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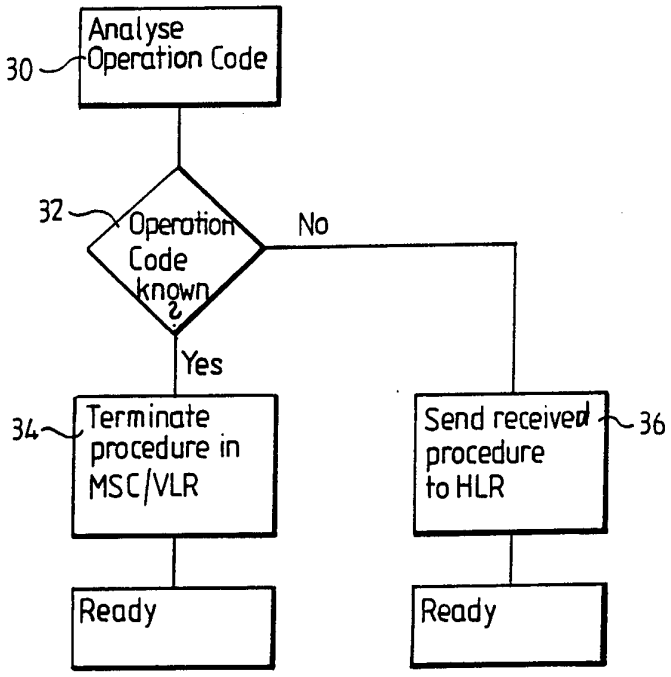

(57) Abstract

A system of managing in MSC/VLR supplementary service procedures directed towards HLR, comprises the following steps: MSC/VLR is aware only of those operations that shall be terminated in MSC/VLR; when receiving a forward direction message within an operation from an MS, a check is made with regard to the operation intended; when the operation is known to MSC/VLR, the procedure is terminated in MSC/VLR; when the operation is not known to MSC/VLR, MSC/VLR makes no further check of the invoke component in the received forward message, but forwards the message to HLR in the condition in which it was received in MSC/VLR.

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Method of Managing Supplementary Service Procedures in GSM/VLR towards HLR

Field of the invention

The present invention generally relates to cellular mobile radio systems based upon the so called GSM standard (GSM - Global System for Mobile communication) and more particularly to a method of managing supplementary service procedures.

Background of the invention

A GSM network basically comprises at least one base station system BSS including a base station controller BSC and base station tranceivers BTS. The GSM network furthermore includes a mobile services switching centre MSC, a home location register HLR and a visitors location register VLR.

Each subscribing mobile station MS belongs to a HLR in a home network, wherein permanent subscriber data is stored. When a mobile station is registered in a MSC/VLR as a new visitor, that mobile station's HLR sends a copy of the relevant subscriber data to MSC/VLR.

Supplementary service procedures are those procedures that are used by an MS (Mobile Station) in the GSM-system either to change supplementary service data or to question the network about current supplementary service data. This procedure may, for instance, involve activating a supplementary service, registering data for a supplementary service, inquiring about data for a given supplementary service, etc.

In a GSM-network, subscriber data is stored permanently in HLR as indicated above. This implies that procedures used by an MS to request changes in subscriber service data will preferably be terminated in HLR, which is responsible for such data. The MSC/VLR responsible for signalling with MS store only copies of the supplementary service data. This data is received in MSC/VLR from HLR in conjunction with a report from MS that the mobile is a new "visitor" in MSC/VLR.

Since it is MSC/VLR that communicates directly with MS in

conjunction with supplementary service procedures, it is MSC/VLR that terminates these procedures as seen from MSC. However, as mentioned, the GSM-network is distributed so that, in the main, it is the HLR which is the actual recipient or target of these procedures. MSC/VLR merely constitutes a procedure transfer point. This is an exception rather than a rule however, since certain procedures are terminated in MSC/VLR and not all of the procedures are transferred to HLR. An example in this respect is found in a query which concerns data that is applicable at that time for a given supplementary service, this query being terminated in MSC/VLR and not in HLR. This applies, however, only to those services that are controlled by MSC/VLR.

When signalling between MS and MSC/VLR, the supplementary service procedures are implemented purely in protocol fashion with the aid of rules that are in accord with the ROSE-concept (Remote Operations Service Element - specified in CCITT X.219 and X.220). This means that all procedures are specified in a protocol fashion as operations. These operations are descriptions of the configuration of the forward and backward messages included in the actual procedure from the aspect of their protocol content. The forward and backward messages included in an operation are called components.

CCITT #7 TCAP (Translation Capabilities Application Part - specified in CCITT Q.771-Q.775) is utilized when signalling between MSC/VLR and HLR. TCAP is also based on ROSE. This enables operations that are used in signalling between MSC/VLR and MS to be "imported" and used also when signalling between MSC/VLR and HLR.

Background Art

EP 295,678 describes a radio telephony system in which a "radio connector" sends an ID-number for the radio zone in which it is located. The radio telephone compares the received radio-zone ID-number with the number stored in a memory. If the ID-numbers do not mutually coincide, the radio-telephone ID-number and the received radio-zone ID-number are sent as a position entry signal to a radio control

unit, via a "radio connector". The radio-channel control unit registers the two ID-numbers.

U.S. 4,901,340 discloses essentially a general picture of the standpoint of techniques with regard to mobile telephony, where mobiles are located in foreign areas outside their home service area.

Disclosure of the Invention

As will be evident from the above, when MSC/VLR receives a supplementary service operation from a mobile station it is necessary for MSC/VLR to decide whether the operation shall be terminated in MSC/VLR or forwarded to HLR. The object of the present invention is to simplify the procedure when the operation concerned shall not be terminated in MSC/VLR, but shall be forwarded to HLR.

This object is achieved in a method of managing supplementary service procedures in GSM/VLR towards HLR which, in accordance with the invention, comprises the following steps

a) letting MSC/VLR be aware only of those operations that shall be terminated in MSC/VLR,

b) checking the intended operation when receiving a forward direction message within an operation from an MS for deciding whether the operation is known to MSC/VLR, and

c) if the operation is known to MSC/VLR, terminating it in MSC/VLR,

d) if the operation is not known to MSC/VLR, making no further check of it but forwarding the message to HLR in the condition in which it was received in MSC/VLR.

A preferred embodiment comprises the following steps

checking in step b) the invoke component of said operation by analysing Operation Code,

terminating in step c) the operation if the value of Operation Code coincides with a value known to MSC/VLR,

making in step d) no further check of the received invoke component if the value of Operation Code is not known to MSC/VLR but forwarding it to HLR in the condition in which it was received in MSC/VLR.

Brief Description of the Drawings

The invention will now be described in more detail with reference to the accompanying drawings, in which

Figure 1 is a schematic diagram illustrating the basic structure of a conventional GSM network,

Figure 2 illustrates schematically a conventional supplementary service procedure including signalling between MS and MSC/VLR and between MSC/VLR and HLR, and

Figure 3 illustrates similarly an example of how MSC/VLR manages a supplementary service procedure from MS which shall be forwarded to HLR, in accordance with the present invention.

Description of Preferred Embodiments

With reference to Figure 1, a GSM cellular network basically comprises a number of base station systems, of which two are generally indicated at BSS1 and BSS2, respectively. Each of the base station systems BSS1 and BSS2 includes a base station controller BSC1 and BSC2, respectively, connected to base station tranceivers BTS via communication links L, one of said base station tranceivers being designated BTS.n in Figure 1. Each tranceiver BTS is located in an associated cell of the cellular network, which is shown in Figure 1 as a honeycomb structure wherein each hexagone represents a cell. In Figure 1 the cell containing the tranceiver BTS.n is designated C.n. The GSM network furthermore includes a mobile services switching centre MSC having a visitors location register VLR. There are furthermore one or more home location registers communicating with MSC. The MSC is connected for communicatiom with the base station controllers BSC1 and BSC2 via a public land mobile network PLMN.

Although not shown, the MSC shown i Figure 1 usually has an interface to other MSCs, each MSC having furthermore interfaces for connection to a local public switched telephone network.

Each subscribing mobile station MS belongs to a HLR in a home network, wherein permanent subscriber data is stored. When a mobile is registered in a MSC/VLR as a new visitor, HLR sends a copy of the relevant subscriber data to MSC/VLR.

When signalling between MS and MSC/VLR, the supplementary service procedures are implemented purely in protocol fashion with the aid of rules that are in accord with the ROSE-concept (Remote Operations Service Element - specified in CCITT X.219 and X.220). This means that all procedures are specified in a protocol fashion as operations. These operations are descriptions of the configuration of the forward and backward messages included in the actual procedure from the aspect of their protocol content. The forward and backward messages included in an operation are called components.

CCITT #7 TCAP (Translation Capabilities Application Part - specified in CCITT Q.771-Q.775) is utilized when signalling between MSC/VLR. TCAP is also based on ROSE. This enables operations that are used in signalling between MSC/VLR and MS to be "imported" and used also when signalling between MSC/VLR and HLR.

Figure 2 illustrates an example of conventional supplementary service procedures, including signalling between MS and MSC/VLR and also between MSC/VLR and HLR.

When signalling between MS, indicated in Figure 2 as a block 2, and MSC/VLR, similarily indicated as a block 4, the procedure is started by MS, by signalling the forward message in the operation (called invoke component) "ActivateSS" in a REGISTER-message 6. The REGISTER-message thus establishes a signalling connection between MS and MSC/VLR. A dialogue is established by MSC/VLR 4 by sending a TCAP TC-BEGIN message 8 containing the invoke component of the operation "ActivateSS" to HLR, indicated as a block 10.

A TCAP TC-CONTINUE message 12 containing the invoke component of the operation "GetPassword" is used by HLR to continue signalling in this dialogue. In response, MSC/VLR forwards a FACILITY-message 14 containing the invoke component of the operation "GetPassword" to MS. MS answers in a FACILITY-message 16 containing the return result component of the operation "GetPassword" to MSC. MSC continues by forwarding the TCAP TC-CONTINUE message 18 containing the return result component of the operation "GetPassword" to HLR.

Generally, in response to a message from MS, MSC/VLR can either send a FACILITY-message, such as 14, or a RELEASE COMPLETE-message, such as 20. The FACILITY-message is used to signal on an existing signalling connection without releasing the connection. The RELEASE COMPLETE-message is used to release the signal connection.

The FACILITY-message and the RELEASE COMPLETE-message are used either to respond to the requested operation either with a positive or with a negative reply, and to start a new operation when so required.

Generally, between MSC and HLR, a dialogue is established by sending a TC-BEGIN message. TC-CONTINUE is used to continue signalling in this dialogue, and TC-END 22 is used to end the dialogue. The user is able to send different types of components in all of these TCAP-messages.

As appears from the above, MSC/VLR when receiving a supplementary operation must decide whether it shall be terminated in MSC/VLR or if it shall be passed on to HLR. The present invention relates to the case where the procedure shall not be terminated in MSC/VLR but shall be passed on to HLR.

The invention implies that MSC/VLR is aware solely of those operations that shall be terminated in MSC/VLR. When receiving an invoke component within an operation from an MS, a check is made to determine the operation concerned. This is indicated by a value called an Operation Code. With reference to Figure 3, MSC/VLR in step 30 analyses Operation Code. If the Operation Code value coincides, as decided in step 32, with one of the values known to MSC/VLR, the procedure is terminated in MSC/VLR, step 34.

If the operation code value is not known to MSC/VLR, MSC/VLR makes no further syntactic check of the received invoke component.

When practicing conventional standards for signalling between MSC/VLR and HLR, it would now have been normal practice to create a new invoke component of which a part includes new data allocated by MSC/VLR and also data that MSC/VLR has received from MS. This has meant that MSC/VLR must be aware of some part of the content of operations that

are actually transparent to MSC/VLR, and also the identity of these operations and how they function.

Instead of MSC/VLR being aware of those operations that shall be signalled or forwarded to HLR, the invention is based on the concept that MSC/VLR will be aware solely of those operations that shall not be signalled to HLR. In accordance with this solution, those operations that shall not be terminated in MSC/VLR, i.e. operations that shall be signalled to HLR, are unknown to MSC/VLR and shall be one-hundred percent transparent to MSC/VLR.

Instead of allocating certain own data within the invoke component, the component in step 36 is forwarded to HLR in the TCAP-message TC-BEGIN totally in the condition in which it was received from MS, i.e. without MSC/VLR being aware of the operation concerned or of other data.

MSC/VLR has now "opened a signalling channel" on which HLR and MS can exchange components included in any desired number of operations, without MSC/VLR needing to know to which operations signalling between MS and HLR via MSC/VLR relates, or the contents of these operations.

In turn, this means that new operations and changes in existing operations, such as new data or new negative acknowledgements for instance (according to TCAP, so-called ERRORS) can be introduced into HLR and in MS without influencing MSC/VLR. This provides good properties with regard to the introduction of new services in HLR without influencing MSC/VLR. This is particularly beneficial in GSM, where the HLR operator is sometimes not the same as the MSC/VLR operator (MS is located in another network, for instance in another country).

Claims

1. A method of managing in MSC/VLR supplementary service procedures directed towards HLR, comprising the steps of

a) letting MSC/VLR be aware only of those operations that shall be terminated in MSC/VLR,

b) checking the intended operation when receiving a forward direction message within an operation from an MS for deciding whether the operation is known to MSC/VLR, and

c) if the operation is known to MSC/VLR, terminating it in MSC/VLR,

d) if the operation is not known to MSC/VLR, making no further check of it but forwarding the message to HLR in the condition in which it was received in MSC/VLR.

2. A method according to Claim 1, comprising

checking in step b) the invoke component of said operation by analysing Operation Code,

terminating in step c) the operation if the value of Operation Code coincides with a value known to MSC/VLR,

making in step d) no further check of the received invoke component if the value of Operation Code is not known to MSC/VLR but forwarding it to HLR in the condition in which it was received in MSC/VLR.

Fig.1

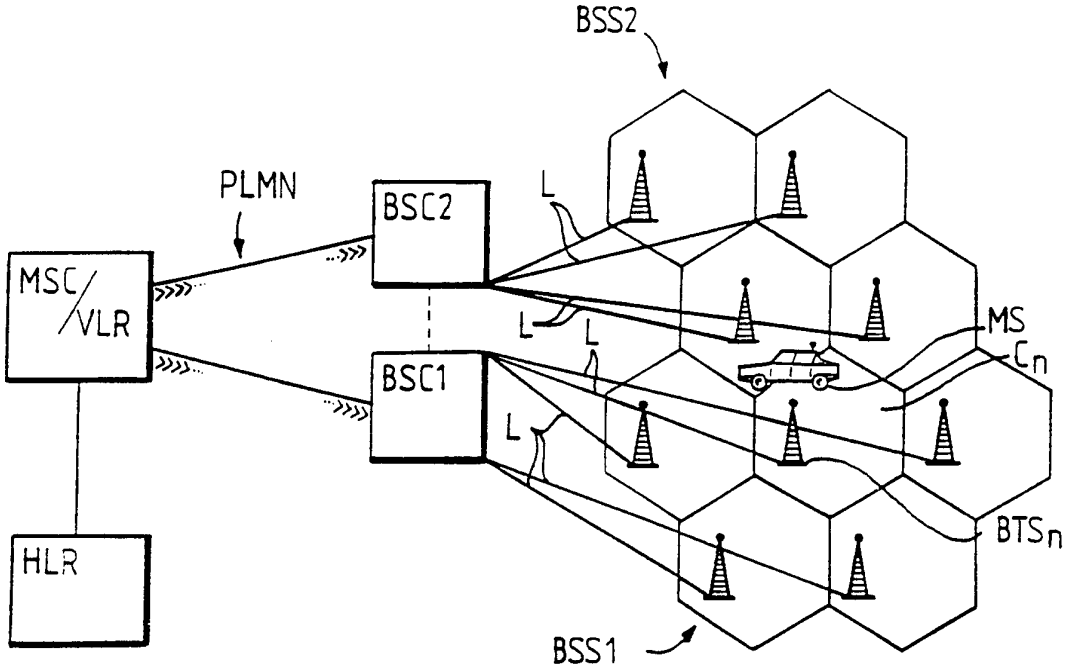


Fig.2

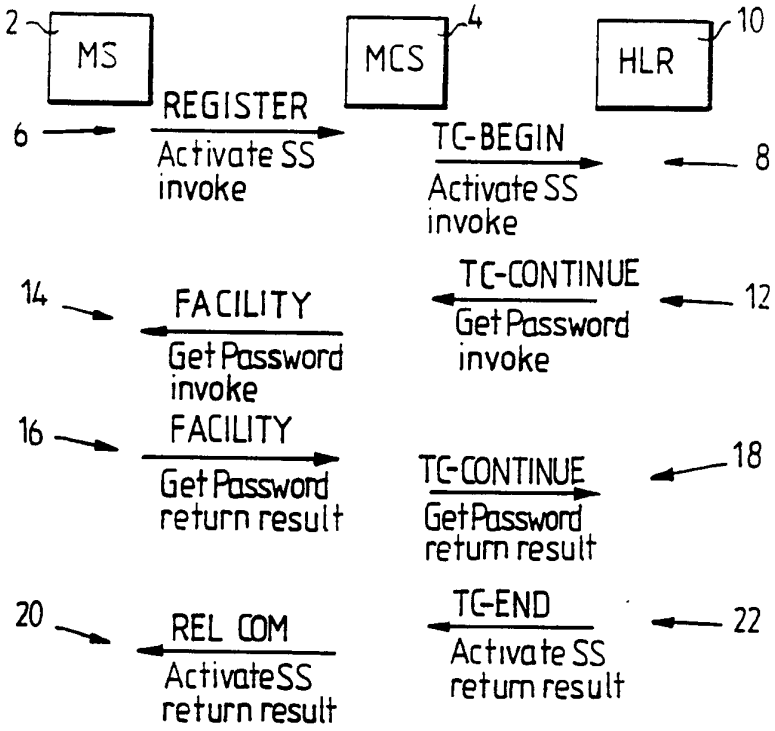
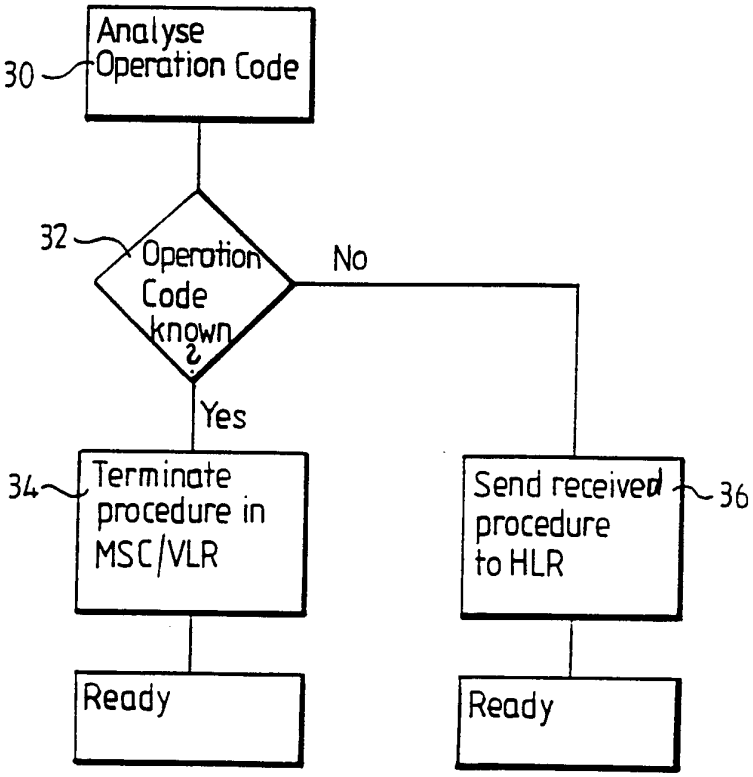

2
MS
MCS
4
HLR
10
REGISTER
6
Activate SS
invoke
TC-BEGIN
Activate SS
invoke
8
TC-CONTINUE
Get Password
invoke
12
14
FACILITY
Get Password
invoke
16
FACILITY
Get Password
return result
TC-CONTINUE
Get Password
return result
18
20
REL COM
Activate SS
return result
TC-END
Activate SS
return result
22

Fig.3


Analyse
Operation Code
30
32
Operation
Code
known
2
No
Yes
34
Terminate
procedure in
MSC/VLR
Send received
procedure
to HLR
36
Ready
Ready

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 93/00879

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: H04Q 7/04
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)

IPC5: H04B, 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.
A	EP, A2, 0462728 (NORTHERN TELECOM LIMITED), 27 December 1991 (27.12.91), column 4, line 13 - line 32 --	1-2
A	EP, A2, 0295678 (MATSUSHITA COMMUNICATION INDUSTRIAL CO. LTD), 21 December 1988 (21.12.88) --	1-2

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Information on patent family members

30/12/93

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A2- 0462728	27/12/91	CA-A- 2044435	19/12/91
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		US-A- 5260987	09/11/93
EP-A2- 0295678	21/12/88	AU-B- 591597	07/12/89
		CA-A- 1280172	12/02/91
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		US-A- 4852148	25/07/89