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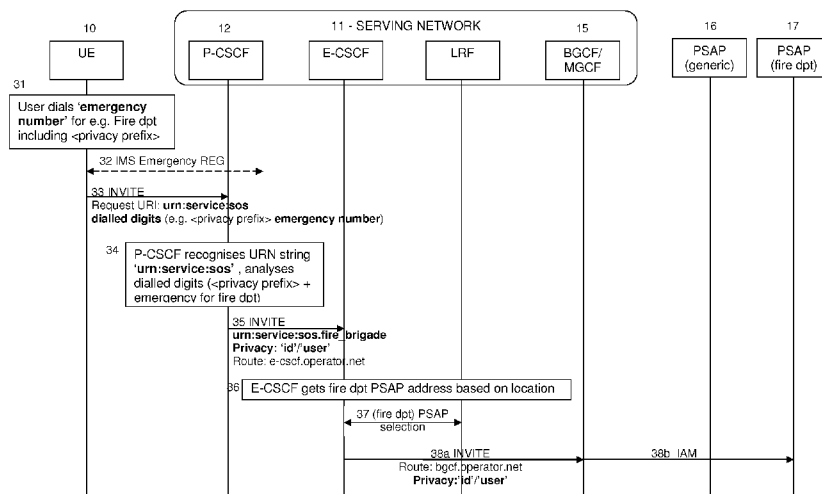


Figure 3A

(57) **Abstract:** Embodiments provide a method of establishing an emergency session between a UE accessing an IMS network, and an emergency service centre. The emergency service centre (or PSAP) relates to one of a plurality of emergency sub-services. A session initiation request, sent from the UE to the IMS, includes the dialled digits of an emergency number. The digits of the dialled emergency number are analysed, to determine a corresponding emergency sub-service. The session establishment request is then routed to an emergency service centre of the corresponding emergency sub-service.

Enhanced Emergency Service Calls

Technical Field

5 Mechanisms for enhancing Emergency Service calls are presented. These include support of enriched indications of type of Emergency Service. In particular the mechanisms relate to emergency calls over an IP Multimedia Subsystem (IMS) network.

Background

10 The IP Multimedia Subsystem (IMS) is the technology defined by the Third Generation Partnership Project (3GPP) to provide IP Multimedia services over mobile communication networks. The IMS makes use of the Session Initiation Protocol (SIP) to set up and control calls or sessions between user terminals (or user terminals and application servers). The Session Description Protocol (SDP), carried by SIP signalling,
15 is used to describe and negotiate the media components of the session. Whilst SIP was created as a user-to-user protocol, the IMS introduces additional functionality for e.g. subscription handling, security and charging to allow operators and service providers to control user access to services and to charge users accordingly.

20 Figure 1 is a network diagram illustrating schematically how the IMS fits into mobile network architecture in the case of a General Packet Radio Service (GPRS) access network. The IMS 3 includes a core network 3a, and a Service Network 3b. Call/Session Control Functions (CSCFs) 4 operate as SIP proxies within an IMS core network 3a. User Equipment (UE) 2 accesses the IMS 3 via an IP Connectivity Access
25 Network (IP-CAN) and gateway nodes in a connectivity layer 1. A Home Subscriber Server HSS 8 keeps a log of users' subscription profiles that define the services that the user has subscribed to. After registering, the user is able to establish a communication session with other peers, making use of the multimedia capabilities of the IMS. The 3GPP architecture defines a number of types of CSCFs including: a
30 Proxy CSCF (P-CSCF) which is the first point of contact for the user within the IMS core network 3a; a Serving CSCF (S-CSCF) controls the provision of services to the users in accordance with the user's subscription; an Interrogating CSCF (I-CSCF) whose role is to identify the correct S-CSCF, based on the user's subscription profile which it obtains from the user's HSS 8, and to forward to that S-CSCF a request
35 received from a SIP terminal via a P-CSCF.

IMS Emergency Services specified in the 3rd Generation partnership project (3GPP) Technical Specification (TS), 3GPP TS 23.167 define the architecture and mechanisms required for a user to be able to establish IMS emergency sessions towards
5 Emergency Centers and Public Safety Answering Points (PSAPs).

The related detailed mechanisms are defined in TS 24.229 including the means by which a UE indicates that an IMS Registration is triggered for the purpose of establishing an emergency session; and the means by which an IMS emergency
10 session is established. A UE is required to match the digits dialed by the user with a list of known emergency numbers in order to trigger emergency sessions using the emergency service URN. Additionally, TS 24.229 defines the means by which the IMS serving network detects that an IMS session is established for the emergency service. The P-CSCF must be prepared to detect an emergency session even if the UE does
15 not use the emergency service URN.

In addition to the emergency service URN, the UE or the P-CSCF (if required) may also include an additional sub-service type (e.g. ambulance, police) if information on the type of emergency service is known. This information about the type of emergency
20 service is relevant in order to route the emergency call to the most suitable PSAP/Emergency Centre (e.g. fire department instead of police department or general emergency centre).

However, in certain cases, it may occur that such information is not available in the emergency session request and the call is managed as a generic emergency call (i.e. routed to a generic or operator defined default emergency centre). This means that even if the user is willing to get urgent access to a specific type of emergency
25 personnel, the emergency session will be routed towards a generic or operator defined default emergency centre instead. Also, the possibility for the user to be anonymous during an emergency call is a regulatory requirement in some countries (e.g. Japan). In such cases, the user will dial a privacy prefix together with the emergency number, which will make it impossible for the UE to recognize the dialled number as an emergency call even if the UE is able to recognize the emergency number. As a
30 consequence, the user's preferences regarding privacy will not be taken care of.

Summary

Embodiments provide a method of establishing an emergency session between a User Equipment, UE, accessing an IP Multimedia Subsystem, IMS, network, and an emergency service centre. The emergency service centre relates to one of a plurality of emergency sub-services. A Session Initiation Protocol, SIP, request, is received in the IMS network from the UE, the request including the dialled digits of an emergency number. The digits of the dialled emergency number are analysed, to determine a corresponding emergency sub-service. The session establishment request is then routed to an emergency service centre of the corresponding emergency sub-service. The method is preferably performed in an IMS network entity, such as a P-CSCF or Emergency CSCF (E-CSCF).

In addition, the dialled emergency number may include a privacy prefix. The need for privacy in relation to the emergency session is forwarded to the emergency service centre. The dialled emergency number and/or privacy prefix digits may be included in a header field in the session establishment request.

It is an advantage that the method, which is based on the definition of new IMS network controlled mechanisms, enhances emergency session requests with information of the type of emergency service requested in support for more accurate and optimal selection of PSAPs. The mechanisms facilitate the extension of the emergency session request with the information related to the emergency service requested, even if the UE is not initially able to identify the dialled number with a particular type of emergency service. A much more effective selection of an appropriate PSAP is then possible, based on the added information.

Embodiments may also provide a UE operable to communicate over an IMS and/or a method of operating a UE. The UE comprises a user interface for conveying information to a user and for receiving input data and instructions from the user; a transceiver interface for transmitting signals to and receiving signals from the IMS network; a memory storing data and program instructions, and a processor for executing the program instructions in response to user input and signals received. The UE is configured, when initiating an emergency session, to send a SIP request to the IMS, including the dialled digits of an emergency number dialled relating to an emergency sub-service in a header of the SIP Request in a pre-defined header field, or

a header field that has been agreed between the UE and IMS network. The UE may also include a dialled privacy prefix of the session initiation request.

Embodiments may also provide an IMS network entity that includes an input/output over which signals are sent to/from other network entities and to/from a UE accessing the IMS network. The network entity also includes a memory storing data and programming instructions and a processor for executing the programming instructions, which cause the entity to analyse a SIP request received from a UE, which includes digits of an emergency number dialled at the UE, and to determine a corresponding emergency sub-service. The network entity is further configured to route the request to an emergency service centre of the corresponding emergency sub-service. The network entity may also be configured to recognise a privacy prefix in the digits, and to include a privacy indication in the session establishment request routed to the emergency service centre. Preferably, the network entity is a Proxy Call Session Control Function, P-CSCF. Alternatively, the network entity may be an Emergency CSCF, E-CSCF.

Brief Description of the Drawings

Figure 1 is a network diagram illustrating schematically how the IMS fits into mobile network architecture in the case of a General Packet Radio Service (GPRS) access network.

Figure 2 is a signalling diagram illustrating PSAP selection without considering type of emergency service.

Figures 3A and 3B are signalling diagrams illustrating PSAP selection considering the type of emergency service, in accordance with the mechanisms described herein.

Figure 4 is a block diagram illustrating the principal functional components of a User equipment (UE) embodiment.

Figure 5 is a block diagram illustrating the principal functional components of an IMS network entity.

Figure 6 is a flow diagram illustrating procedures followed in an IMS network.

Figure 7 is a flow diagram illustrating procedures followed at a UE.

Detailed Description

5 TS 24.229 specifies the means by which a UE indicates that:

- An IMS Registration is triggered for the purpose of establishing emergency sessions (i.e. including a Contact header field with a "sos" SIP Uniform resource Identifier (URI) parameter that indicates that this is an emergency registration);
- 10 • An IMS session is established for the purpose of an emergency service (i.e. including a Request-URI sent to an emergency service Uniform Resource Name (URN) – a service URN with a top-level service type of "sos").

15 A UE is required to match the digits dialed by the user with the list of known emergency numbers in order to trigger emergency sessions using the emergency service URN.

The list of known emergency numbers at the UE can comprise:

- default emergency numbers in the ME (112 and 911);
- USIM pre-configured numbers (normally home country emergency numbers);
- and
- 20 • Numbers downloaded in attach and Mobility Management procedures from the serving IP Connectivity Access Network - IP-CAN, including local emergency numbers in roamed to networks. (See 3GPP TS 24.301 and TS 24.008 for further details.)

25 TS 24.229 specifies how the IMS serving network detects that an IMS session is established for an emergency service, when the Request URI is an emergency number or an emergency service URN configured in the P-CSCF. The P-CSCF must be prepared to detect an emergency session even if the UE does not use the emergency service URN. This is a backup for those cases when the UE (e.g. when roaming) does
30 not have all the information about all local emergency call numbers, and initiates a normal call (referred to as a UE undetected Emergency call in 3GPP TS 23.167).

TS 24.229 also defines the means by which the IMS serving network rejects an emergency session establishment request and instructs the UE to retry the emergency
35 session after executing an IMS Emergency Registration, when required by the IP-CAN.

(This involves sending a 380 (Alternative Service) response to a SIP INVITE request containing a P-Asserted-Identity header field with a value equal to the value of the last entry of the Path header field value received during registration and the response containing a 3GPP IP Multimedia Core Network (IM CN) subsystem XML (Extensible Markup Language) body that includes an <ims-3gpp> element, including a version attribute, with an <alternative-service> child element with the <type> child element set to "emergency").

In accordance with currently specified procedures, in addition to the emergency service URN, the UE or the P-CSCF (if required) may also include an additional sub-service type (e.g. ambulance, police) if information on the type of emergency service is known. At the UE this could be available if pre-configured in the Universal Services Identity Module, USIM, (for home emergency numbers), and if received (optional IE) from the serving network over Mobility Management procedures (related to local emergency numbers/services). At the P-CSCF this could be available if configured. This information about the type of emergency service is relevant in order to route the emergency call to the most suitable PSAP/Emergency Centre (e.g. fire department instead of police department or general emergency centre).

The available types of emergency services, as defined in 3GPP TS 24.008, are the following:

- Police
- Ambulance
- Fire Brigade
- Marine Guard
- Mountain rescue
- Manually initiated eCall
- Automatically Initiated eCall

It should be possible to tie any emergency call number to any single emergency call type or to any combination of emergency call types. However, in certain cases, such information may not be available in the emergency session request, and the call is managed as a generic emergency call (i.e. routed to a generic or operator defined default emergency centre). This may occur for example when: the serving IP-CAN does not provide the list of local emergency numbers to the UE; the list of local

emergency numbers is provided to the UE but without indicating which type of emergency service an emergency number is related to; and/or there is the possibility for the user to be anonymous during an emergency call, which is a regulatory requirement in some countries (e.g. Japan) – in such cases, the user will dial a privacy prefix together with the emergency number which will make it impossible for the UE to recognize the dialled number as an emergency call even if the UE is able to recognize the emergency number. Another situation that could arise is where the list of local emergency numbers provided to the UE has conflicts with the UE's list of emergency numbers for its home network - e.g. dialled digits in home network correspond to "fire" while in the local network the same dialled digits correspond to "police". In this case the UE may be configured to use the top level SOS indication (i.e. a generic emergency number rather than any of the possible emergency sub-service types).

In these cases, the sequence of events depicted in Figure 2 will take place, according to defined procedures in the 3GPP TSs. Figure 2 is a signal diagram showing the sequence of signals and actions carried out by: a UE 10; entities of a serving IMS network 11, including a P-CSCF 12, Emergency CSCf (E-CSCF) 13, Location Register Function (LRF) 14 and Border Gateway Control Function/Media Gateway Control Function (BGCF/MGCF) 15; a generic PSAP 16 and a specific PSAP 27 (in this example a fire department PSAP).

At step 21 a user of UE 10 dials a local emergency number with the intention to reach e.g. the closest fire department. Potentially, the user may prefer to stay anonymous and use an optional privacy preference by dialing the local privacy prefix. At step 22, the UE 10 is not be able to recognize the local emergency number as an emergency number so it will initiate a normal IMS session instead over a normal Registration. Note that even when the UE 10 is aware of local emergency numbers, the potential use of a privacy prefix (as shown) may prevent the UE 10 from identifying the session request as an emergency request. At steps 23 and 24, the serving IMS network 11 (i.e. P-CSCF 12) will however detect that this is an emergency session attempt and will instruct the UE 10 to retry the session after executing an IMS Emergency Registration. The P-CSCF 12 is configured to be aware of local emergency numbers. It is assumed that the P-CSCF 12 is also aware of the privacy prefix used in the local network, if the user has included this at step 21.

The UE 10 will follow instructions from the serving IMS Network 11, and after completing an emergency registration (step 25) will initiate an emergency session request 26 (including a Request-URI sent to an emergency service URN, i.e. a service URN with a top-level service type of "sos"). However, in the currently defined procedures the P-CSCF 12 will not include any instructions requiring the UE 10 to include any indication of the specific type of emergency service, nor any privacy preferences. Therefore, it is not expected that the UE 10 indicates any additional information regarding the type of emergency service the emergency call is intended for as there is no particular indication for that provided by the P-CSCF in the previous steps. Furthermore, from 3GPP TS 24.229, it is unclear whether the UE 10 will simply include the emergency service URN in the "To" header field or if the UE 10 will insert a dialstring URI or a tel URL representing the dialled digits since it cannot perform local dialstring interpretation for the dialled digits.

3GPP TS 24.229 does not specify any particular handling of type of emergency services, or use of privacy preferences at the P-CSCF 12 (nor at the E-CSCF 13). Therefore these indications are not included by the UE 10 in the re-sent INVITE at step 26. The PSAP selection process, which involves the E-CSCF 13 and the LRF 14, as shown at steps 27a and 28, will not take into account the type of emergency service that the emergency call is intended for. Therefore, even if the user is willing to get urgent access to a specific type of emergency personnel, the emergency session will be routed (steps 29a and 29b) via the BGCF/MGCF 15 towards a generic, or operator defined, default emergency centre (i.e. PSAP 16) instead of the specific fire department PSAP 17, as originally requested at step 21. Additionally, the user's preferences regarding privacy will not be taken care of.

These issues are addressed by the mechanisms described below, which are based on the following main aspects:

- Indication of dialed digits by the UE at every emergency session set up request.
- Analysis of dialed digits within an emergency session set-up request at the P-CSCF.
- Enriching emergency session set-up request with additional information relevant for the optimal handling of the emergency session.

These different aspects of the invention are depicted in Figures 3A and 3B, and are described in detail below. The entities shown in Figures 3A and 3B are the same as those in Figure 2, and use the same reference numerals.

5 In Figure 3A, at step 31 an emergency number is dialled at UE 10. In this case an optional privacy prefix is also dialled. At step 32 the UE performs an emergency registration. At step 33, the UE sends a session initiation request (SIP INVITE), in which the URI has a SOS indication. However, the INVITE does not include any indication of the emergency sub-service type. The URI is used for the SOS indication
10 and does not include the dialled digits. In order for the serving IMS network 11 to provide mechanisms for enhancing emergency session requests with information about the type of emergency service requested, the mechanisms provide that, in addition to the emergency service URN in the Request-URI, the UE also includes a dialstring URI or a tel URL representing the dialled digits (both the emergency number and the
15 privacy prefix in this example) within a header field of the emergency session request. This is shown at step 33. This could be any available header field in the request, provided that the P-CSCF is configured to know in which header field of the request it should look for the dialled digits. It should therefore be a pre-defined header field, or one that has been agreed between the UE 10 and IMS network 11.

20

At step 34, when the P-CSCF 12 receives the emergency session request (i.e. including the emergency service URN in the Request-URI and the privacy prefix), the P-CSCF 12 analyses the content of the request header field in order to identify if additional information regarding the type of emergency service might be added to the
25 emergency session request.

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Accordingly, at step 34, the P-CSCF 12 performs a local dialstring interpretation for the dialled digits inserted by the UE 10 in the header field of the emergency session request. This requires that the P-CSCF 12 is configured not only with a list of local
30 emergency numbers (as currently required) but also with the type of emergency service each one is intended for. The P-CSCF 12 is also able to recognize any other aspect of the dialled digits that may influence the emergency session. For example, in the case that a privacy indicator is used for the emergency session, the P-CSCF 12 is able to recognize this prefix in combination with the local emergency number.

30

35

Before progressing the emergency session request to the E-CSCF 13, the P-CSCF 12 enhances the request with additional information relevant for the selection of PSAPs and/or the correct handling of the session. In particular, because the UE 10 did not indicate the type of emergency service required within the emergency service URN included in the Request-URI at step 33, the P-CSCF 12 could include such information now, as identified during the analysis of the dialed digits previously proposed (e.g. *service."sos".fire_brigade*). Additionally, any other relevant aspect for the handling of the emergency session that may be inferred by the P-CSCF 12 during the analysis of the dialed digits could be included in the request. For example, if a privacy prefix was used, the P-CSCF 12 could include a privacy header in the request. If any of the information inferred by the P-CSCF 12 during the analysis of the dialed digits is already available in the request, the P-CSCF 12 will not need to modify the request at all. The P-CSCF 12 may check the presence of this type of information in the request even before executing the analysis of the dialed numbers. At step 35, the enhanced Request is then sent to the E-CSCF 13.

When received by the E-CSCF 13, selection of PSAP and handling of the emergency session request will be managed as currently specified, but now takes into consideration the type of emergency service and additional characteristics included by the P-CSCF 12. This is shown at steps 36 and 37. Finally, at steps 38a and 38b the Request (INVITE) is routed to the selected PSAP, which in this example is the fire department PSAP 17, as originally requested by the UE 10.

Note that there are a number of possibilities that may arise when the user initially dials the local emergency number at step 31. This may or may not include an indication ("sos") that it is an emergency call, and may, or may not, include the dialed digits of the emergency number. In the procedure shown and described above for Figure 3A, the UE 10 recognizes the number as an emergency number and so performs an emergency registration. It then uses the SOS indication in the URI of the INVITE at step 33. However, there may be instances where the UE does not recognize the number as an emergency number and does not perform an emergency registration. A procedure for dealing with this situation is shown in Figure 3B, where an initial session initiation request 301 received from the UE 10 does not indicate that it is a request for an emergency session but does include the dialed digits that correspond to an emergency number known by the serving network 11. At step 302, the UE 10 sends

an INVITE without performing an emergency registration. As in the example of Figure 3A, Figure 3B depicts the case where the user has also dialed an optional privacy prefix. At step 303, the P-CSCF 12 recognizes the dialed digits as being those of an emergency number and analyses these to determine the particular emergency sub-service type.

These mechanisms then allow for two alternative ways that the serving network 11 may handle the request.

In the first alternative the initial request INVITE 302 from the UE 10 is rejected and at step 304 the serving network (P-CSCF 12) sends a response to the UE 10 rejecting the session. The response sent to the UE 10 at step 304 indicates that the UE 10 should send the request again after performing an IMS Emergency Registration, using an emergency URN and additionally indicating the specific emergency subservice type corresponding to the dialed digits sent originally. In addition, where the UE included a privacy prefix in the original request 302, the response to the UE 10 may include an indication that it needs to include the privacy indicator (i.e. privacy prefix) in the re-sent request. At step 305 the UE 10 then re-sends the request, including all the appropriate information (i.e. emergency service URN including appropriate subservice type and optionally privacy indicator), after performing an emergency registration (not shown). The serving network 11, then routes the request to the appropriate PSAP 17, in the normal way (steps 306 to 309b, which are the same as steps 35-38b of Figure 3A).

In the second alternative, the P-CSCF 12 is able to determine from the dialed digits that the call relates to a specific emergency sub-service type. In this case the P-CSCF 12 adds an appropriate emergency indication and subservice type in the session establishment request sent to the E-CSCF. The P-CSCF 12, after analyzing the dialed digits, determines that the call should be routed to a particular emergency sub-service, and so the P-CSCF 12 does not reject the session (as at step 304), but instead inserts the relevant information into the INVITE, including an emergency SOS indication in the URI and an indication that privacy is to be used for the session (if originally requested by the UE 10). In other words, in this alternative, the P-CSCF 12 inserts the information into the request that the UE had provided in the re-sent request at step 305 of the first alternative. This alternative therefore follows the same steps shown in Figure 3B for the first alternative, but omitting steps 304 and 305. The request is then

routed on towards the appropriate PSAP for the identified emergency sub-service as shown in steps 306 to 309b (the same procedure as shown in steps 35 to 38b in Figure 3A).

5 Figure 4 is a block diagram illustrating the principal functional components of a User equipment (UE) 40 operable to communicate over an IP Multimedia Subsystem, IMS. The UE 40 includes an input/output by which signalling/messages are sent and received, a processor 44, a memory 46 storing data and programming instructions that are executed by the processor 44, and a user interface through communications are
10 provided to and from a user. The user interface includes a means by which a user can input digits when dialling. The UE 40 is configured, when initiating an emergency session, to send a session initiation request to the IMS via the input/output 42. The request includes, in a header field, the digits of an emergency number dialled on the user interface 48. The UE may also include a dialled privacy prefix in the header field
15 of the session initiation request.

Figure 5 is a block diagram illustrating the principal functional components of an IMS network entity 50. The IMS network entity 50 includes an input/output 52 over which signals are sent to/from other network entities and to/from a UE accessing the IMS
20 network. The network entity 50 also includes a memory 56 storing data and programming instructions and a processor 54 for executing the programming instructions, which cause the entity to analyse an emergency session initiation request received from a UE, which includes digits of an emergency number dialled at the UE, and to determine a corresponding emergency sub-service. The network entity 50 is
25 further configured to route the session establishment request to an emergency service centre of the corresponding emergency sub-service. The network entity 50 may also be configured to recognise a privacy prefix in the digits, and to include a privacy indication in the session establishment request routed to the emergency service centre.

30 The following additional, alternative, or less preferred features may also be provided in the mechanisms described above.

Figure 6 is a flow diagram illustrating procedures performed in the IMS network, in this example at the P-CSCF. At step 60, the P-CSCF receives a session initiation request
35 from a UE for an emergency session. At step 61, the P-CSCF determines if the

request includes an emergency indication and the dialing digits used for making the call. If not, then at step 62 the P-CSCF sends a response back to the UE suggesting that it re-sends a request including the dialing digits of the number called, after performing an emergency registration. The process then returns to step 60 where the P-CSCF receives the re-sent request from the UE, which this time should include the emergency indication and the dialed digits. When the P-CSCF has received the request with the emergency indication and the dialed digits, then at step 63 it analyses the digits to determine the emergency sub-service to which the call should be routed and any other additional information, such as use of privacy, contained in the request. Finally, at step 62, the request is routed to the PSAP of the appropriate sub-service together with any additional information.

Figure 7 is a flow diagram illustrating the procedures followed at the UE. At step 70, a number is dialed by the user of the UE. At step 71 if the UE recognizes the number as an emergency number it performs an emergency registration (not shown) and at step 72 sends a request to the IMS network to initiate the emergency session. However, if at step 71 the UE does not recognize the dialed number as an emergency number, then at step 73 and the UE sends a SIP request to the visited IMS network to initiate a session over a normal registration. At step 74, if no response rejecting the session is received from the IMS, then at step 75 the session can continue over the normal registration (and by implication it is a normal session, not an emergency session). If at step 74 a response rejecting the session is received from the IMS network together with a suggestion to retry following an emergency registration (because the IMS has recognized the URN in the request as an emergency URN), then the UE follows the instructions in the response, which includes performing an emergency registration at step 76 and then proceeding to step 72 to send the request to the IMS together with the dialing digits in a header of the request. If the User included a privacy prefix in the dialed number, then this will be included with dialing digits at step 72. Also, if a response from the IMS received at step 74 indicates the need to use privacy, the UE will include a privacy prefix in the request sent at step 72.

The mechanisms above describe the P-CSCF as the entity executing the analysis of the dialed digits, and including the additional information before sending the request to the E-CSCF. Alternatively, the analysis could be executed at another IMS network

entity such as the E-CSCF instead. However, the P-CSCF option is preferred as a base for dialed number analysis is already in place in the P-CSCF.

5 Another alternative to basing the introduction of additional information required for the correct handling of the emergency call at the P-CSCF, is for the P-CSCF to instruct the UE to include such information in the request in the first place. In order to achieve this, the P-CSCF could enrich the information provided to the UE within the XML schema included in the 380 response (step 24 in Figure 2). This enriched information should include a request to the UE to add the specific type of emergency service in the
10 Request URI and/or to use privacy preferences. This is a less-preferred option to that described above, which is seen as optimal as it does not place so many requirements on the UE.

15 Another optional feature is to provide indications regarding type of emergency service as known in the Home network. In the case where a roaming user dials an emergency number known in the home network, the UE will initiate an emergency session appropriately (i.e. including the emergency service URN in the Request-URI). This is basically the goal of the concept of using the service URN; i.e. that a roaming user does not need to know the local emergency numbers. However, if the UE does not
20 include the information of the type of emergency service required in the request, the emergency call will be routed to a generic or default configured PSAP. Therefore, an extension of the procedures described above is to make it possible for the P-CSCF to include the information of the type of emergency service also in this case. This requires that the P-CSCF is made aware of the relation of emergency numbers and emergency
25 service types managed at the user's home network during the user's emergency registration procedure. The S-CSCF should have this information configured locally and should include it in the Registration flow when it detects that the user is roaming. The P-CSCF could keep this information on a per roaming partner basis.

30 It will be apparent that the mechanisms described hereabove facilitate an effective PSAP selection and an appropriate handling of the emergency session according to user preferences when triggering the session which otherwise will not be possible in the scenarios addressed.

Claims

1. A method of establishing an emergency session between a User Equipment, UE, accessing an IP Multimedia Subsystem, IMS, network, and an emergency service centre, wherein the emergency service centre relates to one of a plurality of emergency sub-services, the method comprising:
- 5 receiving in the IMS network a Session Initiation Protocol, SIP, request from the UE, the request including the dialled digits of an emergency number;
- 10 analysing the dialled digits of the emergency number to determine a corresponding emergency sub-service; and
- routing a session establishment request to an emergency service centre of the corresponding emergency sub-service.
2. The method of claim 1 wherein analysing the dialled digits further comprises
- 15 identifying additional information relating to the emergency session and adding this to the session establishment request before routing it to the emergency service centre.
3. The method of claim 1 or claim 2 wherein the dialled digits in the request also include a privacy prefix, the method further including forwarding the session
- 20 establishment request towards the emergency service centre with an indication of the need for privacy in relation to the emergency session.
4. The method of any preceding claim wherein the SIP request is an initial SIP request received from the UE, which does not indicate that it is a request for an
- 25 emergency session, but the included dialled digits correspond to an emergency number known by the serving network, and wherein the method further includes sending a response to the UE rejecting the session and indicating that the UE should send the request again using an emergency URN after performing an IMS emergency registration, and additionally indicating in the reject message the specific emergency
- 30 subservice type to be used corresponding to the dialled digits sent originally.
5. The method of claim 4 wherein the initial SIP request included a privacy prefix and the response to the UE rejecting the session also includes an indication to the UE of the need to include a privacy indication in relation to the emergency session when it
- 35 send the request again.

6. The method of any of claims 1 to 3 wherein an initial session initiation request received from the UE does not indicate that it is a request for an emergency session but the included dialled digits correspond to an emergency number known by the serving network, the method further including adding an appropriate emergency indication and subservice type in the session establishment request on behalf of the UE and forwarding the request within the network.

7. The method of any of claims 1 to 3, wherein an initial SIP request received from the UE does indicate that it is a request for an emergency session and wherein the method includes the UE inserting the dialled digits of the emergency number in a header of the SIP Request in a pre-defined header field, or a header field that has been agreed between the UE and IMS network.

8. A method of operating a User Equipment, UE, communicating over an IP Multimedia Subsystem, IMS, to establish an emergency session with an emergency service centre of an emergency sub-service, the method comprising sending a Session Initiation Protocol, SIP, request to the IMS, the request including the dialled digits of an emergency number relating to the emergency sub-service within the SIP Request in a pre-defined header field, or a header field that has been agreed between the UE and IMS network.

9. The method of claim 8 wherein the UE also includes a privacy prefix with the dialled digits in the SIP request.

10. The method of claim 8 or claim 9 wherein the UE initially attempts to establish a session without indicating that it is an emergency session but the included dialled digits correspond to an emergency number known by the serving network, and wherein after receiving a response from the IMS rejecting the session and suggesting that it tries again after performing an IMS emergency registration the UE sends the session initiation request again using an emergency URN including the specific emergency subservice type corresponding to the dialled digits sent originally, and optionally including a privacy prefix, after performing an IMS emergency registration.

11. The method of claim 8, wherein the UE includes an indication that the request is for an emergency session.

5 12. A User Equipment, UE, operable to communicate over an IP Multimedia Subsystem, IMS, network the UE comprising:

a user interface for conveying information to a user and for receiving input data and instructions from the user;

an transceiver interface for transmitting signals to and receiving signals from the IMS network;

10 a memory storing data and program instructions; and

a processor for executing the program instructions in response to user input and signals received, including initiating an emergency session by sending a Session Initiation Protocol, SIP, request to the IMS, the request including the dialled digits of an emergency number relating to an emergency sub-service in a header of the SIP Request in a pre-defined header field, or a header field that has been agreed between
15 the UE and IMS network.

13. An IP Multimedia Subsystem, IMS, network entity comprising:

20 an input/output over which signals are sent to/from other network entities and to/from a User Equipment, UE, accessing the IMS network;

a memory storing data and programming instructions; and

25 a processor for executing the programming instructions, which cause the entity to analyse an emergency Session Initiation Protocol, SIP, request received from the UE, wherein the request includes dialled digits of an emergency number, to determine a corresponding emergency sub-service, and to route the a session establishment request to an emergency service centre of the corresponding emergency sub-service.

14. The IMS network entity of claim 13 wherein the processor executes the program instructions causing the entity to identify additional information relating to the
30 emergency session and to add this to the session establishment request.

15. The IMS network entity of claim 13 or claim 14 wherein the processor executes the program instructions causing the entity to recognise a privacy prefix in the dialled digits and to include a privacy indication in the session establishment request
35 routed to the emergency service centre.

16. The IMS network entity of any of claims 13 to 15 wherein the processor executes the program instructions causing the entity on receiving an initial SIP request from the UE that does not indicate that it is a request for an emergency session, to
5 send a response to the UE rejecting the session and indicating that the UE should send the request again using an emergency URN after performing an IMS emergency registration, and additionally indicating in the reject message the specific emergency subservice type to be used corresponding to the dialled digits sent originally.

10 17. The IMS network entity of any of claims 15 to 18 wherein the entity is a Proxy Call Session Control Function, P-CSCF or an Emergency CSCF, E-CSCF.

18. A computer program for programming a computer in an IP Multimedia Subsystem, IMS, network to establish an emergency session between a User
15 Equipment, UE, accessing the IMS network, and an emergency service centre, wherein the emergency service centre relates to one of a plurality of emergency sub-services, and wherein on receiving a Session Initiation Protocol, SIP, request from the UE, the request including the dialling digits of an emergency number, the program causes the computer to:

20 analyse the dialling digits of the emergency number to determine a corresponding emergency sub-service; and

route a session establishment request to an emergency service centre of the corresponding emergency sub-service.

25 19. A computer program product comprising instructions for enabling a computer in a network to establish an emergency session between a User Equipment, UE, accessing the an IP Multimedia Subsystem, IMS, network, and an emergency service centre, wherein the emergency service centre relates to one of a plurality of emergency sub-services, and wherein on receiving a Session Initiation Protocol, SIP, request from
30 the UE, the request including the dialling digits of an emergency number, the program causes the computer to:

analyse the dialling digits of the emergency number to determine a corresponding emergency sub-service; and

35 route the session establishment request to an emergency service centre of the corresponding emergency sub-service.

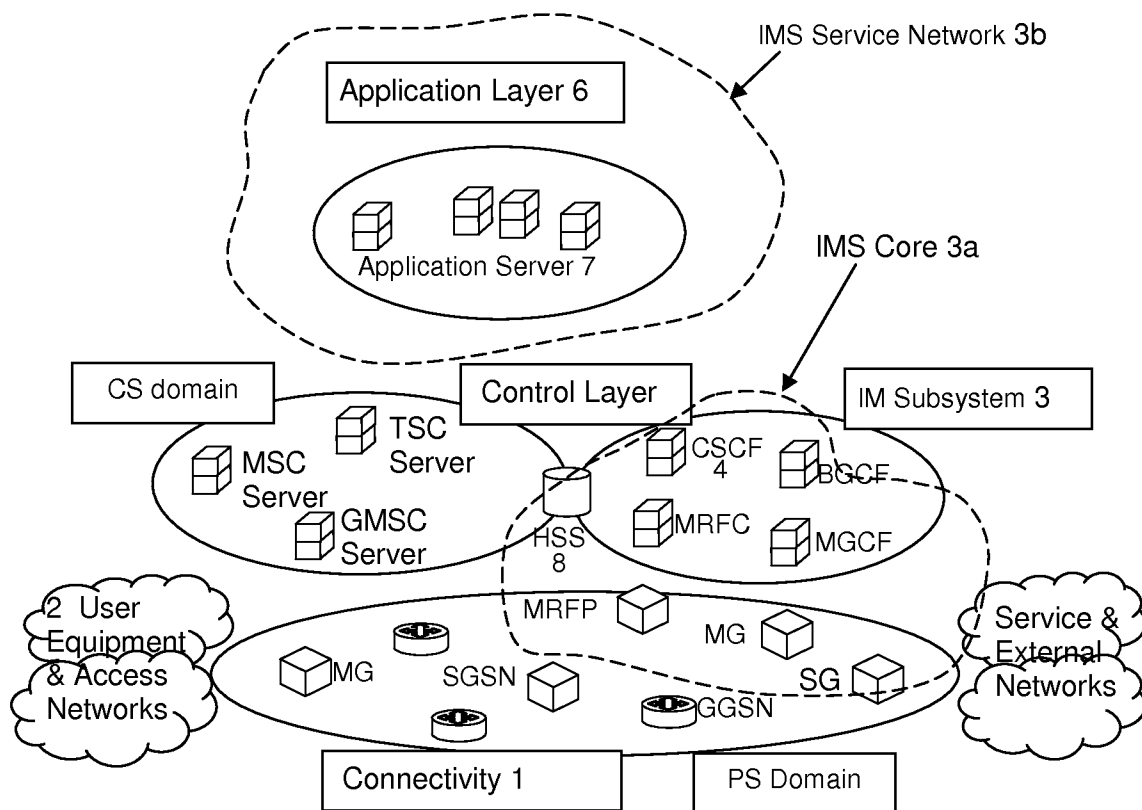


Figure 1

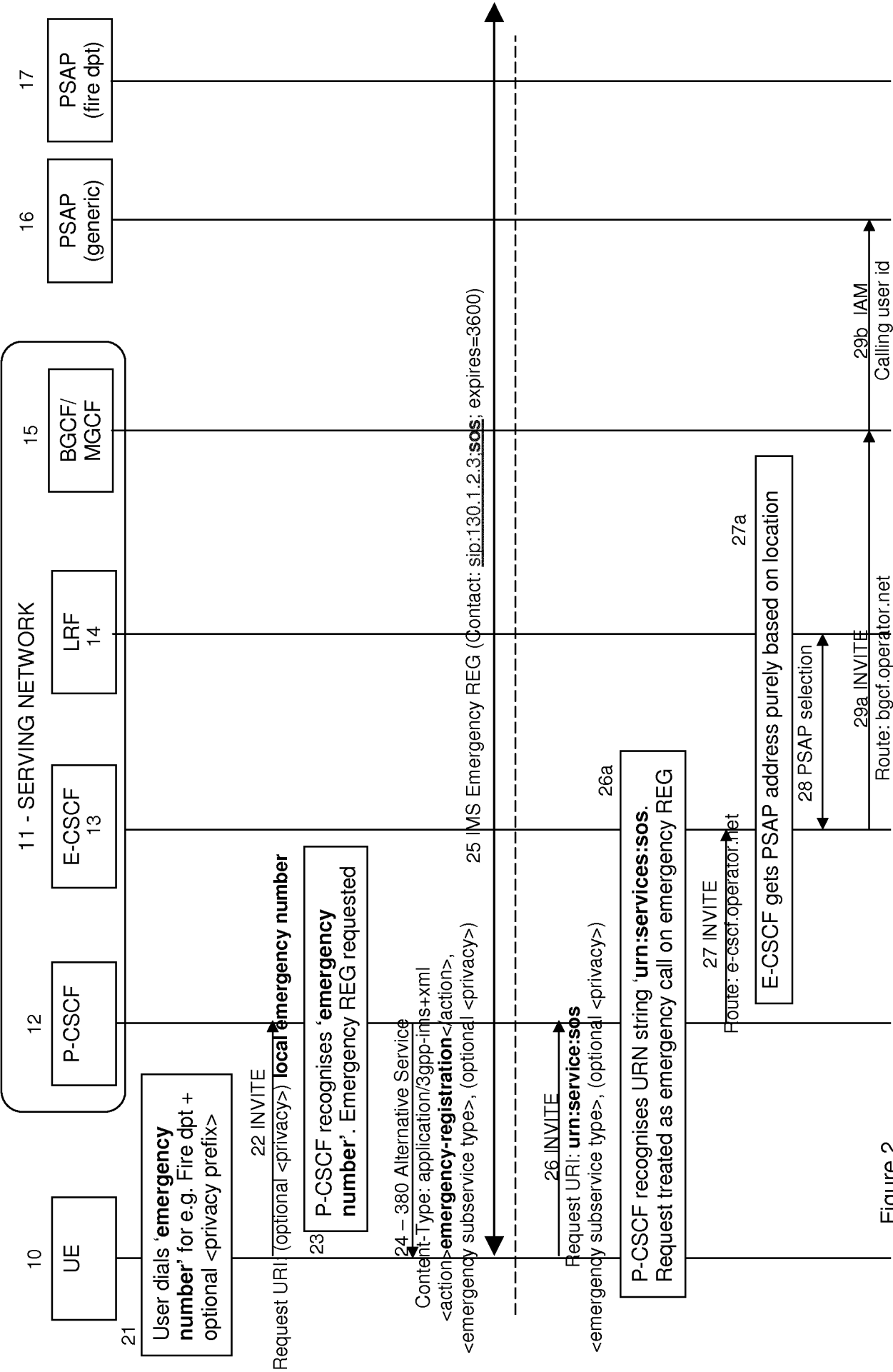


Figure 2

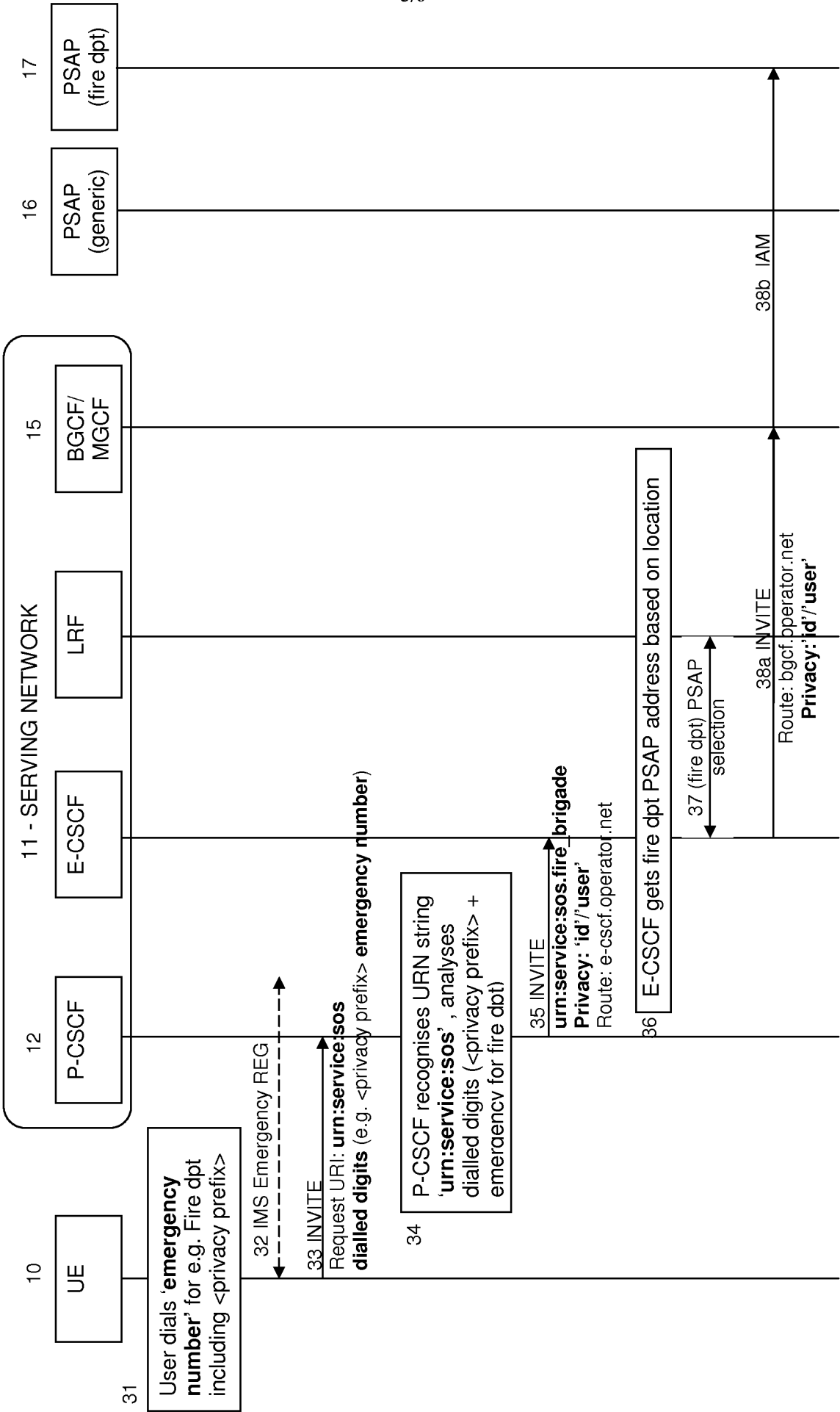


Figure 3A

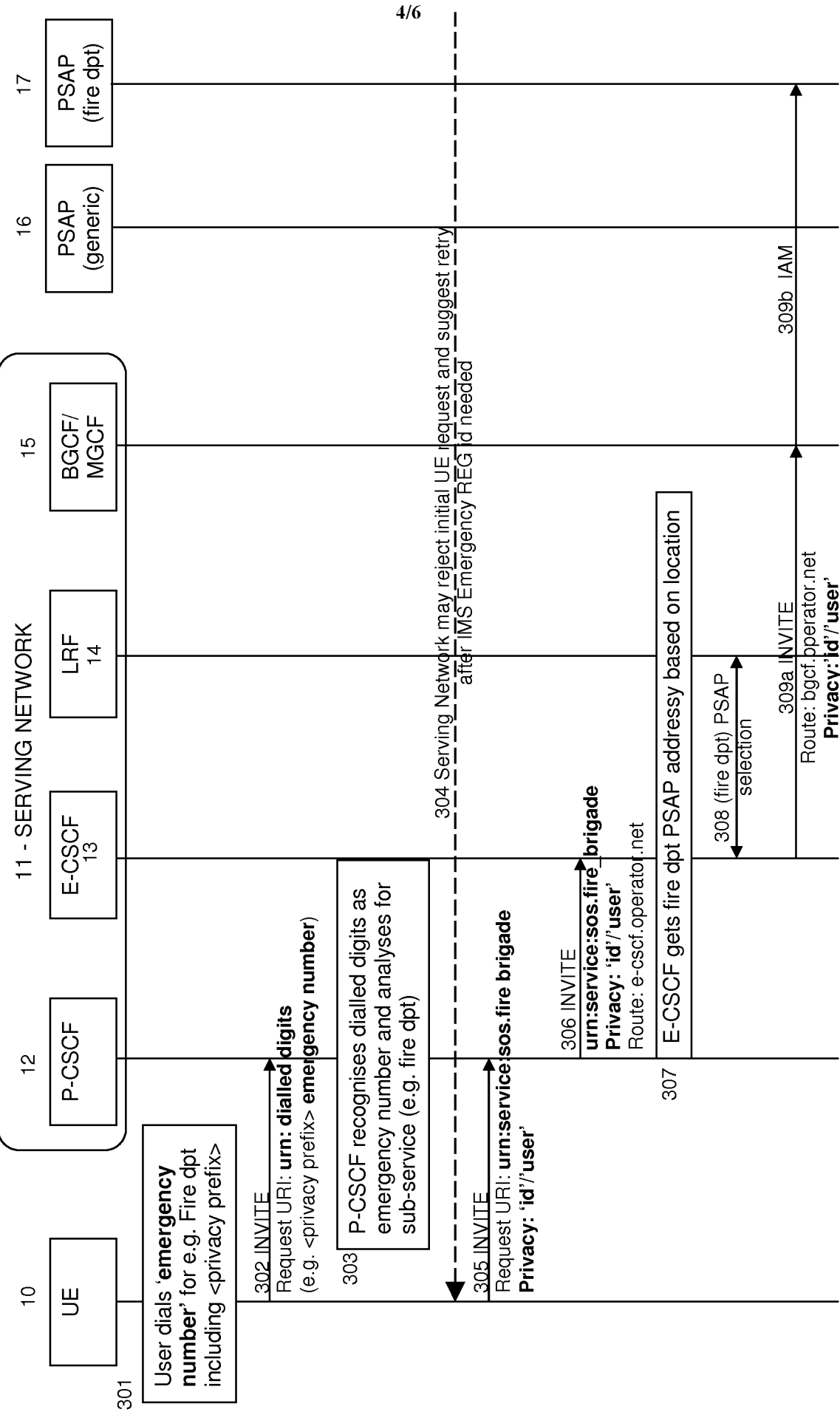


Figure 3B

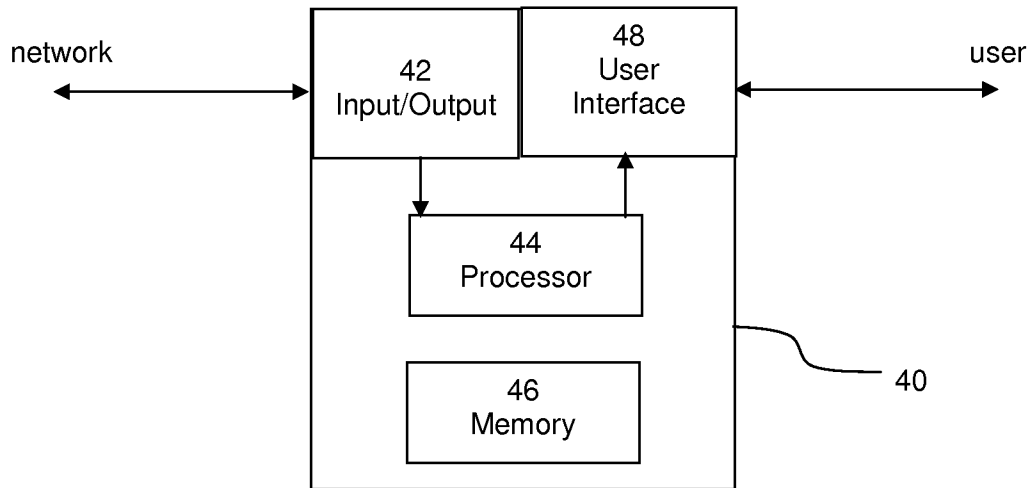


Figure 4

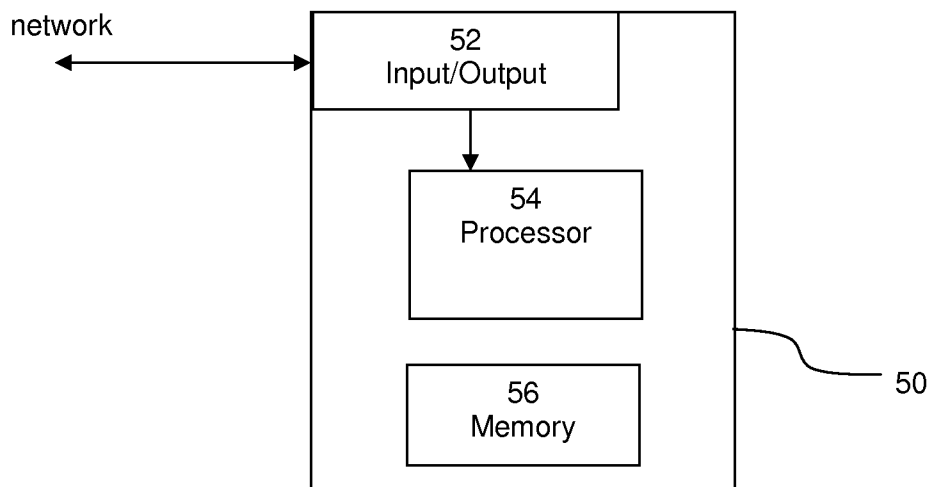


Figure 5

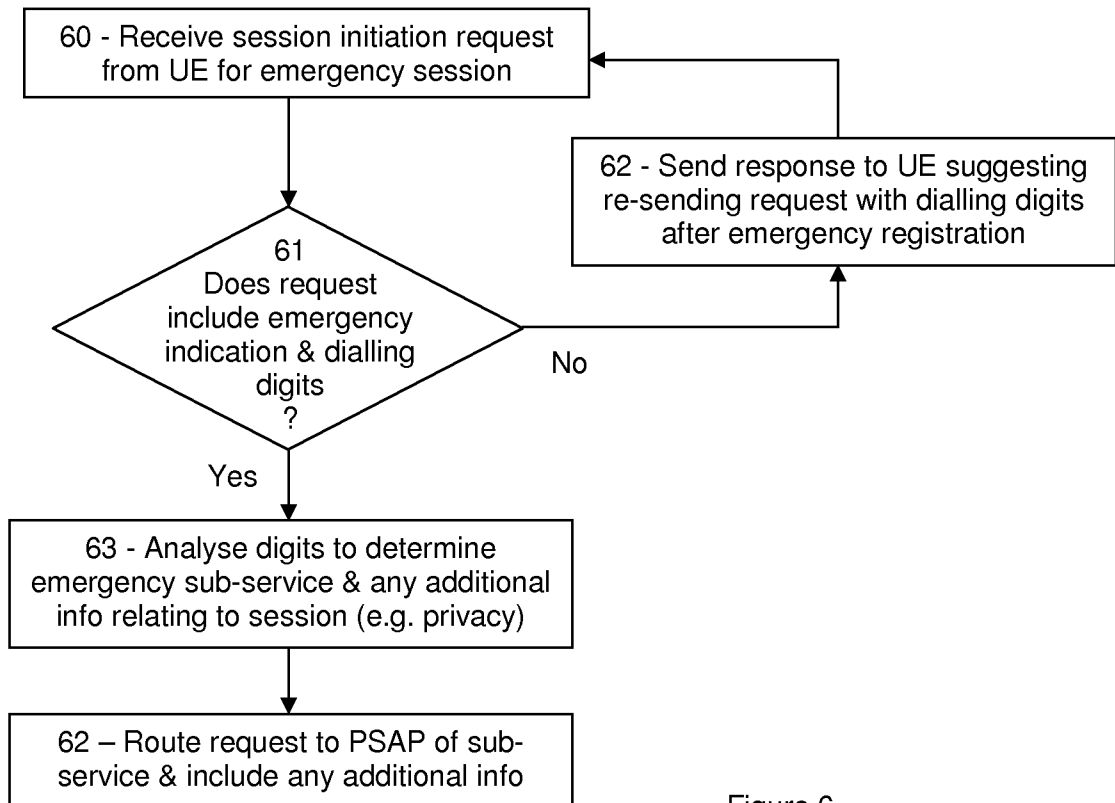


Figure 6

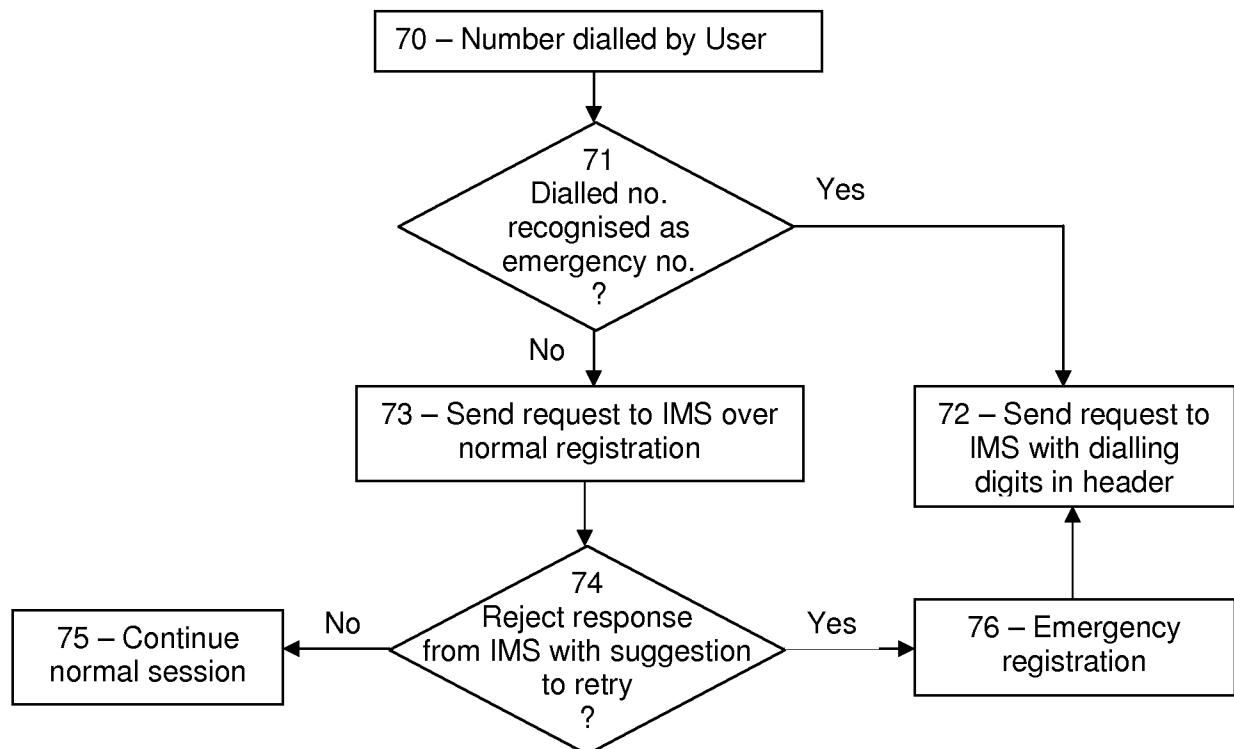


Figure 7