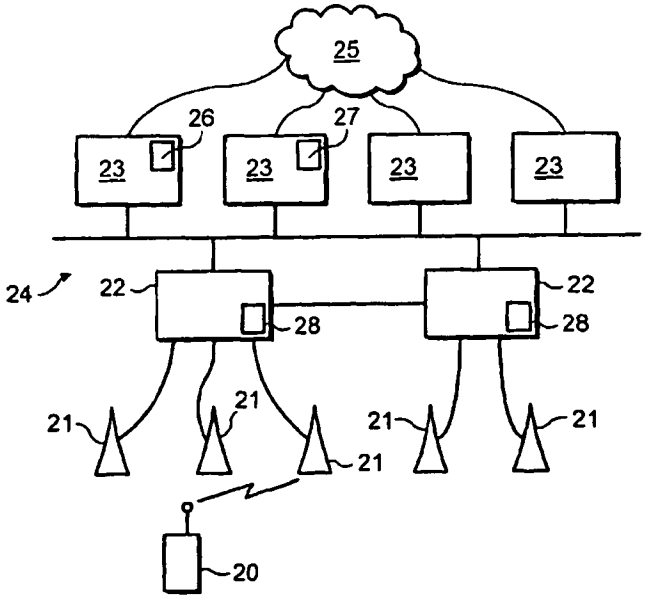
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SERVICE MANAGEMENT



(57) Abstract: A method of establishing a connection in a telecommunications system in which an intermediate network provides for communications between a user terminal and one or more of a plurality of serving network entities each capable of providing communications services to the user terminal by means of at least one telecommunications protocol, the method comprising the step of the intermediate network transmitting to the user terminal an indication of the serving network entities and the communications services provided by each one.

WO 01/03454 A1

SERVICE MANAGEMENT

This invention relates to managing services and overseeing mobility of a user in a telecommunication network. The invention is especially, but not exclusively, suitable for implementation in the proposed UMTS (Universal Mobile Telecommunications System) architecture.

Figure 1 shows generally the architecture proposed for UMTS. A mobile station (MS) 1 can communicate by radio with one or more base stations (BS) 2. Each base station is linked by an Iub interface 3 to a single radio network controller (RNC) 4. Each RNC can be linked to one or more BSs. An RNC can be linked to another RNC by an Iur interface 5. Each RNC is linked by an Iu interface 6 to a core network (CN) 7. The CN includes one or more serving nodes that can provide communication services to a connected mobile station, for example a mobile switching centre (MSC) or a serving GPRS (general packet radio service) support node (SGSN) 8. These units are connected by the Iu interface to the RNCs. The CN is also connected to other telecommunications networks 9 such as fixed line networks or other mobile networks to allow onward connection of communications outside the UMTS network. The CN also includes other units such as a home location register (HLR) 10 and a visitor location register (VLR) 11 which help to control access to the network. The BSs and the RNCs and their interconnections constitute a UMTS terrestrial radio access network (UTRAN).

A mobile station can communicate with a core network via an RNC and a base station connected to that RNC. In soft handover (macrodiversity), the mobile station can send traffic communications via more than one base station. Those base stations may be connected to the same RNC or to different RNCs. If the base stations are connected to different RNCs then those RNCs communicate directly with each other via the Iur interface to co-ordinate their actions and to combine signals received from the mobile station. One of those RNCs is designated as the serving

RNC and the others as drift RNCs. Communications between the user and the core network go via the serving RNC only. Thus, whether the mobile station is in soft handover or not its connection to the CN is through a single RNC. It can also arise in other circumstances than macrodiversity that a BS is controlled by a drift RNC, with communications going via serving a serving RNC to the core network.

In the core network each serving node such as an MSC or SGSN can provide a set of services to the mobile station. For example:

- An MSC can provide circuit switched (CS) communications, for example for speech, fax or non-transparent data services, and therefore has a link to other entities in the circuit switched domain such as other CS mobile networks such as GSM (Global System for Mobile Communications) and CS fixed wire networks such as conventional voice telephony networks.
- An SGSN can provide packet switched (PS) communications, for example for packet data protocol (PDP) contexts for internet protocol (IP) data transmission, and therefore has a link to other entities in the packet switched domain such as GPRS-equipped GSM networks and the internet.

The division of services between serving nodes is specified in the system specification and is strictly tied to the assumed network architecture. There may be other nodes than the MSC or SGSN providing overlapping or additional services.

It can be envisaged that in the future some services may be provided differently from the current arrangement. For example, speech services seem likely to migrate from the CS to the PS domain. In order to implement these changes to the network in the form described above is likely to cause substantial disruption. For example, to shift the provision of a fundamental service such as voice traffic to the PS domain may require routing hardware and software, as well as software in each mobile station, to be updated. This would cause great expense and inconvenience to network operators.

It would be desirable for there to be a way in which an operator can move a service previously executed by one type of network node to another type of network node with less disruption, or to introduce a new service via a new or an existing core network .

According to one aspect of the present invention there is provided a method of establishing a connection in a telecommunications system in which an intermediate network provides for communications between a user terminal and one or more of a plurality of serving network entities each capable of providing communications services to the user terminal by means of at least one telecommunications protocol, the method comprising the step of the intermediate network transmitting to the user terminal an indication of the serving network entities and the communications services provided by each one.

According to a second aspect of the present invention there is provided a telecommunications system comprising: a user terminal; a plurality of serving network entities each capable of providing communications services to the user terminal by means of at least one respective telecommunications protocol; an intermediate network providing for communications between a user terminal and one or more of the serving network entities, and being capable of transmitting to the user terminal an indication of the serving network entities and the communications services provided by each one.

Suitably, the user terminal selects the set of serving network entities which together support the set of services the user terminal wishes to use, and attaches to the serving network entities of the set.

Suitably the said indication is generated by the intermediate network. For this purpose the intermediate network may suitably store information defining the

available serving network entities and the service(s) capable of being provided by each one, preferably together with an identifier for each network entity.

The said indication may be transmitted to the user terminal during and/or after establishment by the user terminal of a connection with the intermediate network. In the latter case, the indication may suitably be transmitted in response to a mobility event of the mobile terminal, for example during or generally in consequence of a procedure of the intermediate network consequent on reallocation of equipment in the intermediate network serving the connection with the user terminal. That event may be a serving radio network controller relocation in, for example, a UMTS system or the like.

The intermediate network is suitably capable of adjusting the number of paging areas according to the number of serving network entities, for example with one paging area for each serving network entity. Alternatively, all, or at least more than one, of the serving network entities may use a common paging area.

The intermediate network is suitably capable of constituting a communication path between the user terminal and one or more of the network entities. The user terminal and one or more of the network entities are preferably capable of communicating via the intermediate network.

There may be a plurality of mobile stations, which are preferably operable in similar manner, whereby each mobile station can individually establish or register for communications with one or more serving network entities.

Suitably, for the user terminal an instance of a management process is established for each serving network entity with which that terminal is registered for informing the respective serving network of changes in the connection path to the respective terminal through the intermediate network. The said instance may be run on

processing apparatus local to the user terminal. On a change in the connection path to the mobile station through the intermediate network, each serving network entity may be informed of the change by means of the respective instance.

Suitably the intermediate network is capable of transmitting to a mobile station an indication of one or a plurality of serving network entities and the communications services provided by each one. Preferably, in order to receive a desired service a mobile station is capable of determining one of the serving network entities indicated as providing that service and attempting to establish a connection with that serving network entity via the intermediate network. Preferably, in consequence of the said indication of serving network entities and the communications services provided by each one, the system (most preferably the terminal) is capable of establishing a further instance of the management process for informing a respective serving network entity of changes in the connection path to a the said mobile station through the intermediate network. Alternatively, when a list of services is communicated to a terminal the terminal may already know which services are related to which serving nodes and consecutive to which management process. In that case if later the terminal needs to initialise a communication for a specific service then it may already be aware of which serving node it should contact, and thus suitably of which management process a request for such initialisation may be related to. In consequence of the said indication of serving network entities and the communications services provided by each one the system may suitably be capable of terminating an instance of the management process for informing a respective serving network entity of changes in the connection path to the said mobile station through the intermediate network.

The management process may be a mobility management process, suitably operable in accordance with a mobility management protocol, suitably a mobility management protocol of or for the Universal Mobile Telecommunications System or a derivative thereof.

The service(s) related to such management processes may, for example, be call control entities, session management entities, PDP (packet data protocol) entities, SMS (short message service) handling entities, voice-over-IP (internet protocol) entities, H.323 or H.324 entities, or supplementary service instances.

Some preferred features of all aspects of the invention will now be set out.

Suitably the user terminal is capable of communicating by radio and/or another medium with the intermediate network. The user terminal may be a unit that can be termed a mobile station, whether it is in fact mobile or immobile. The user terminal may be a mobile telephone.

The intermediate network is suitably operable according to the Universal Mobile Telecommunications System or a derivative thereof.

The intermediate network may be a radio access network, and is preferably a Universal Mobile Telecommunications System radio access network. The intermediate network is suitably capable of routing signals between the user terminal and one of the serving network entities, for example on the basis of (or in dependence on) a core network domain indicator. The intermediate network may include a Universal Mobile Telecommunications System radio network controller capable of performing the said routing.

Suitably at least one of the serving network entities is capable of providing for communications between the intermediate network and another telecommunications network. Each serving network entity may be a core network. Each serving network entity may include a home location register and/or a visitor location register. Suitably one or more of the serving network entities is capable of providing for circuit switched communications between the intermediate network and another telecommunications network. Suitably one or more of the serving network entities is capable of providing

for packet switched communications between the intermediate network and another telecommunications network.

The or each serving network entity may suitably but not necessarily be a serving network domain or serving network element.

The present invention will now be described by way of example with reference to the accompanying drawings, in which:

figure 1 is a schematic diagram of the currently-proposed architecture for a UMTS telecommunications system;

figure 2 is a schematic diagram of a modified architecture for a UMTS telecommunications system; and

figure 3 is a flow diagram illustrating the operation of a method in the system of figure 2.

The network shown in figure 2 is arranged so that instead of services being offered to a mobile station by a set of rigidly configured core network nodes, services can be offered to the user by a set of logical CN nodes. The services offered by each logical CN node can be reconfigured in a relatively straightforward manner. Furthermore, it is relatively easy to add additional CN nodes to introduce new services.

The network of figure 2 includes a mobile station 20, base stations 21 and RNCs 22. The interconnection of these units and the general aspects of their operation are suitably as for the UMTS system of figure 1.

The network of figure 2 also includes a plurality of core network entities 23 any of which may communicate with any of the RNCs 22 via a distributed communication arrangement 24. The core networks 23 can communicate with external telecommunications networks 25 such as other mobile networks, the internet and fixed line networks, depending on the capabilities of the respective core network. For

example, a core network may include a mobile switching centre (MSC) 26 for communications via voice or fax protocols or a serving GPRS (general packet radio service) support node (SGSN) 27 for data protocol communications. In a large network not all of the core networks 25 may be able to communicate with all of the RNCs 22, for geographical network configuration reasons.

The RNCs 22 include processing apparatus 28 for processing communications through the RNCs, handling control of the base stations 21 (e.g. controlling handovers), managing access of mobile stations into the system, managing mobility (e.g. location management or radio resource management) of mobile stations in the system between base stations, and other functions.

When a mobile station makes contact with the network it makes radio communication with a base station and thereby establishes an RRC (radio resource control) connection with the RNC to which that base station is connected. In the course of setting up that connection the UTRAN indicates to the mobile station the available CN nodes (domains) offering services within the service area controlled by the respective RNC. For each domain the UTRAN indicates to the MS the service(s) offered by that domain, together with an identifier for the domain, suitably a logical identifier such as a core network access number that may be used by the mobile station or other network entities to identify that core network in communications and allow routing to that network.

The MS is aware of which services it supports and for which of those services it requires a connection to the network. The MS can therefore select one or more appropriate CN domains for providing the required service(s). The MS attempts to connect to each selected domain so that it can be provided with a desired service from that domain.

For example, if the MS connects to the network requiring a circuit switched fax connection and a packet switched voice connection, the MS receives from the UTRAN a message indicating the available domains and the services offered/supported by each. The MS then selects one CN domain that is offering a fax service and one CN domain that is offering a packet switched service capable of carrying voice traffic. The MS then attempts to make a connection to each one of those domains. The domains may be the same or different.

The process is illustrated generally in figure 3.

The said core network access number can simply be an identifier that is generated by the RNC for use in its communications with the MS. The MS can use the core network access number to indicate to the RNC which core network it wishes to access but the subsequent forwarding of an access request message on to the relevant core network may be done by the RNC using a different, true identifier that is unknown to the MS. Thus, from the point of view of the MS the RNC transparently passes its communications on to the relevant core network. Once a core network accepts and establishes an attachment to an MS the MS can be informed of a true identifier for the core network to allow it to direct communications to the core network via another RNC if necessary. The RNC preferably has logic to allow it to direct communications to a suitable CN serving entity of the desired domain – for example randomly, on the basis of information determined by the RNC, on the basis of information given to the RNC by one or more of the serving node (e.g. their loads) or on the basis of information given to the RNC by the user equipment (UE) (e.g. the identity of the entity that previously handled the UE's communications and therefore may have some information on the UE). When such an entity has been selected the RNC may address that entity by the identifier of a specific entity given to the user equipment by the entity itself.

As the mobile station moves within the network the base station(s) and the RNC(s) serving it may change, as may the serving nodes in the core network. To cope with this the UMTS system provides for mobility management (MM) protocol instances which handle location updates within the network in idle mode. In connected mode (i.e. when an RRC connection exists between the mobile station and an RNC) handover procedures are used, in which a connection is switched from a former node to a new node; the same principle is used whether the changing node is the BS, RNC or serving CN. In the system of figure 2, on attaching to a domain a mobile station initiates a UMTS mobility management instance especially for that domain. Therefore, associated with each MS there is a MM instance for each CN domain to which that MS is attached. In principle each MM instance operates independently of the others, following the UTRAN paging area indication and making appropriate location updates to its respective CN domain. (In practice the MM instances may be somewhat linked by, for example, a common paging area). By this means, each CN domain to which the MS is attached can be kept independently updated of the mobile station's location so that it can route communications to the mobile station accordingly.

As the operator updates the network and offers different services through different CN domains this is handled automatically through by the connection arrangement described above. When the MS accesses the network, if the operator now offers a service through a different CN node than before the MS simply attaches to the new CN node that is indicated to the mobile as being capable of providing the desired service. Thus the above arrangement copes automatically with the addition of new CN domains to provide services and with adjustment of the functional split of services between CN domains.

The system is preferably also capable of accommodating changes in the attachment pattern of the MS even whilst it is connected to the network. If the mobile receives from the UTRAN a message indicating a change in the split of services between CN

nodes that affects the services for which the mobile station is attached then it suitably changes its pattern of attachment to meet with the new split of services. To meet the new split of service any of the following changes may be made, as appropriate:

1. Changing the arrangement for provision of a service from one CN domain to which the MS is already attached to another CN domain to which the MS is already attached. In this case the existing MM instance for that CN domain can also be updated to reflect the change in services being accessed through the respective CN domain.
2. Dropping the attachment for provision of a service from one CN domain and establishing an attachment for provision of that service from another CN domain to which the MS was not previously attached. In this case the existing MM instance for the dropped CN domain can be terminated and a new MM instance established for the newly attached CN domain.

This capability offers great flexibility to operators in the provision of new services or the reconfiguration of a network to provide existing services through new nodes. In particular, as services migrate from the CS domain to the PS domain the above arrangement provides the capacity for relatively straightforward reconfiguration of MS to CN connections from nodes that formerly provided a service in the CS domain to nodes that provide an equivalent service in the PS domain.

If the mobile station is informed of the availability of a service that is unknown to the mobile station then it can suitably ignore the availability of that service. By this means the system described above may be used to assist in version management – that is to assist compatibility between older and newer equipment in the system. Thus older mobile stations that are not compatible with newer services can cope with indications of the availability of services with which they are not compatible.

The applicant draws attention to the fact that the present invention may include any feature or combination of features disclosed herein either implicitly or explicitly or any generalisation thereof, without limitation to the scope of any of the present claims. In

view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention.

CLAIMS

1. A method of establishing a connection in a telecommunications system in which an intermediate network provides for communications between a user terminal and one or more of a plurality of serving network entities each capable of providing communications services to the user terminal by means of at least one telecommunications protocol, the method comprising the step of the intermediate network transmitting to the user terminal an indication of the serving network entities and the communications services provided by each one.

2. A method as claimed in claim 1, wherein in order to receive a desired set of services the mobile station determines a set of the serving network entities indicated as together providing that set of services and attempts to establish a connection with the serving network entities in the set via the intermediate network.

3. A method as claimed in claim 2, wherein the said indication is generated by the intermediate network.

4. A method as claimed in any preceding claim wherein the user terminal is capable of communicating by radio with the intermediate network.

5. A method as claimed in any preceding claim wherein the intermediate network is operable according to the Universal Mobile Telecommunications System or a derivative thereof.

6. A method as claimed in claim 5, wherein the serving network entities are core networks.

7. A method as claimed in any preceding claim, wherein the intermediate network is a radio access network.

8. A method as claimed in claim 7, wherein the intermediate network is a Universal Mobile Telecommunications System radio access network.

9. A method as claimed in any preceding claim, wherein the said indication is transmitted to the user terminal during the establishment of a connection between the user terminal and the intermediate network.

10. A method as claimed in any preceding claim, wherein the said indication is transmitted to the user terminal during establishment of a radio resource control connection between the user terminal and the intermediate network.

11. A method as claimed in any of claims 1 to 8, wherein said indication is transmitted to the user after establishment by the of a connection between the user terminal and the intermediate network.

12. A method as claimed in any of claims 1 to 8 or 11, wherein the said indication is transmitted to the user terminal during a procedure of the intermediate network consequent on reallocation of equipment in the intermediate network serving the connection with the user terminal.

13. A method as claimed in claim 11 as dependant directly or indirectly on claim 5, wherein the said indication is transmitted to the user terminal in consequence of a serving radio network controller relocation.

14. A method as claimed in any preceding claim, wherein the said indication is transmitted to the user terminal in consequence of a change in serving network entity.

15. A method as claimed in any preceding claim, wherein the intermediate network is capable of adjusting the number of paging areas according to the number of serving network entities.

16. A method as claimed in any preceding claim, wherein at least one of the serving network entities is capable of providing for communications between the terminal and another telecommunications network.

17. A method as claimed in any preceding claim, wherein at least one of the serving network entities is capable of providing for circuit switched communications between the terminal and another telecommunications network.

18. A method as claimed in any preceding claim, wherein at least one of the serving network entities is capable of providing for packet switched communications between the terminal and another telecommunications network.

19. A method as claimed in any preceding claim, wherein the intermediate network is capable of routing signals between the user terminal and one of the serving network entities.

20. A method as claimed in claim 19, wherein the intermediate network is capable of routing signals from the mobile station to a selected one of the serving network entities on the basis of a core network domain indicator.

21. A method as claimed in claim 19 or 20, wherein the intermediate network includes a Universal Mobile Telecommunications System radio network controller capable of performing the said routing.

22. A method as claimed in any preceding claim, comprising establishing for each user terminal for each serving network entity with which that terminal is registered an

instance of a management process for informing the respective serving network of changes in the connection path to the respective mobile station through the intermediate network, whereby on a change in the connection path to the mobile station through the intermediate network, each serving network entity may be informed of the change by means of the respective instance.

23. A method as claimed in claim 22, comprising the step of, in consequence of the said indication of serving network entities and the communications services provided by each one, establishing a further instance of the management process for informing a respective serving network entity of changes in the connection path to the mobile station through the intermediate network.

24. A method as claimed in claim 22, comprising the step of, in consequence of the said indication of serving network entities and the communications services provided by each one, terminating an instance of the management process for informing a respective serving network entity of changes in the connection path to the said mobile station through the intermediate network.

25. A method as claimed in claim 23 or 24, comprising the step of, in consequence of the said indication of serving network entities and the communications services provided by each one, modifying an instance of the management process for informing a respective serving network entity of changes in the connection path to a the said mobile station through the intermediate network.

26. A method as claimed in any of claims 22 to 25, wherein the management process is a mobility management process.

27. A method as claimed in claim 26, wherein the management process is operable in accordance with a mobility management protocol.

28. A telecommunications system comprising:

a user terminal;

one or more serving network entities each capable of providing communications services to the user terminal by means of at least one respective telecommunications protocol;

an intermediate network providing for communications between a user terminal and one or more of the serving network entities, and being capable of transmitting to the user terminal an indication of the serving network entities and the communications services provided by each one.

29. A telecommunications system as claimed in claim 28, comprising processing apparatus capable of for each user terminal establishing for each serving network entity with which that terminal is registered an instance of a management process for informing the respective serving network of changes in the connection path to the respective user terminal through the intermediate network, whereby on a change in the connection path to the user terminal through the intermediate network, each serving network entity may be informed of the change by means of the respective instance.

30. A method for establishing a connection substantially as herein described with reference to figures 2 and 3 of the accompanying drawings.

31. A method for managing communications substantially as herein described with reference to figures 2 and 3 of the accompanying drawings.

32. A telecommunications system substantially as herein described with reference to figures 2 and 3 of the accompanying drawings.

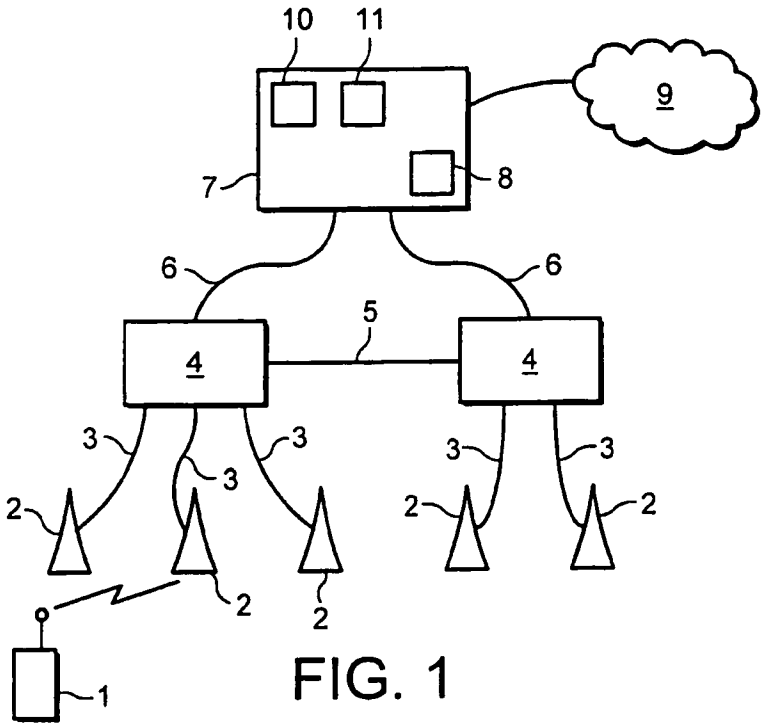

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FIG. 1

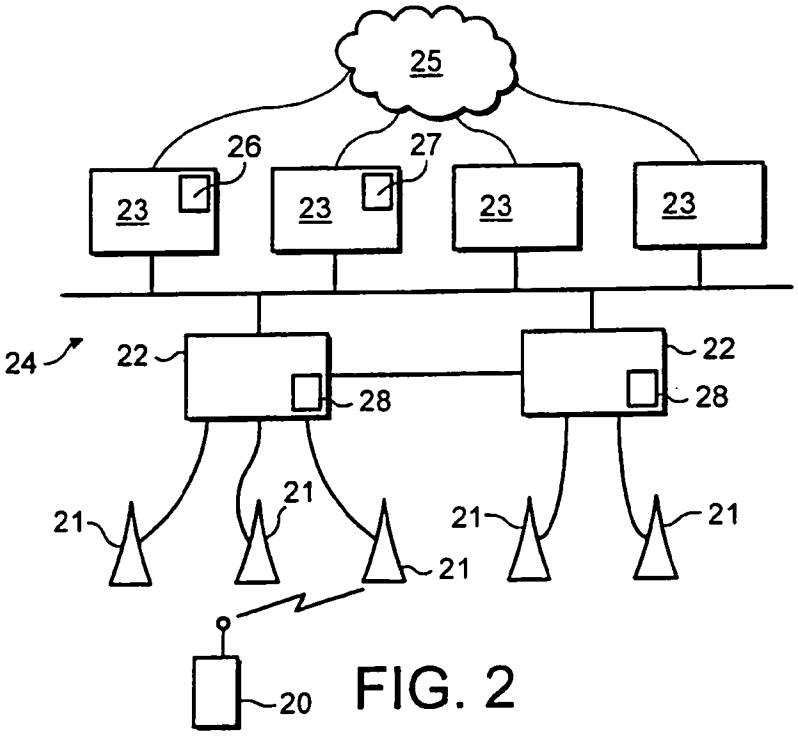

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FIG. 2

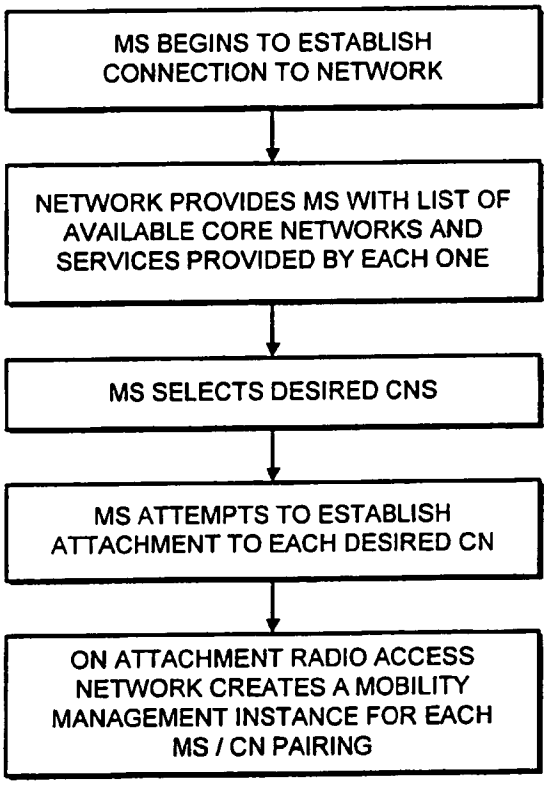

MS BEGINS TO ESTABLISH CONNECTION TO NETWORK
NETWORK PROVIDES MS WITH LIST OF AVAILABLE CORE NETWORKS AND SERVICES PROVIDED BY EACH ONE
MS SELECTS DESIRED CNS
MS ATTEMPTS TO ESTABLISH ATTACHMENT TO EACH DESIRED CN
ON ATTACHMENT RADIO ACCESS NETWORK CREATES A MOBILITY MANAGEMENT INSTANCE FOR EACH MS / CN PAIRING

FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 00/00989

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/24

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 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 practical, search terms used)
EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 294 844 A (MOTOROLA INC) 8 May 1996 (1996-05-08) page 3, line 22 -page 4, line 25 claims 1,2 ---	1,4,6,9, 17,28
A	BERRUTO E ET AL: "ARCHITECTURAL ASPECTS FOR THE EVOLUTION OF MOBILE COMMUNICATIONS TOWARD UMTS" IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS,US,IEEE INC. NEW YORK, vol. 15, no. 8, October 1997 (1997-10), page 1477-1486 XP000721279 ISSN: 0733-8716 the whole document --- -/--	1-29

[X] Further documents are listed in the continuation of box C. [X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 August 2000	04/09/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Pecci, R

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 00/00989

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SCHIEDER A ET AL: "GRAN - A NEW CONCEPT FOR WIRELESS ACCESS IN UMTS" ISS. WORLD TELECOMMUNICATIONS CONGRESS. (INTERNATIONAL SWITCHING SYMPOSIUM),CA,TORONTO, PINNACLE GROUP, 21 September 1997 (1997-09-21), page 339-345 XP000704485 the whole document	1-29

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/IB 00/00989

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		DE 19581443 T	27-02-1997
		WO 9614719 A	17-05-1996
		FI 962789 A	03-09-1996
		JP 9507986 T	12-08-1997

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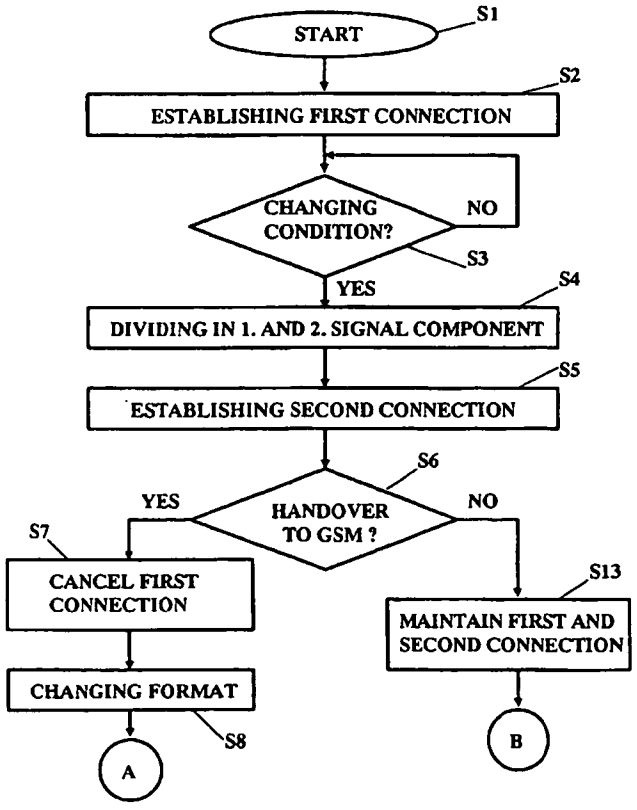
(74) Agents: **TRÖSCH, Hans-Ludwig** et al.; Tiedtke-Bühling-Kinne et al., Bavariaring 4, D-80336 München (DE).

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(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC,

[Continued on next page]

(54) Title: METHOD AND DEVICE FOR HANDLING A MULTIMEDIA CALL



(57) Abstract: The present invention proposes a method for performing a communication between two terminal equipments (TE1, TE2) via at least one communication network (NW1, NW2), said method comprising the steps of establishing (S2) a first connection for a communication signal (V/S) between the two terminal equipments, detecting (S3) a connection changing condition, and, if said connection changing condition is detected, dividing (S4) said communication signal at least into a first signal component (V) and a second signal component (S) and establishing (S5) at least one second connection, said first signal component being transmitted via the first connection and said second signal component being transmitted via the second connection. The present invention proposes also a corresponding device (100) and a corresponding system.

WO 01/03461 A1

NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

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

METHOD AND DEVICE FOR HANDLING A MULTIMEDIA CALL

FIELD OF THE INVENTION

The present invention relates to a method for performing a communication between two terminal equipments via at least one communication network and also relates to a corresponding device and a corresponding system. In particular, the present invention is directed to a method and a corresponding device and a corresponding system for handling a multimedia call in different communication networks.

BACKGROUND OF THE INVENTION

In recent and future communication systems the ability to perform a multimedia call becomes more and more important. An example of such a multimedia call is a videotelephony call. Such kind of communication requires e.g. high data transfer rates and a high quality of service (QoS) level. Therefore, specific services and equipment are to be defined.

Telecommunication systems and networks being adapted to perform a videotelephony call are for example the Integrated Services Digital Network (ISDN), General Packet Radio Service (GPRS) in the Global System for Mobile communication (GSM) or the Universal Mobile Telecommunications System (UMTS). Furthermore, in combination with a respective system, it is possible to use a circuit switched communication or a packet data communication.

For defining a multimedia communication several recommendations for example by the International Telecommunications Union (ITU) have been made, e.g. the

H.245, the H.324 and the like, which describe services, protocols, terminals etc. to be used for a multimedia call such as a videocall.

In the case of the above mentioned videocall, it is possible to transfer data between two terminals (mobile or fixed) via a communication network of one of the above mentioned types. The terminals or terminal equipments (such as mobile stations or videotelephones) can be in the same communication network or in different communication networks. The videocall is performed via a bi-directional connection between the two terminal equipments. Said connection initiated by one of said terminal equipments is for example an end-to-end H.324 connection which is carried for example on a UMTS data bearer.

In view of the high amount of data, the used network has to provide a corresponding high data transfer rate. Said data rate is also to be ensured for a data exchange between two different networks when the two terminal equipments are within respective different networks (for example UMTS -> ISDN, UMTS A -> UMTS B and the like).

However, there are some drawbacks. During a normal connection (e.g. packet data communication or circuit switched communication) between the two terminal equipments being in the same network such as a UMTS network, the quality of service (i.e. of the connection) can get worse and a good or even adequate communication can not be guaranteed. Moreover, when a handover is to be made for at least one of the terminal equipments from a network adapted to perform a videocall such as a UMTS network to a network with lower capacity (and therefore for example not able to perform a videocall) where such high data rates used for a multimedia call are not supported, the connection is interrupted. In the case that the lower capacity network

handed over to is able to perform a videocall, at least the quality of service is getting worse.

SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide a method and a corresponding device for handling a multimedia call such as a videocall in different communication networks, which are free from the above mentioned drawbacks. Furthermore, a corresponding device is to be provided.

According to the present invention, this object is achieved by a method for performing a communication between two terminal equipments via at least one communication network, said method comprising the steps of establishing a first connection for a communication signal between the two terminal equipments, detecting a connection changing condition, and, if said connection changing condition is detected, dividing said communication signal at least into a first signal component and a second signal component and establishing at least one second, said first signal component being transmitted via the first connection and said second signal component being transmitted via the second connection.

Furthermore, the present invention proposes a device for performing a communication between two terminal equipments via at least one communication network, said device comprising first establishing means for establishing a first connection for a communication signal between the two terminal equipments, detecting means for detecting a connection changing condition, dividing means for dividing said communication signal at least into a first signal component and a second signal component, if said detecting means detects said connection changing condition, and

second establishing means for establishing at least one second connection, said first signal component being transmitted via the first connection and said second signal component being transmitted via the second connection.

Moreover, the present invention proposes a system in which a communication between two terminal equipments is performed via at least one communication network, said system is adapted to establish a first connection for a communication signal between the two terminal equipments, detect a connection changing condition, and, if said connection changing condition is detected, divide said communication signal at least into a first signal component and a second signal component and establish at least one second connection, said first signal component being transmitted via the first connection and said second signal component being transmitted via the second connection.

Advantageous further developments of the present invention are as set out in the respective dependent claims.

According to the present invention, the proposed method and/or device and/or system allow to establish at least one second connection between the two terminal equipments or between a respective terminal equipment and a respective network, respectively. By using said second connection parallel to the first one, it is possible to transmit one component (for example a video component) of the original communication signal via the first connection and another component (for example a speech component) of the original communication signal via the second connection. Advantageously, the video component can use the complete capacity of the first connection which improves the quality and robustness according for example H.324. On the other hand, the speech component transmitted via the second connection is not affected by the video component which

also improves quality. Said second connection can be a connection similar to the first one (e.g. a UMTS multimedia call connection) or just a (lower capacity) speech call connection. It is also possible to use both connection as a data bearer and split and combine the data as it seems fit between the two connections.

Additionally, in case of a handover, in particular in a handover to a network with lower capacity or which is unable to perform a videocall (for example some GSM networks), by dropping the video component (i.e. the corresponding connection), the multimedia call or at least the speech call can be maintained. In case of a connection between e.g. a UMTS network and a GSM network each using different protocol types, the speech component can be easily transcoded by a corresponding element. At a handover back to the UMTS network, the multimedia call can be reestablished in the original way.

Preferred embodiments of the invention are described herein below in detail by way of example with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A, 1B and 1C show connection states between two terminals.

FIGS. 2A, 2B show connection paths with elements used in a communication according to the invention.

FIG. 3 is a flowchart illustrating a method for handling a communication according to the invention.

FIG. 4 is a flowchart illustrating a method for handling a communication according to the invention.

FIG. 5 is a flowchart illustrating a method for handling a communication according to the invention.

FIG. 6 is a block circuit diagram for illustrating a device for handling a communication according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

In FIG. 1A a connection state for a multimedia call in a most general case is shown. A first terminal equipment TE 1 is connected to a second terminal equipment TE 2 via a communication network NW 1. Said network is for example an UMTS network adapted to perform a multimedia communication. Through the connection a multimedia signal V/S (e.g. a videotelephony call) is transmitted between said terminal equipments.

FIG. 1B illustrates one implementation of the present invention. In this case, for example the quality of the communication connection within the network NW 1 is getting worse. Therefore the original multimedia signal V/S is divided into at least two components V and S each of which transmitted via a separate connection. The at least one new connection is established similar to the original connection. It is either of the same type (for example an UMTS multimedia call connection) or of a different type (for example a normal speech call connection). The selection of the connection type used for the second connection can be made subscriber specific, dependant on network resources available or fixed (i.e. always the same type such as the above mentioned UMTS connection).

The two signal components V and S can be of the same type (split and combine the data stream of the original signal V/S in accordance with network requirements), i.e. the

connections are used as similar data bearers. On the other hand, there can be formed different component types such as video and speech component.

Optionally, the first connection transmitting for example the video signal component V from the network NW 1 to the second terminal equipment TE 2 can be canceled depending on network resources.

The above described case is also possible when the two terminal equipments are within different networks both of them adapted to perform a multimedia call on the same level. It is obvious, that corresponding connections are to be established between the networks in such a case.

It is to be noted, that for deciding whether a second connection (or even more connections) is to be established e.g. because of a deterioration of quality the connection is to be monitored. This monitoring can be done either by the network (e.g. by a mobile switching center MSC) and/or by the terminal equipment. Also the decision of the establishment of said second connection can be made by either the network or the terminal equipment.

In FIG. 1C another implementation of the present invention is shown. Here, a case of a handover to a second network NW 2, i.e. the second terminal equipment TE 2 is moved into a coverage area of said second network, is described. The second network NW 2 is for example a GSM network which has not adequate resources for transmitting such a high amount of data as used in a multimedia call. Therefore, when recognizing this circumstances, after establishing the second connection and dividing the original multimedia signal V/S into the two components V and S, the first connection and hence the first (video) component is dropped. Only the second component S, for example the

speech component, is forwarded (or handed over) by the first network to the second user equipment. Here, in particular in a circuit switched type connection, when one component is dropped (e.g. the video component V), it can be necessary to notify this change in communication to the terminal equipments TE1, TE2 to guarantee an uninterrupted communication.

In this case, it is also possible that the format of the multimedia signal, i.e. the format of the second signal component S, is to be changed in accordance with the respective second network NW 2 such as a GSM network. For example, when the first network NW 1 uses H.324, the corresponding signal component S is to be transcoded for the second network NW 2.

In the above described cases (FIG. 1B, 1C), when the reason for the establishment of the second connection and the division of the multimedia signal V/S (i.e. a changing condition) is not present anymore, for example due to a back-handover from a GSM network to a UMTS network, the original connection state (one connection, one signal V/S) can be reestablished. However, it is also possible to maintain the two connections.

It should be noted, that it is also possible, e.g. in the case of a packet data transfer, that only a part of the data packets with corresponding contents will be transferred via the communication connection according to the present invention.

In the following, with reference to FIG. 2A and 2B, connection paths and specific network elements used therein in case of the above described handover are illustrated. It is to be noted, that here the paths are shown in the direction from the lower capacity network to the higher

capacity network. However, it is easy to understand that the same procedure is executed in the opposite direction.

In FIG. 2A one example of a connection according to the present invention is shown, in particular in case of a handover to a lower capacity network. This type of handover requires a videocodec/speech codec (encoder/decoder) adapter in the connection path. The situation before said handover is as shown in FIG. 1A. After the handover, as illustrated in FIG 2A, the connection is as follows. The signals are forwarded from a terminal equipment TE 1 via an advanced multirate speech coder AMR to a transcoder. The AMR is a new type of speech coder used for GSM systems, which is adapted to vary its coding rate in accordance with the data (speech) to be transmitted. The transcoder is adapted to encode and decode for example the speech signal into corresponding data formats. The data is then transmitted to a network element of the (second) network NW 2, for example to a mobile switching center MSC. Here, a pulse code modulation PCM is used as a coding method for transmitting data such as speech via the networks. One method used for coding is for example A-law. Then, the data is forwarded to another network NW 1 via a gateway 1. Said gateway is also a transcoder used for changing the format of the data from the PCM A-law format into another format, for example a H.324 format. Optionally, a further advanced multirate speech coder can be introduced. Via the network NW 2 (for example a network applicable according to H.324) data is transmitted to the called terminal equipment TE 2.

FIG. 2B shows a similar case to FIG. 2A. Here, a tandemfree operation is supported, i.e. the transcoder is within the network itself. In contrast to the above described case with reference to FIG. 2A, the gateway 2 simply adepts the AMR speech signal format to a H.324 format, which can be also correspond to an AMR.

As mentioned above, it is also possible to use the present invention in case of a deterioration of quality or to guarantee service continuity. For this application, it is for example requested to switch off the video connection or video channel V, i.e. the corresponding data bearer. The speech component S (AMR speech) is for example encapsulated in a H.223 multiplexing protocol data stream. In this case, it is possible to reach a lower bit error rate and a higher quality. Furthermore, also a dedicated speech service with AMR speech coding and the like can be requested.

With reference to FIG. 3, a method for performing a communication between the two terminal equipments TE1, TE2 according to the invention is described. When the procedure is started (step S1), first the first connection for the multimedia signal V/S between the two terminal equipments TE1, TE2 via the first communication network is established in step S2. When in step S3 a connection changing condition (e.g. because of a deterioration of quality or due to a handover, as described above) is detected, the process proceeds to step S4, otherwise said step S3 is repeated.

In step S4, after detection of said connection changing condition, the multimedia signal V/S is divided at least into a first signal component V and a second signal component S, which are in the case of a videotelephony call a video component and a speech component, respectively. Also, in step S5, at least one second connection is established, either on request by a respective terminal equipment TE 1, TE 2 or by the network itself. Now the first signal component V may be transmitted via the first connection and the second signal component S may be transmitted via the second connection.

In a step S6, it is decided, whether the changing condition detected in said detecting step S3 is a handover to a lower capacity network. If YES, in step S7 the first connection including the transmitted first signal component V (for example the video component as the component requiring the most resources) is canceled. Furthermore, in step S8, the format of the still transmitted signal component S may be changed or transcoded, if required.

With reference to FIG. 4, in the following the case is described where the changing condition concerning a handover is canceled. When detecting in step S9 that e.g. the handover to a lower capacity network is finished and a handover to a higher capacity network (at least at an adequate capacity level to perform a multimedia call) is performed, in step S10 the first connection canceled in said canceling step S7 is reestablished. This reestablishment can be initiated by a terminal equipment TE 1, TE 2 or by the network (for example by the mobile switching center MSC). Now, the multimedia communication can be performed via the first connection transmitting the first signal component V and the second connection transmitting the second signal component S, as described above. However, it is also possible to recombine both components V and S to the original multimedia signal V/S (step S11). Then the second connection can be canceled or still used to transmit one part of said multimedia signal V/S split thereof.

With reference to FIGS. 3 and 5, now the case is described where no handover is to be performed but the changing condition detected in said detecting step S3 is for example a lack of quality.

In the above mentioned case, in step S13, the multimedia communication is performed by maintaining the first and the

second connection transmitting the first and the second signal component V, S. Similar to the above described handover, when the canceling of the changing condition is detected in step S14 in FIG. 4 (i.e. the quality can be guaranteed again or because of a user request), in step S15 the original multimedia signal V/S is rebuilt from the first signal component V and the second signal component S. The second connection is canceled in step S16 the rebuilt multimedia signal V/S is again transmitted via the first connection. Optionally, the second connection can be maintained, as described above, for transmitting one signal part.

In FIG. 6, a device 100 (V/S call device) adapted to perform a handling of a multimedia call in accordance with the present invention is shown. For said multimedia call, the first connection for a multimedia signal V/S between the two terminal equipments TE1, TE2 via the network is established by a connection establishing means 110. When a detecting means 120 detects a connection changing condition such as a handover to a lower capacity network or a deterioration of quality, a dividing means 130 divides said multimedia signal V/S at least into a first signal component V (for example a video component) and a second signal component S (for example a speech component). The establishing means 110 establishes at least one second connection, wherein said first signal component V may be transmitted via the first connection and said second signal component S may be transmitted via the second connection.

Additionally, a canceling means 140 is adapted to cancel the first connection transmitting the first signal component V, for example in the case of a handover to a lower capacity network NW2 as described above. Then the communication is performed only via the second connection transmitting the second signal component S.

A reestablishing means 150 is adapted to reestablish the first connection canceled by said canceling means 140, when said changing condition is dropped (detected for example by said detecting means 120). Now the communication may be performed via the first connection transmitting the first signal component V and the second connection transmitting the second signal component S. It is also possible, that the original multimedia signal V/S is rebuilt by a rebuilding means 160 from the first and the second signal component V and S. In this case, said communication may be performed via the first and second connection both transmitting one part of the multimedia signal V/S (for example split). Another solution is to cancel the second connection by said canceling means 140. Then the multimedia call is only performed via the first connection transmitting the rebuilt multimedia signal V/S.

In the case of a handover, when the lower capacity network uses for example a different protocol type, a changing means 170 is used for changing or transcoding the respective communication signal (for example the speech component S) from one format into the respective other format used in the respective networks NW 1, NW 2.

It should be noted, that the device 100 can be part of the corresponding networks and or of the terminal equipments.

As mentioned above, it is possible to maintain both parallel connections even if the changing condition is dropped. However, it should be mentioned, that this solution increases costs as more resources are required. Therefore, in general the second connection is only activated if required (low quality, preparation of handover or the like) and canceled when not needed anymore.

A user performing a call using the present invention will be charged according to the number (and/or capacity) of the currently established connections. However, when a connection or connections are for example handed over from one network (e.g. NW1) to another network (e.g. NW2), it is obvious that charging will be stopped in the first network and started in the second network handed over to. Conditions for the charge can be subscriber specific or according to usual network negotiations.

It may be possible to enhance current in-band negotiation protocols to handle the above described parallel call feature according to the present invention. The data bearer should be able to carry H.245 signaling.

The parallel (speech call) connection can be established for example before, during or after a handover, e.g. to a lower capacity network. Furthermore, the present invention can be used in a handover within for example one UMTS network (intra-UMTS handover), in a user initiated handover or in a user initiated change of connection type (bearer re-negotiation).

In particular, when the present invention is used in a packet data multimedia communication for example in a H.323 system, it is very easy to implement. Since in a H.323 system each multimedia signal component (e.g. speech and video) has own separate bearers (in uplink and downlink direction), a diversion of the components or even a switch off of one component (i.e. of the corresponding bearers) is easy to perform. This allows an improvement of quality or a continuation of the multimedia call, for example only by speech, when a lack of capacity of the used network as a changing condition occurs (e.g. due to a handover or other reasons, as described above). When the changing condition is dropped (e.g. handover back to the higher capacity

network or the like), it is also easy to reestablish the original communication paths only by switching on the previously cancelled bearers.

The present invention proposes a method for performing a communication between two terminal equipments TE1, TE2 via at least one communication network NW1, NW2, said method comprising the steps of establishing S2 a first connection for a communication signal V/S between the two terminal equipments, detecting S3 a connection changing condition, and, if said connection changing condition is detected, dividing S4 said communication signal at least into a first signal component V and a second signal component S and establishing S5 at least one second, said first signal component being transmitted via the first connection and said second signal component being transmitted via the second connection. The present invention proposes also a corresponding device 100 and a corresponding system.

It should be understood that the above description and accompanying figures are merely intended to illustrate the present invention by way of example only. The preferred embodiments of the present invention may thus vary within the scope of the attached claims.

CLAIMS

1. A method for performing a communication between two terminal equipments (**TE1, TE2**) via at least one communication network (**NW1, NW2**),

said method comprising the steps of:

establishing (**S2**) a first connection for a communication signal (**V/S**) between the two terminal equipments (**TE1, TE2**),

detecting (**S3**) a connection changing condition, and,

if said connection changing condition is detected, dividing (**S4**) said communication signal (**V/S**) at least into a first signal component (**V**) and a second signal component (**S**) and

establishing (**S5**) at least one second connection, said first signal component (**V**) being transmitted via the first connection and said second signal component (**S**) being transmitted via the second connection.

2. A method according to claim 1, wherein said changing condition is a reduction of quality of said first connection.

3. A method according to claim 1, wherein said changing condition is a handover.

4. A method according to claim 1, further comprising the steps of:

canceling (**S7**) the first connection transmitting the first signal component (**V**), and

maintaining the communication via the second connection transmitting the second signal component (**S**).

5. A method according to claim 4, further comprising the steps of:

reestablishing (S10) the first connection canceled in said canceling step (S7), when said changing condition is dropped (S9), and

performing the communication via the first connection transmitting the first signal component (V) and the second connection transmitting the second signal component (S).

6. A method according to claim 4, further comprising the steps of:

reestablishing (S10) the first connection canceled in said canceling step (S7), when said changing condition is dropped (S9),

rebuilding (S11) the communication signal (V/S) from the first signal component (V) and the second signal component (S), and

performing the communication via the first connection transmitting the communication signal (V/S) rebuilt in said rebuilding step (S11).

7. A method according to claim 1, further comprising the steps of:

maintaining (S13) the communication via the first and the second connection transmitting the first and the second signal component (V, S),

rebuilding (S15) the communication signal (V/S) from the first signal component (V) and the second signal component (S),

canceling (S16) the second connection, and

transmitting the rebuilt communication signal (V/S) via the first connection.

8. A method according to claim 1, wherein said communication signal (V/S) is a videotelephony signal.

9. A method according to claim 8, wherein said first signal component (V) is a video signal component and said second signal component (S) is a speech component.

10. A method according to claim 3, wherein said handover is performed when at least one of said terminal equipments (TE1, TE2) leaves a communication area of a first communication network (NW1) and enters a communication area of a second communication network (NW2).

11. A method according to claim 10, wherein communication signals of a first format are used in said first communication area (NW1) and communication signals of a second format are used in said second communication area (NW2),

said method further comprising the step of

changing (S8) the communication signal (V/S) or the first signal component (V) or the second signal component (S) from one of said first or second format into the respective other of the first or second format.

12. A method for performing a packet data multimedia communication between two terminal equipments (TE1, TE2) via at least one communication network (NW1, NW2),

said method comprising the steps of:

establishing at least a first connection and a second connection for communication signal components (V, S) between the two terminal equipments (TE1, TE2),

detecting a connection changing condition, and,

if said connection changing condition is detected, canceling one of said at least first and the second connections transmitting one communication signal component (V).

13. A method according to claim 12, wherein said changing condition is a reduction of quality of said first connection.

14. A method according to claim 12, wherein said changing condition is a handover.

15. A method according to claim 14, further comprising the steps of:

reestablishing the connection canceled in said canceling step, when said changing condition is dropped, and

performing the communication via the at least first and second connections transmitting the communication signal components (V, S).

16. A device for performing a communication between two terminal equipments (TE1, TE2) via at least one communication network (NW1, NW2),

said device (100) comprising:

first establishing means (110) for establishing a first connection for a communication signal (V/S) between the two terminal equipments (TE1, TE2),

detecting means (120) for detecting a connection changing condition,

dividing means (130) for dividing said communication signal (V/S) at least into a first signal component (V) and a second signal component (S), if said detecting means (120) detects said connection changing condition, and

second establishing means (110) for establishing at least one second connection, said first signal component (V) being transmitted via the first connection and said second signal component (S) being transmitted via the second connection.

17. A device (100) according to claim 16, wherein said changing condition is a reduction of quality of said first connection.

18. A device (100) according to claim 16, wherein said changing condition is a handover.

19. A device (100) according to claim 16, comprising canceling means (140) for canceling the first connection transmitting the first signal component (V), said communication being maintained via the second connection transmitting the second signal component (S).

20. A device according to claim 19, comprising reestablishing means (150) for reestablishing the first connection canceled by said canceling means (140), when said changing condition is dropped, said communication being performed via the first connection transmitting the first signal component (V) and the second connection transmitting the second signal component (S).

21. A device (100) according to claim 19, comprising reestablishing means (150) for reestablishing the first connection canceled by said canceling means (140), when said changing condition is dropped, and rebuilding means (160) for rebuilding the communication signal (V/S) from the first and the second signal component (V, S), said communication being performed via the first connection transmitting the communication signal (V/S) rebuilt by said rebuilding means (160).

22. A device according to claim 16, wherein the communication is maintained via the first and the second connection transmitting the first and the second signal component (V, S),
said device (100) comprising

rebuilding means (160) for rebuilding the communication signal (V/S) from the first and the second signal component (V, S),

canceling means (140) for canceling the second connection, said communication being performed via the first connection transmitting the communication signal (V/S) rebuilt by said rebuilding means (160).

23. A device according to claim 16, wherein said communication signal (V/S) is a videotelephony signal.

24. A device according to claim 23, wherein said first signal component (V) is a video signal component and said second signal component (S) is a speech component.

25. A device according to claim 18, wherein said handover is performed when at least one of said terminal equipments (TE1, TE2) leaves a communication area of a first communication network (NW1) and enters a communication area of a second communication network (NW2).

26. A device according to claim 25, wherein communication signals of a first format are used in said first communication area (NW1) and communication signals of a second format are used in said second communication area (NW2),

said device (100) comprising

changing means (170) for changing the communication signal (V/S) or the first signal component (V) or the second signal component (S) from one of said first or second format into the respective other of the first or second format.

27. A device for performing a packet data multimedia communication between two terminal equipments (TE1, TE2) via at least one communication network (NW1, NW2),

said device comprising:

establishing means for establishing at least a first connection and a second connection for communication signal components (V, S) between the two terminal equipments (TE1, TE2),

detecting means for detecting a connection changing condition, and

canceling means for canceling one of said at least first and the second connections transmitting one communication signal component (V).

28. A device according to claim 27, wherein said changing condition is a reduction of quality of said first connection.

29. A device according to claim 27, wherein said changing condition is a handover.

30. A device according to claim 27, further comprising:

reestablishing means for reestablishing the connection canceled by said canceling means, when said changing condition is dropped, said packet data communication being performed via the at least first and second connections transmitting the communication signal components (V, S).

31. A system in which a communication between two terminal equipments (TE1, TE2) is performed via at least one communication network (NW1, NW2),

said system is adapted to:

establish (S2) a first connection for a communication signal (V/S) between the two terminal equipments (TE1, TE2),

detect (S3) a connection changing condition, and,

if said connection changing condition is detected, divide (S4) said communication signal (V/S) at least into a

first signal component (V) and a second signal component (S) and

establish (S5) at least one second connection, said first signal component (V) being transmitted via the first connection and said second signal component (S) being transmitted via the second connection.

32. A system according to claim 31, wherein said changing condition is a reduction of quality of said first connection.

33. A system according to claim 31, wherein said changing condition is a handover.

34. A system according to claim 31, further adapted to:

cancel (S7) the first connection transmitting the first signal component (V), and

maintain the communication via the second connection transmitting the second signal component (S).

35. A system according to claim 34, further adapted to:

reestablish (S10) the canceled first connection, when said changing condition is dropped (S9), and

perform the communication via the first connection transmitting the first signal component (V) and the second connection transmitting the second signal component (S).

36. A system according to claim 34, further adapted to:

reestablish (S10) the first connection canceled in said canceling step (S7), when said changing condition is dropped (S9),

rebuild (S11) the communication signal (V/S) from the first signal component (V) and the second signal component (S), and

perform the communication via the first connection transmitting the communication signal (V/S) rebuilt in said rebuilding step (S11).

37. A system according to claim 31, further adapted to:

maintain (S13) the communication via the first and the second connection transmitting the first and the second signal component (V, S),

rebuild (S15) the communication signal (V/S) from the first signal component (V) and the second signal component (S),

cancel (S16) the second connection, and

transmit the rebuilt communication signal (V/S) via the first connection.

38. A system according to claim 31, wherein said communication signal (V/S) is a videotelephony signal.

39. A system according to claim 38, wherein said first signal component (V) is a video signal component and said second signal component (S) is a speech component.

40. A method according to claim 33, wherein said handover is performed when at least one of said terminal equipments (TE1, TE2) leaves a communication area of a first communication network (NW1) and enters a communication area of a second communication network (NW2).

41. A method according to claim 40, wherein communication signals of a first format are used in said first communication area (NW1) and communication signals of a second format are used in said second communication area (NW2),

said system is adapted to

change (S8) the communication signal (V/S) or the first signal component (V) or the second signal component

(S) from one of said first or second format into the respective other of the first or second format.

42. A system for performing a packet data multimedia communication between two terminal equipments (TE1, TE2) via at least one communication network (NW1, NW2),

said system being adapted to:

establish at least a first connection and a second connection for communication signal components (V, S) between the two terminal equipments (TE1, TE2),

detect a connection changing condition, and,

if said connection changing condition is detected, cancel one of said at least first and the second connections transmitting one communication signal component (V).

43. A system according to claim 42, wherein said changing condition is a reduction of quality of said first connection.

44. A system according to claim 42, wherein said changing condition is a handover.

45. A system according to claim 44, further adapted to:

reestablish the connection canceled in said canceling step, when said changing condition is dropped, and

perform the communication via the at least first and second connections transmitting the communication signal components (V, S).



FIG. 1A



FIG. 1B

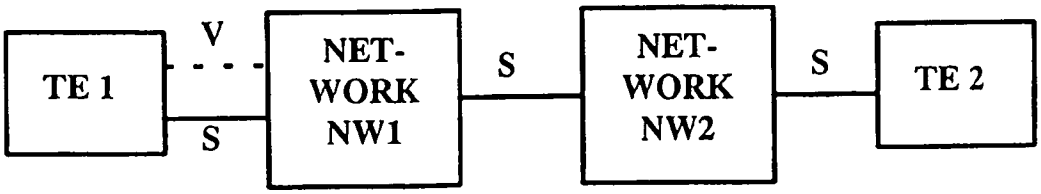


FIG. 1C

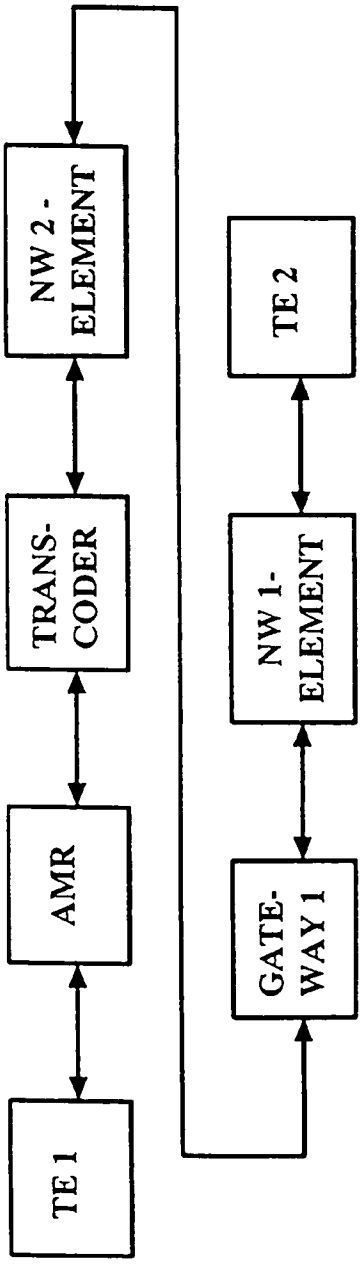

NW 2 - ELEMENT
TRANS- CODER
AMR
TE 1
TE 2
NW 1- ELEMENT
GATE- WAY 1

FIG. 2A

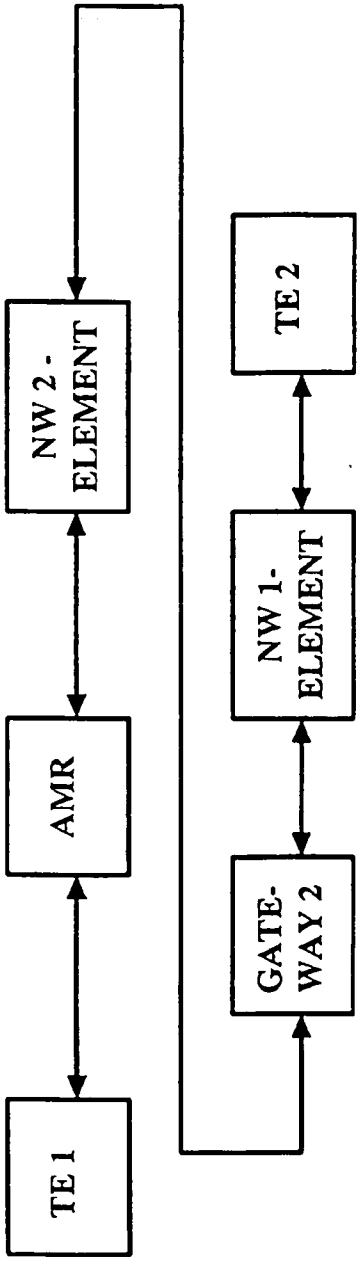

NW 2 - ELEMENT
AMR
TE 1
TE 2
NW 1- ELEMENT
GATE- WAY 2

FIG. 2B

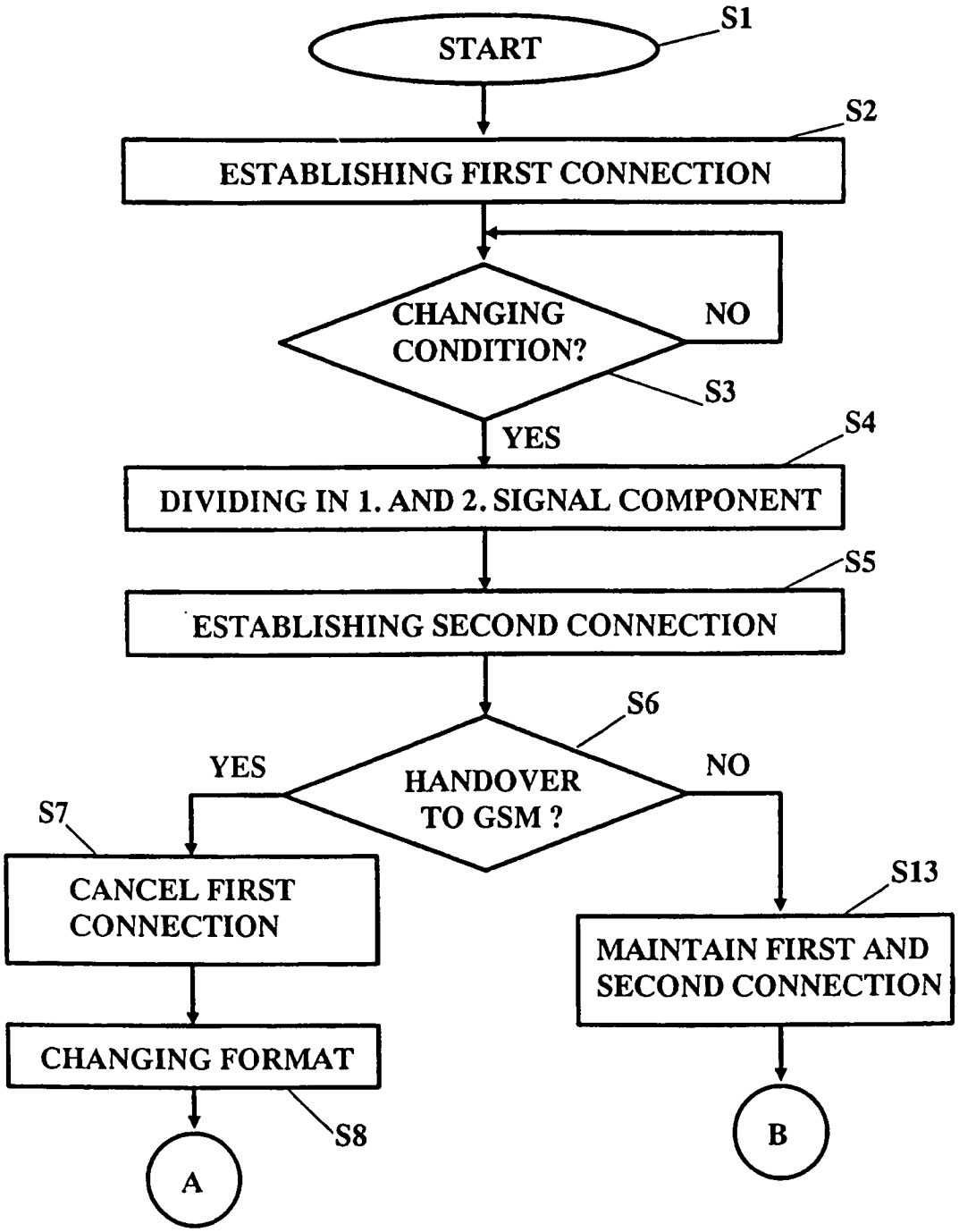

START
S1
ESTABLISHING FIRST CONNECTION
S2
CHANGING CONDITION?
NO
S3
YES
S4
DIVIDING IN 1. AND 2. SIGNAL COMPONENT
S5
ESTABLISHING SECOND CONNECTION
S6
HANDOVER TO GSM ?
YES
NO
S7
CANCEL FIRST CONNECTION
CHANGING FORMAT
S8
A
S13
MAINTAIN FIRST AND SECOND CONNECTION
B

FIG.3

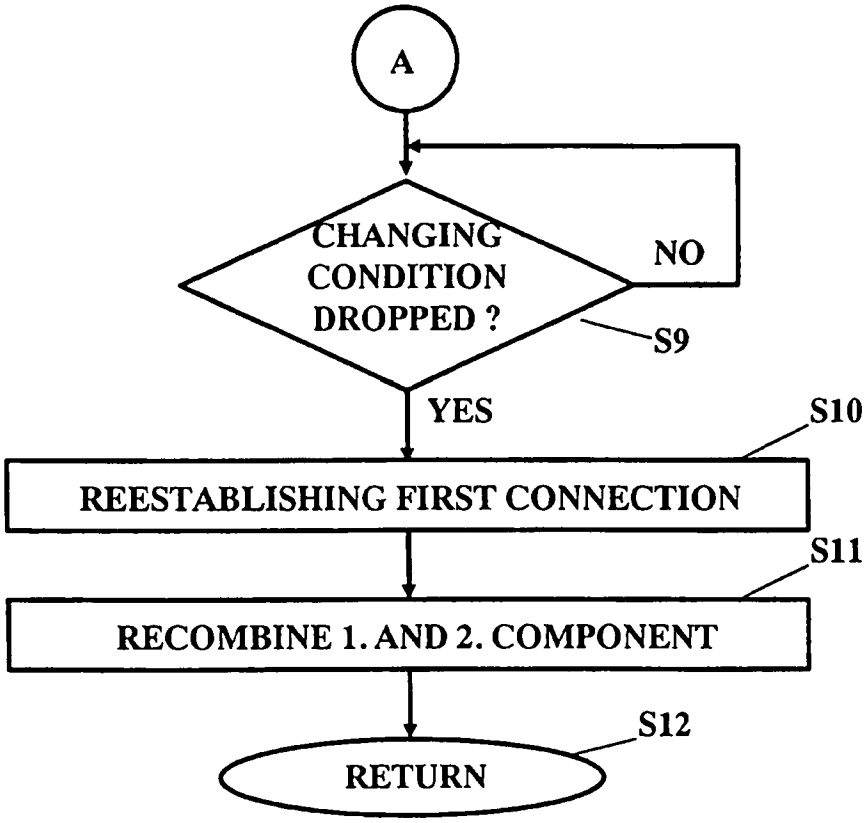

A
CHANGING CONDITION DROPPED ?
NO
S9
YES
S10
REESTABLISHING FIRST CONNECTION
S11
RECOMBINE 1. AND 2. COMPONENT
S12
RETURN

FIG.4

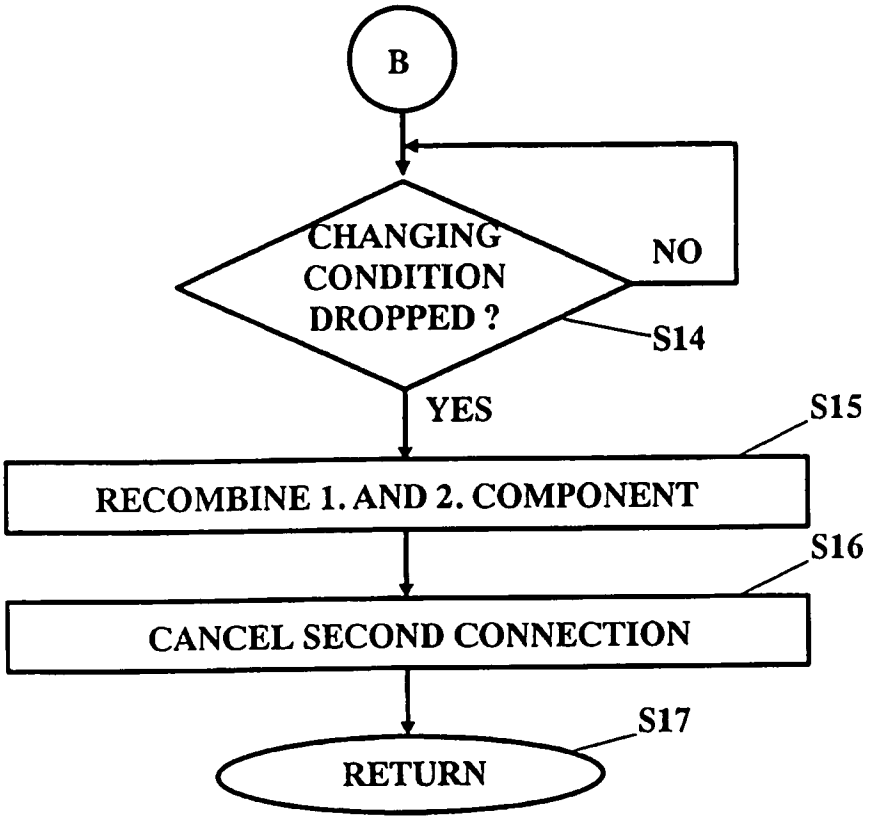

B
CHANGING CONDITION DROPPED ?
NO
S14
YES
S15
RECOMBINE 1. AND 2. COMPONENT
S16
CANCEL SECOND CONNECTION
S17
RETURN

FIG.5

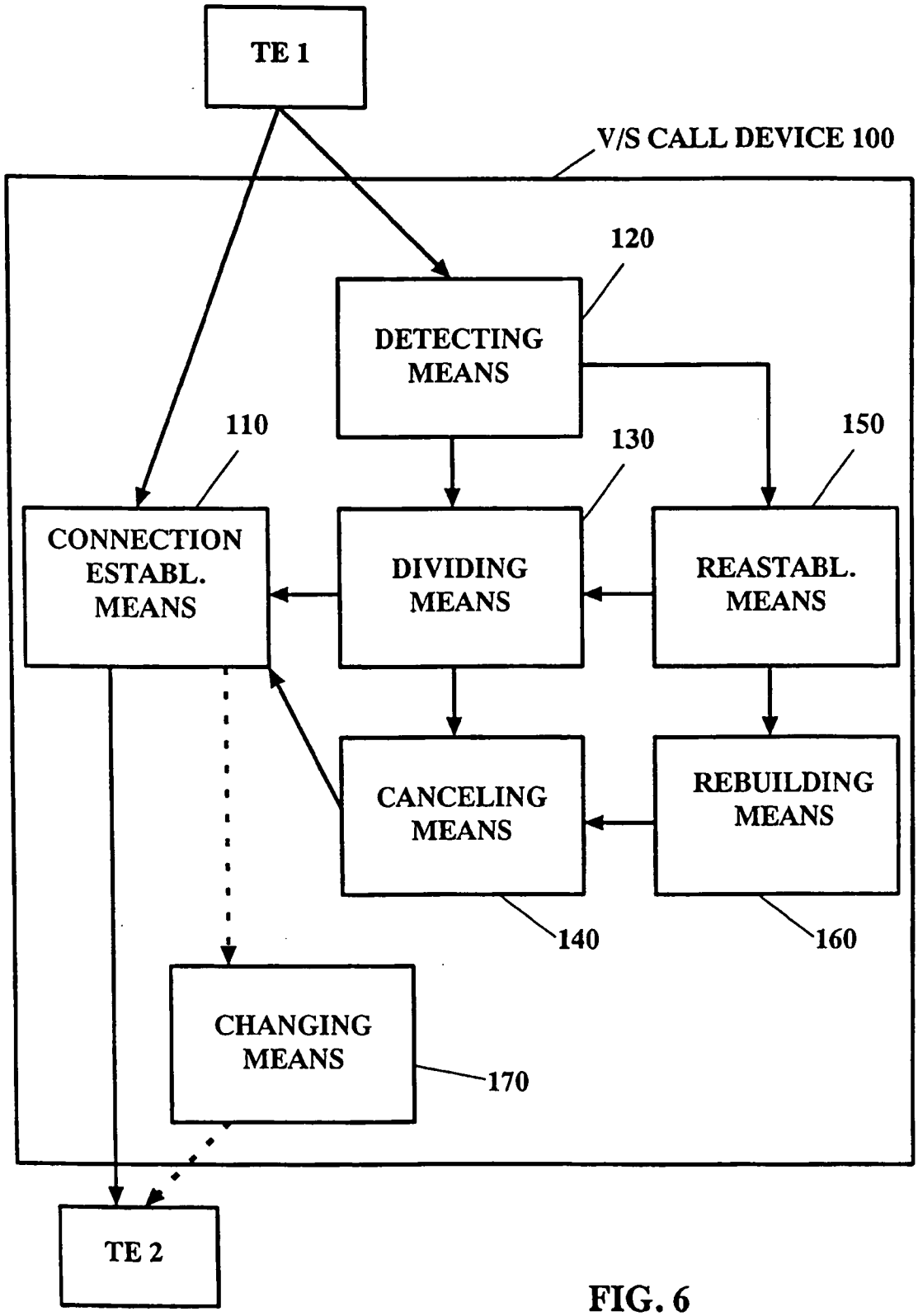

TE 1
V/S CALL DEVICE 100
120
DETECTING MEANS
110
130
150
CONNECTION ESTABL. MEANS
DIVIDING MEANS
REASTABL. MEANS
CANCELING MEANS
REBUILDING MEANS
140
160
CHANGING MEANS
170
TE 2

FIG. 6

INTERNATIONAL SEARCH REPORT

Inter. nal Application No
PCT/EP 99/04518

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

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 7 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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 841 763 A (NOKIA MOBILE PHONES LTD) 13 May 1998 (1998-05-13) column 11, line 47 -column 12, line 5 column 13, line 6 - line 22 column 14, line 24 - line 32 column 14, line 48 - line 51 column 15, line 1 - line 17 column 21, line 34 - line 36; claim 42 -/—	1,8,9, 12,16, 19,23, 24,27, 31,34, 38,39,42

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 February 2000	28/02/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax (+31–70) 340–3016	Rothlübbers, C

Form PCT/ISA/210 (second sheet) (July 1992)

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INTERNATIONAL SEARCH REPORT

Intern nal Application No
PCT/EP 99/04518

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 09810 A (MOTOROLA INC) 13 March 1997 (1997-03-13) page 3, line 9 - line 17 page 4, line 21 - line 31 page 5, line 16 - line 27 page 7, line 17 - line 21	1,2,12, 13,16, 17,27, 28,31, 32,42,43
E	WO 99 52307 A (ERICSSON TELEFON AB L M) 14 October 1999 (1999-10-14) page 4, line 17 - line 19 page 6, line 5 - line 17 page 7, line 9 - line 12 page 29, line 15 - line 23	1,2,8,9, 12,13, 27,28, 42,43

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern al Application No
PCT/EP 99/04518

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		BR 9705138 A	18-05-1999
		JP 10190621 A	21-07-1998
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		EP 0847641 A	17-06-1998
WO 9952307 A	14-10-1999	AU 3857199 A	25-10-1999

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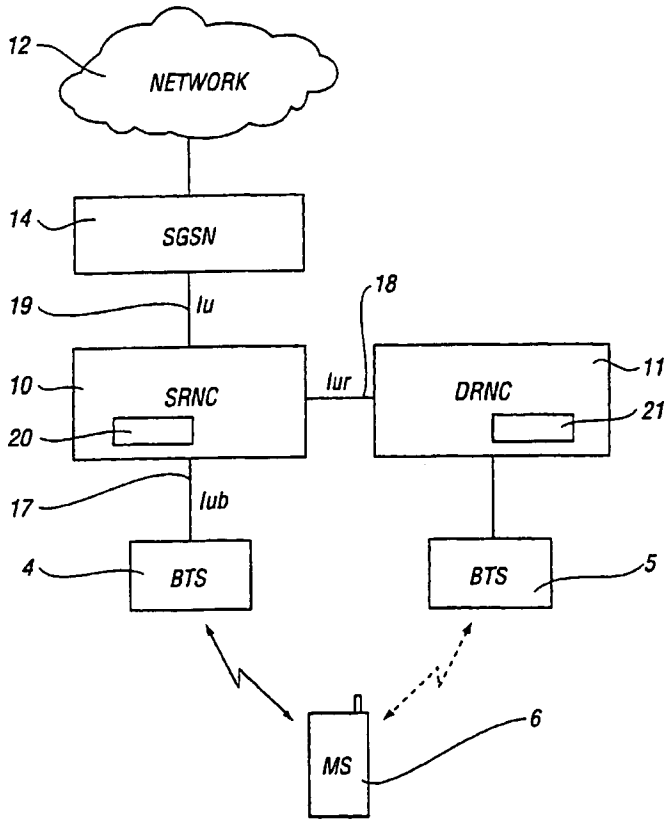
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[Continued on next page]

(54) Title: RELOCATION IN A COMMUNICATION SYSTEM



(57) Abstract: The present invnetion relates to relocation of a protocol termination point in a communication system comprising a first protocol termination point, a second protocol termination point and control means for relocating a first protocol from the first protocol termination point to the second protocol termination point. A protocol initialization unit that contains predefined information of the first termination point is defined by means of the first protocol. The protocol initialization unit is subsequently transferred from the first termination point to the second termination point by means of a second protocol. The second termination point is initialized based on the received protocol initialization unit.

WO 01/20938 A1



patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

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

Published:

— *With international search report.*

Relocation in a communication system

Field of the Invention

The present invention relates to relocation in a communication system and in particular, but not exclusively, to relocation of a protocol termination point.

Background of the Invention

Communication networks typically operate in accordance with a given standard which sets out what the elements of the network are permitted to do and how that should be achieved. The communication in the networks follows predefined rules which are referred to in the following as protocols. The protocols to be used are defined in the associated standard. The protocols can be used for controlling various events and functionalities in a connection provided through the communications network. Several protocols may be simultaneously in an active state for providing control of a connection. During an ongoing i.e. active connection a protocol is having a termination point in the network element controlling the connection. For example, a protocol may have termination points in a telephone terminal and in a network controller controlling the connection.

A communication network is a cellular radio network consisting of cells. In most cases the cell can be defined as a certain area covered by one or several base transceiver stations (BTS) serving mobile stations (MS) via a radio interface and connected to a base station subsystem (BSS). Several cells cover a larger area, and form the coverage area of a cellular

radio network. The cell (or group of cells) and thus the mobile station (MS) or similar user equipment (UE) within one of the cells of the system can be controlled by a node providing controller functionality, for example by a radio network controller (RNC) or a mobile switching center (MSC). The controller can be connected further to a gateway or linking node, for example a gateway GPRS support node (GGSN) or gateway mobile switching center (GSMC), linking the cell to the other parts of the communication system and/or other communication networks, such as to a PSTN (Public Switched Telecommunications Network) or to a data network, such as to a X.25 based network or to a TCP/IP (Transmission Control Protocol/Internet Protocol) based network.

The mobile station MS may be controlled by only one controller at time. However, the MS may also be simultaneously controlled by several controller nodes. This may occur e.g. when the cells overlap or in so called soft handoff mode, where the MS may be in communication with two base stations and those base stations may be connected to different controllers, or when one controller is controlling another controller controlling the MS. One controller of the plurality of controllers in the system can be defined as a serving (main) controller whereas the others may act as secondary controllers. The responsibility of controlling a connection between the mobile station and the network may change during an ongoing connection. It is therefore necessary to relocate at least part of functionalities associated with the connection such that the connection will not become disconnected and/or that the quality of the connection remains in an acceptable level. It is to be appreciated that in addition or as an alternative to relocating functionalities of the controller node, the

functionality to be relocated may also be located in any other of the network elements, for example in the base station, base station subsystem, in the gateway and so on.

When relocation is decided to be performed, the serving controller or another node of the communication system may initiate the necessary proceeding for replacing one or several of the network nodes with a new corresponding node or nodes.

In case of an active i.e. ongoing connection, one of the features that should to be relocated is the state of a protocol termination point. Although it is not always necessary, in a usual case the status of the protocol termination point at the new "replacing" network element or node should be such that it may take over the functions of the old "replaced" network node. At the present the parameters which need to be transferred have to be defined also in the protocols which are used to convey the information from the old termination point to the new termination point. For example, if parameters of a Radio Resource Control (RRC) or Medium Access Control (MAC) or Radio Link Control (RLC) protocols are to be relocated in a system that would use radio network subsystem application part (RNSAP) for communication between the network controller nodes, this would mean that a lot of "external" parameters would have to be defined for the RNSAP. This would increase the complexity of the RNSAP. In addition, if several additional parameters of a protocol are to be defined for the another protocol, it makes these two different protocols very dependent on each other. The independent evolution of them would thus become more difficult to manage.

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Summary of the Invention

It is an aim of the embodiments of the present invention to address one or several of the above problems.

According to one aspect of the present invention, there is provided a method in a communication system for relocating a protocol termination point, comprising:

defining a protocol initialization unit containing predefined information of a first termination point of a first protocol by the first protocol;

transferring the protocol initialization unit from the first termination point to a second termination point by a second protocol; and

initializing the second termination point based on the protocol initialization unit.

According to another aspect of the present invention there is provided a communication system, comprising:

a first protocol termination point;

a second protocol termination point;

control means for relocating a first protocol from the first protocol termination point to the second protocol termination point, said control means being arranged to form a protocol initialization unit containing predefined information of the first protocol at the first protocol termination point;

communication path based on a second protocol between the first and the second termination points for transferring the protocol initialization unit; and

control means for initializing the second protocol termination point based on the protocol initialization unit.

According to a still another aspect of the present invention there is provided a network element for use in a communication network, comprising:

a protocol termination point;

control means for relocating a first protocol from the protocol termination point to another protocol termination point, said control means being arranged to form a protocol initialization unit containing predefined information of the first protocol at the protocol termination point; and

interface to said other protocol termination point based on a second protocol for transferring the protocol initialization unit from the first termination point by means of the second protocol.

According to a still another aspect of the present invention there is provided a network element for use in a communication network, comprising:

a protocol termination point of a first protocol;

interface to another protocol termination point for receiving a protocol initialization unit containing predefined information of the first protocol at said other termination point, wherein the interface is based on a second protocol; and

control means for initializing the protocol termination point based on the received protocol initialization unit.

According to a more specific embodiment, the protocol initialization unit may contain state information of the first protocol termination point.

The first termination point may also be located at a first network element of the communication system and the second

termination point may be located at a second network element of the communication system. The second network element may, upon receiving the protocol information unit, generate and transmit a response to the first network element by means of the second protocol.

The protocol initialization unit may be encapsulated in a message transmitted between the first termination point and the second termination point. The protocol initialization unit may also be transparent for the second protocol.

The protocol initialization unit may be transmitted via a network element of a core network of the communication system. This may be accomplished by means of a radio access network application part (RANAP) protocol. According to an embodiment, the protocol initialization unit may be transmitted directly between the termination points. This may be accomplished by means of a radio network subsystem application part (RNSAP) protocol.

The protocol initialization unit may contain information of at least one further protocol. According to an embodiment at least one further protocol initialization unit may be defined containing predefined information of a further protocol by the further protocol, whereafter the further protocol initialization unit is transferred from the first termination point to the second termination point. The further protocol initialization unit may be transferred between the termination points by a protocol that is different to the second protocol.

The parameters of the second termination point may be set into a state that is relatively similar to the state of parameters

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of the first termination point before or at the time the relocation procedure was initiated during the initialization procedure.

The embodiments of the invention provide several advantages. One of the benefits is that a need for defining a great number of parameters of one protocol in another protocol is avoided. This provides clear benefits in updating and maintenance of the protocols.

Brief Description of Drawings

For better understanding of the present invention, reference will now be made by way of example to the accompanying drawings in which:

Figure 1 shows a schematic diagram of a cellular radio network system in which embodiments of the invention can be implemented;

Figure 2 shows the hierarchy of various elements of the network of Figure 1;

Figure 3 shows two possible interfaces between network nodes; and

Figure 4 is a flow chart for operation in accordance with one embodiment.

Description of Preferred Embodiments of the Invention

Reference will be first made to Figure 1 in which three cells 1,2,3 of a cellular telecommunications network are shown. Each cell 1,2,3 is served by a respective base transceiver station (BTS) 4',4,5. Each base transceiver station (BTS) is arranged to transmit signals to and receive signals from the mobile

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stations (MS) 6 located in the cell associated with the given base transceiver station. Likewise, each mobile station 6 is able to transmit signals to and receive signals from the respective base transceiver station 4',4,5, and also able to move from the coverage area of one cell to the coverage area of another cell, e.g. from cell 2 to cell 3.

The exemplifying cellular telecommunications network will be described in more detail in the following by using the terminology of a proposed Universal Mobile Telecommunications System (UMTS) standard. However, it is to be appreciated that the invention is not restricted to UMTS but can be implemented in any standard. Examples of these include, without any intention to restrict the possible communication systems to these, any of the code division multiple access (CDMA) based systems or any of the time division multiple access (TDMA) based systems or any of the frequency division multiple access (FDMA) based systems or any hybrids thereof.

Reference is now made to Figure 2 which shows the hierarchy of a cellular communication system. As can be seen, the mobile station 6 is in wireless communication with one of the base stations. Typically a number of mobile stations will be in communication with each base station although only one mobile station is shown in Figure 2 for clarity. A first base station 4 is connected to a first network controller, which in Figure 2 is a serving radio network controller SRNC 10. Again, more than one base station is usually connected to each controller 10 although only one is shown for clarity. Typically more than one controller is also provided in a network. The SRNC 10 is connected to other elements of the network 12 via a suitable

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linking or gateway apparatus, such as a serving GPRS (General Packet radio Service) Support Node (SGSN) 14.

The SRNC 10 is arranged to control the base station, either directly or through an intermediate node (not shown). The controller 10 passes on data to be transmitted to the mobile station by the base station. The controller 10 will also receive from the base station data which the base station has received from the mobile station. The implementation of the communication between the base station, the mobile station and the controller is known, and will thus not be discussed in detail herein. It is sufficient to note that the interface may comprise channels in both uplink and downlink directions. The data may be sent between the mobile station and the controller in any suitable format. The messages sent from the mobile stations may include information identifying the mobile station (for instance, MS ID and/or IMSI (Mobile Station Identity and/or International Mobile Subscriber Identity, respectively)).

In addition to the serving controller (RNC 10), the cellular telecommunications system of Figure 2 includes another controller RNC 11 controlling the base station 5 of cell 3 of Figure 2. It is, again, noted that the second controller may also control more than one base station. The second controller may also sometimes be referred to as a drift controller (DRNC). The SNRC 10 and DRNC 11 may communicate with each other over an open Iur interface 18 established between them.

Figure 2 illustrates one possible relocation situation wherein the mobile station MS 6 or similar user equipment communicates firstly via the BTS 4 over a radio interface designated by a

solid line and then switches to communicate via a new BTS 5, as designated by the dashed radio interface. According to one possibility the change from one base station to another may occur after the mobile station 6 has moved into the service or illumination area of the second base station 5. However, it is to be appreciated that in addition to the movement of the mobile station, there are also other possible reasons for triggering the relocation of the connection to another base station or to another network element, such as network optimization, load balancing, hardware congestion, connection quality improvement, fault in the system or base station and so on.

In order to ensure a proper operation of the system and to avoid disconnecting a possibly ongoing call, at least some of the functionalities of the network elements have to be relocated for the connection. For example, when a SRNC functionality is to be located from a first RNC to a second RNC some protocol termination points of an ongoing connection (such as RRC, RCL and/or MAC protocols) need to be changed from the first RNC to the second RNC.

Before explaining an embodiment for the relocation in more detail, a brief explanation will given of the protocol termination point with reference to Figure 3 showing a block diagram of the source RNC 10 and the target RNC 11. The exemplifying protocol termination point is illustrated to comprise a radio resource control (RRC) protocol. However, it is to be appreciated that the described RRC protocol is only an example, and that the embodiments can be implemented for any other protocol used for a connection in a communication system as well. These other protocols include, without any

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restriction to these, medium access control (MAC) protocol, radio link control (RLC) protocol and packet data convergence protocol (PDCP).

The SRNC 10 and DRNC 11 each are provided with a Radio Resource Controller functionality RRC 24 and 26, respectively. When the MS 6 is communication with the controller 10, the RRC protocol has its other termination point correspondingly at the controller 10, while the other termination point is at the mobile station. However, should the controller change, the termination point of the RRC protocol should also be changed correspondingly. More precisely, the new controller 11 should be provided with a similar termination point functionality using similar parameters as the previous controller had. These functionalities will be controlled by a control unit 20 at the source controller 10 and by a control unit 21 at the target controller 11.

Figure 3 shows further an Iur interface 18 between the DRNC 10 and the SRNC 11. For example, a RNSAP (Radio Network Subsystem Application Part) protocol can be used for the direct signalling between the two RNCs. A RANAP (Radio Access Network Application Part; in the control plane) protocol can used for L3 (Layer 3) signalling over the Iu interface between the RNCs and an appropriate element 14 of the core network 14. The core network element 14 can be e.g. a mobile switching center or a serving GPRS support node.

A reference will now be made to the flow chart of Figure 4 showing in more detail an embodiment for moving the required state information of a protocol termination point from one termination point at a first network element (NE) to another

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termination point in a second network element. As illustrated by step 30, the protocol termination point is to be moved between the termination points during an active state of the protocol between the servicing network controller and the mobile station. After the relocation procedures are initiated at step 32, the "old" protocol termination point in the source network element produces at step 34 a special protocol data unit (PDU) containing predefined necessary protocol parameters for initialization of the second termination point before relocation of the connection. The PDU is passed at step 36 to the new termination point with help of a second protocol. The second protocol is used for signaling between the different network elements or nodes. The passed information can be transparent to the second protocol used for the transmission of the PDU. Examples of the protocols which may be used for the transmission of the PDU will be discussed in more detail later in this specification. The new termination point receives the PDU and it is initialized at step 38 based on the information received from the old termination point. After the initialization procedure the termination point will be relocated at step 40 to the new network element and the operation of the system continues as before except that the protocol termination point of the active protocol is now situated in the new network element.

In other words, an explicit protocol message will be passed between the old termination point and the new termination point of a protocol in case of relocation of the protocol termination point. The specified PDU (or message) is used within a protocol peer between the old and the new termination point of the protocol. In a preferred embodiment a single protocol defines the information to be transferred between the

protocol peers and the information to be transmitted within one peer. By means of this it is possible to avoid a need for defining a great number of parameters of one protocol in another protocol. For example, by the embodiment described in the following about 100 RRC parameters in the RANAP protocol are avoided.

Referring again to Figure 3, a more detailed example of the relocation procedure will now be given in context of relocating a radio interface L3 protocol (i.e. a radio resource control; RRC) protocol from a first or source controller (e.g. RNC 10 of Figure 3) to a second or target controller (e.g. RNC 11 of Figure 3). The exemplifying RRC protocol is known, and is not described in more detail. It is sufficient to note that the RRC provides common controlling and signaling over the air interface between the serving RNC and the mobile station and that the RRC can be shared with circuit switched traffic and packet switched traffic.

The control unit 20 of the first (source) RNC 10 produces the special protocol initialization unit which in this instance will be referred to as a RRC PDU. The RRC PDU contains all such predefined RRC parameters that have to be known by the new termination point in order to receive and continue the connection. These parameters may include information concerning e.g. one or several of the following: radio bearer(s), transport channel(s), radio link(s) and their physical channels, capability information as well as user equipment capabilities and measurements being reported by the user equipment and so on. According to a preferred embodiment the RRC PDU contains all such RRC parameters that are required by the termination point at the target RNC to start the RRC

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protocol in a relatively similar state and conditions that existed in the old termination point.

According to an embodiment the generated RRC PDU can be transferred from the first RNC to the second RNC by means of a RNSAP (Radio Network Subsystem Application Part) over an open interface Iur 18 provided between the first controller 10 and the second controller 11. The termination point at the second RNC receives the RRC PDU and subsequently decodes the received RRC PDU. The termination point 26 is initialized based on the received and decoded information. The initialization procedure can be controlled by the control unit 21.

According to another embodiment the PDU is firstly moved from the source RNC 10 to the core network (CN) 14 over an Iu interface 19 by a RANAP (Radio Access Network Application Part) message 'RELOCATION REQUIRED' and subsequently from the core network to the target RNC 11 by an Iu RANAP message 'RELOCATION REQUEST'.

The RRC PDU can be encapsulated within a message in the second protocol as there is no need for the contents of the RRC PDU to be visible for the functionality of the second protocol, such as to the RANAP or the RNSAP. The encapsulation of protocol messages transparently to a message of another protocol is a known technique and will thus not be discussed in more detail herein

It should be appreciated that the status of any other protocol, such as the MAC protocol or RLC protocol referred to above, could also be conveyed by the RRC protocol. In more general terms, a protocol may "collect" required information

for several protocols and generate a PDU containing required information for all or at least more than one of the protocols to be relocated. According to an embodiment a separate or further protocol initialization unit PDU is used for each of the protocols to be relocated or at least some of the protocols to be relocated. The different protocol initialization units can be transferred between the termination point by protocols that are different to each other.

It should also be appreciated that some embodiments do not require an identical or relatively similar protocol termination point at the old and the new network element. However, it is preferred that the information included in the protocol initialization unit is such that that the functionalities of the communication system may continue without disconnecting the user equipment from the communication system.

According to one possibility the termination point is not relocated from a network element or node to another node but within the node.

It is noted that in some embodiments of the invention, the relocation of some or all functionalities may also be triggered even in such conditions where the communication could continue without any relocation proceedings, e.g. in order to optimize the operation of the system or balance the load distribution in the system. In addition, the mobile station 6 of Figure 2 may be in communication with both controllers 10 and 11. Furthermore, it may not be necessary to relocate the entire protocol or all protocols used for a

connection, but instead only a part of the information concerning the protocols is transmitted between the network elements. For example, a user plane communication may be enabled via the Iur interface 18 of Figure 2, whereby the mobile station 6 within the service area of the controller 11 could still be controlled by the old servicing controller 10 via the controller 11.

According to a further embodiment the initialization is a bi-directional process. In other words, instead of only transmitting information from the first network element (node) to the second element, the new network element may send a respond to the first element or accomplish a transmission to a further network element. The respond may include a message such as "unable to initialize", "overload", "all parameters not received" and so on. Upon receiving the response, the first network element may modify its state and/or take some other actions towards the new termination point. For example, transmit modified parameter or parameters, or use different transmission route, or try to relocate the connection to another network element.

It should also be appreciated that whilst embodiments of the present invention have been described in relation to a connection between the network nodes and a mobile station, embodiments of the present invention are applicable to any other suitable type of connections terminating to one node. It should also be appreciated that base stations can sometimes be referred to as node B.

There are also other possible reasons for initiating the relocation procedure that movement of the mobile station into a new service area. For example, the network element in

question may become overloaded or a failure in the system of the network element itself may force the system to relocate at least a part of the functionalities, network optimization, load balancing and so on.

The exemplifying embodiments of the invention have discussed protocols terminated to a network controller. Embodiments of the present invention can be applicable to other network elements as well where applicable.

It is also noted herein that while the above describes one exemplifying embodiment of the invention, there are several variations and modifications which may be made to the disclosed solution without departing from the scope of the present invention as defined in the appended claims.

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Claims

1. A method in a communication system for relocating a protocol termination point, comprising:

defining a protocol initialization unit containing predefined information of a first termination point of a first protocol by the first protocol;

transferring the protocol initialization unit from the first termination point to a second termination point by a second protocol; and

initializing the second termination point based on the protocol initialization unit.

2. A method according to claim 1, wherein the protocol initialization unit contains state information of the first protocol termination point.

3. A method according to claim 1 or 2, wherein the first termination point is located at a first network element of the communication system and the second termination point is located at a second network element of the communication system.

4. A method according to claim 3, wherein the second network element, upon receiving the protocol information unit, generates and transmits a response to the first network element by means of the second protocol.

5. A method according to any of the preceding claims, wherein the protocol initialization unit is encapsulated in a message transmitted between the first termination point and the second termination point by the second protocol.

6. A method according to any of the preceding claims, wherein the protocol initialization unit is transparent for the second protocol.

7. A method according to any of the preceding claims, wherein the protocol initialization unit is transmitted via a third network element between the termination points.

8. A method according to claim 7, wherein the transmission is based on a radio access network application part (RANAP) protocol.

9. A method according to any of claims 1 to 6, wherein the protocol initialization unit is transmitted by a direct connection between the termination points.

10. A method according to claim 9, wherein the transmission is based on a radio network subsystem application part (RNSAP) protocol.

11. A method according to any of the preceding claims, wherein the predefined information of the first protocol comprise one or several parameters of a radio resource control protocol (RRC), medium access control protocol (MAC), radio link control protocol (RLC), and/or packet data convergence protocol (PDCP).

12. A method according to any of the preceding claims, wherein the protocol initialization unit contains information of at least one further protocol.

13. A method according to any of the preceding claims, comprising steps of:

defining at least one further protocol initialization unit containing predefined information of a further protocol by the further protocol; and

transferring the further protocol initialization unit from the first termination point to the second termination point.

14. A method according to claim 13, wherein the further protocol initialization unit is transferred between the termination points by a protocol that is different to the second protocol.

15. A method according to any of the preceding claims, wherein at least one of the termination points is located at one of the following: a base station controller, a radio network controller, a base station, a gateway.

16. A method according to any of the preceding claims, wherein the step of initializing the second termination point comprises setting the parameters of the second termination point into a state that is similar to the parameters of the first termination point before or at the time the relocation procedure was initiated.

17. A communication system, comprising:

a first protocol termination point;

a second protocol termination point;

control means for relocating a first protocol from the first protocol termination point to the second protocol termination point, said control means being arranged to form a

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protocol initialization unit containing predefined information of the first protocol at the first protocol termination point;

communication path based on a second protocol between the first and the second termination points for transferring the protocol initialization unit; and

control means for initializing the second protocol termination point based on the protocol initialization unit.

18. A communication system according to claim 17, wherein the protocol initialization unit contains state information of the first protocol termination point.

19. A communication system according to claim 17 or 18, wherein the control means for relocating are arranged to encapsulate the protocol initialization unit into a message to be transmitted from the first termination point to the second termination point.

20. A communication system according to any of claims 17 to 19, wherein the first termination point is located at a first network element of the communication system and the control means for relocating are arranged in connection with the first network element.

21. A communication system according to any of claims 17 to 20, wherein the second termination point is located at a second network element of the communication system and the control means for initializing are arranged in connection with the second network element.

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22. A communication system according to any of the claims 17 to 21, wherein the protocol initialization unit contains information of at least one further protocol.

23. A network element for use in a communication network, comprising:

a protocol termination point;

control means for relocating a first protocol from the protocol termination point to another protocol termination point, said control means being arranged to form a protocol initialization unit containing predefined information of the first protocol at the protocol termination point; and

interface to said other protocol termination point based on a second protocol for transferring the protocol initialization unit from the first termination point by means of the second protocol.

24. A network element according to claim 23, wherein the network element comprises a controller of a cellular communication network.

25. A network element according to claim 23 or 24, wherein the control means for relocating are arranged to encapsulate the protocol initialization unit into a message to be transmitted from the first termination point by means of the second protocol.

26. A network element according to any of claims 23 to 25, wherein the protocol initialization unit contains information of at least one further protocol.

27. A network element for use in a communication network, comprising:

a protocol termination point of a first protocol;

interface to another protocol termination point for receiving a protocol initialization unit containing predefined information of the first protocol at said other termination point, wherein the interface is based on a second protocol; and

control means for initializing the protocol termination point based on the received protocol initialization unit.

28. A network element according to claim 27, wherein the network element comprises a controller of a cellular communication network.

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1/3

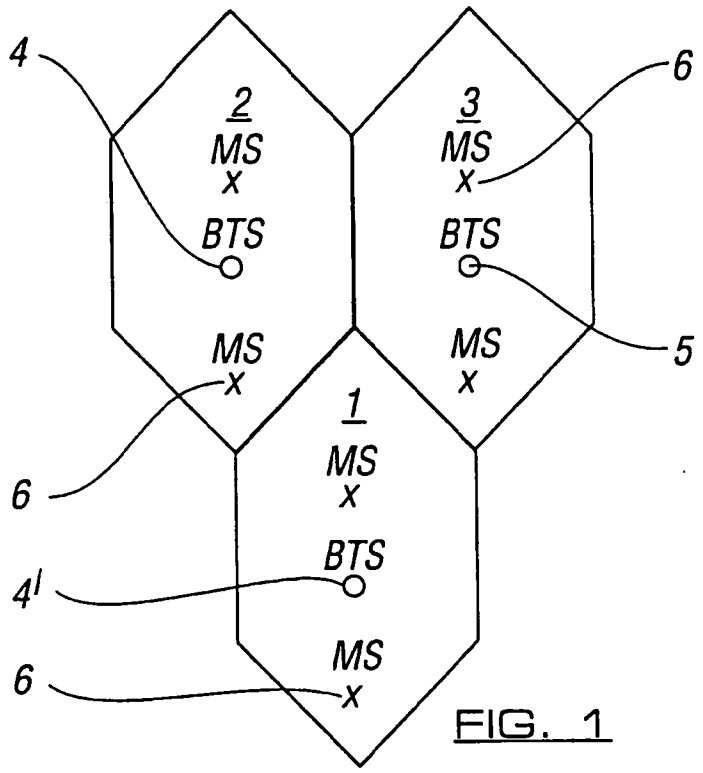

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FIG. 1

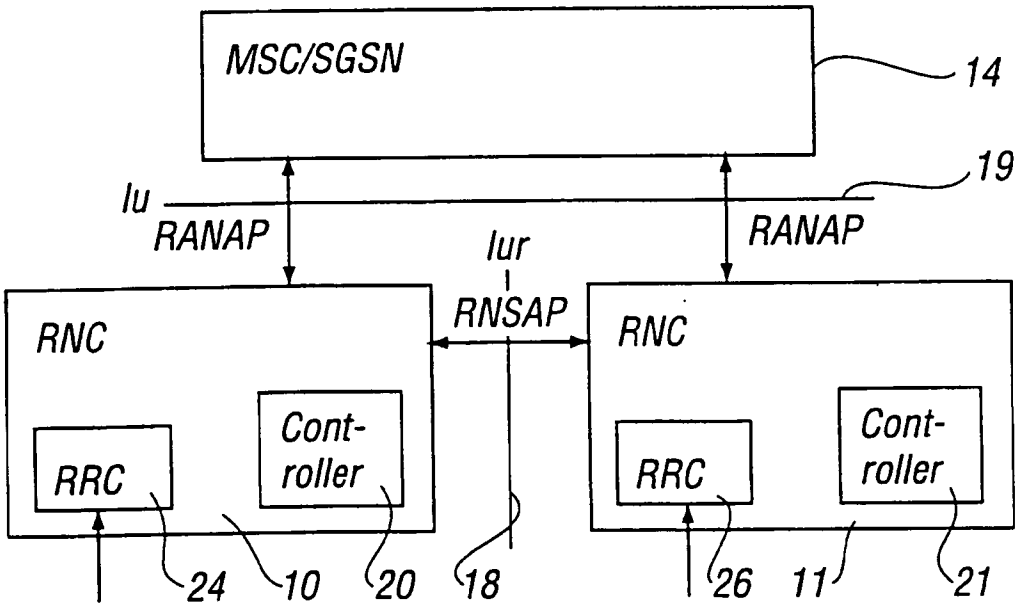

MSC/SGSN
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19
Iu
RANAP
RANAP
Iur
RNSAP
RNC
RRC
Cont-
roller
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RRC
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24
10
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18
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11
21

FIG. 3

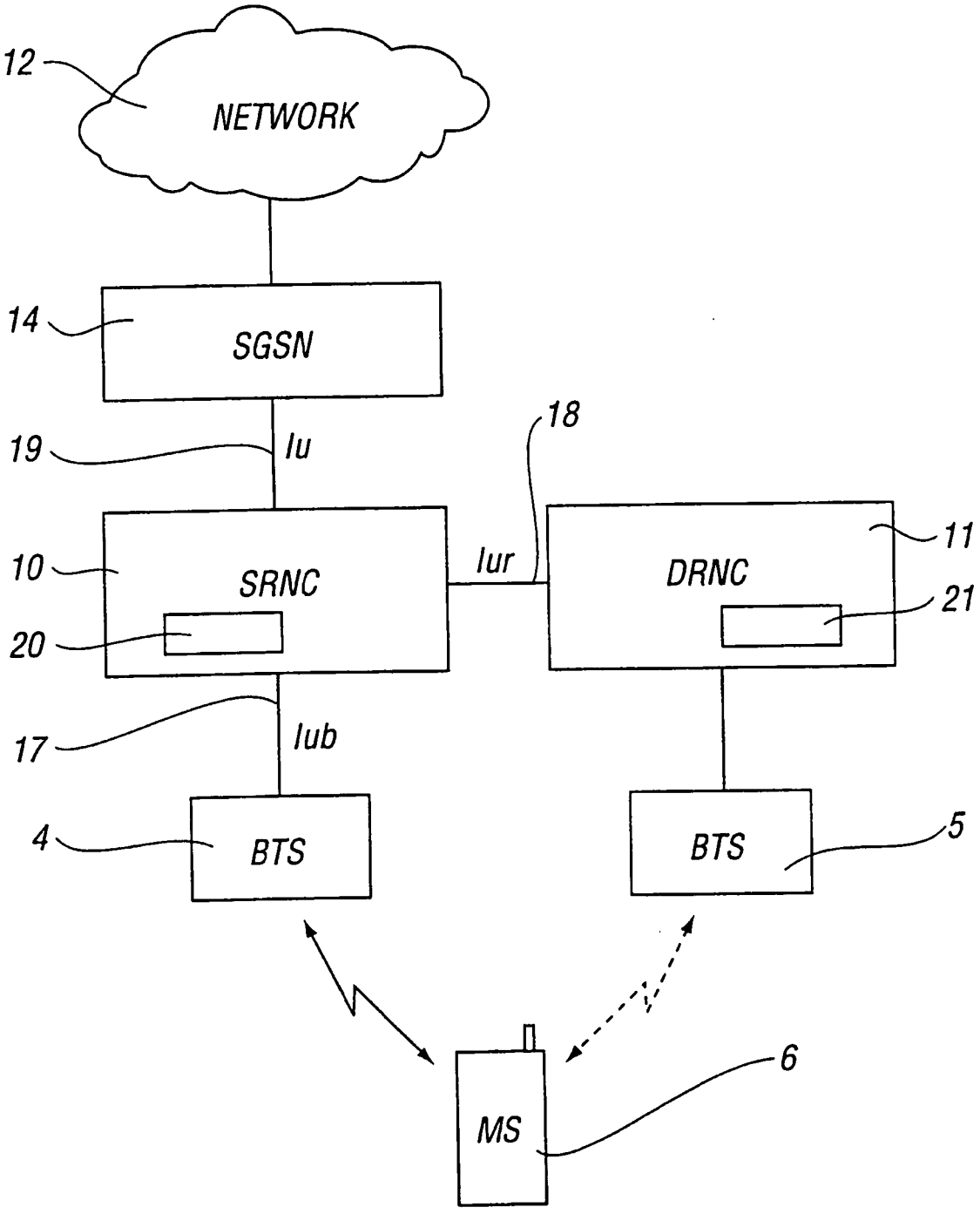


FIG. 2

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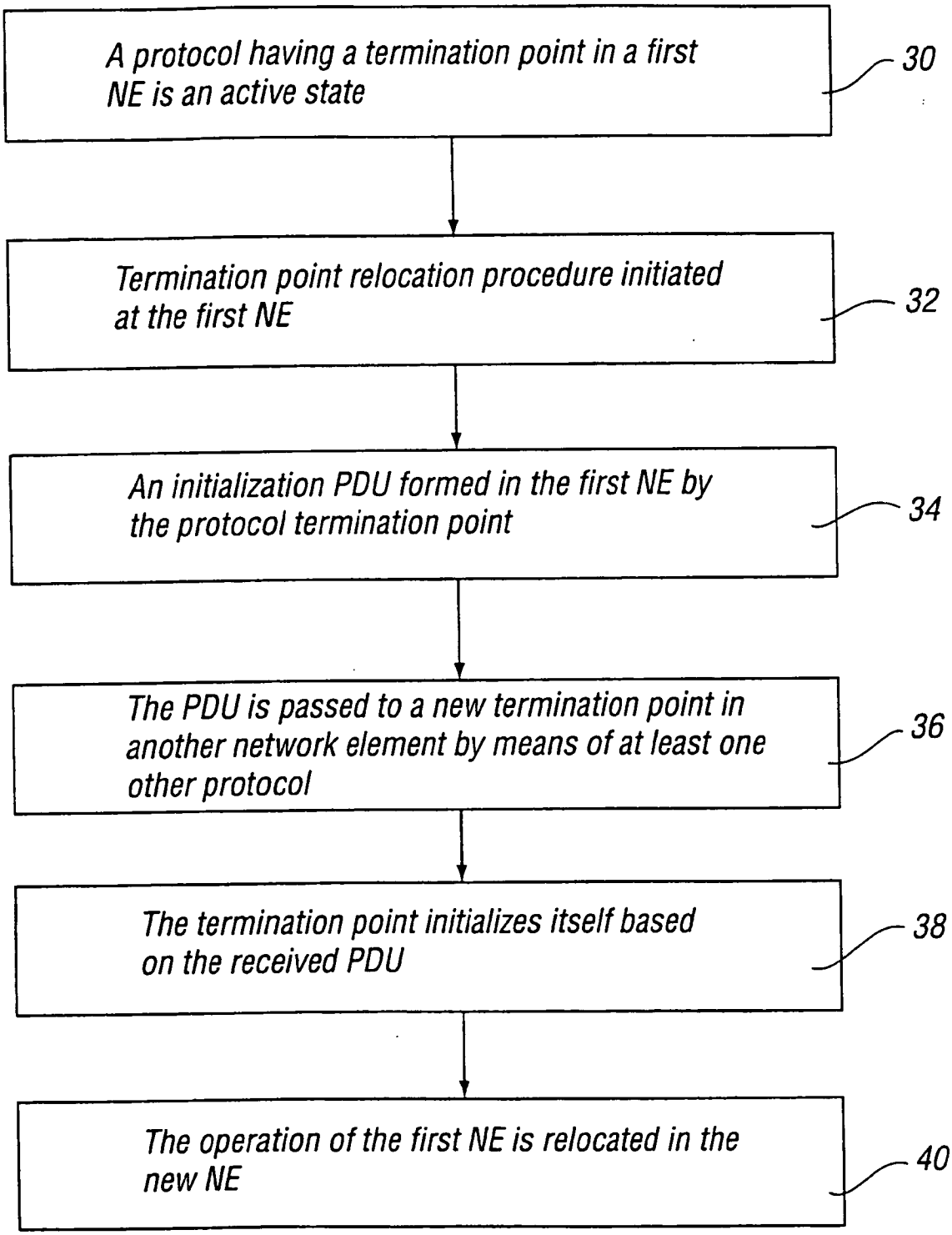


FIG. 4

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INTERNATIONAL SEARCH REPORT

Interna al Application No
PCT/EP 00/09100

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

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 7 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 practical, search terms used)
EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 898 438 A (NOKIA MOBILE PHONES LTD) 24 February 1999 (1999-02-24) column 4, line 18 -column 5, line 22 column 8, line 1 - line 8 column 10, line 7 -column 11, line 49 figure 7 ---	1-3,5,7, 9,15-21, 23-25, 27,28
A	CH 682 867 A (ASCOM TECH AG) 30 November 1993 (1993-11-30) column 7, line 19 -column 10, line 20 --- -/--	1,3,15, 17,20, 21,23, 24,27,28

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

'A' document defining the general state of the art which is not considered to be of particular relevance

'E' earlier document but published on or after the international filing date

'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

'O' document referring to an oral disclosure, use, exhibition or other means

'P' document published prior to the international filing date but later than the priority date claimed

'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

'&' document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 December 2000	12/12/2000

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Intern: al Application No
PCT/EP 00/09100

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 99 51051 A (NOKIA TELECOMMUNICATIONS OY ;AHMAVAARA KALLE (FI)) 7 October 1999 (1999-10-07) page 3, line 4 - line 17 page 4, line 14 -page 6, line 20 claims 1,14 -----	1-3,5-7, 9,11-28

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