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**Title:** PUBLIC SAFETY THREAT NOTIFICATIONS

**Abstract:**
A technique comprising: controlling a node of a radio access network to push to a communication device via a control channel of the radio access network an explicit indication of the availability via the radio access network of a notification relating to a public safety threat.

**FIG 4**

402: TRANSMIT RRC MESSAGE INCLUDING SECONDARY NOTIFICATION INDICATION IE TO UE IN IDLE MODE, URA_PCH, CELL_PCH OR CELL_FACH STATE

404: IN RESPONSE TO DETECTING SECONDARY NOTIFICATION INDICATION IE IN RRC MESSAGE RECEIVED AT UE, DIRECT UE TO RECEIVE RRC MESSAGE INCLUDING SECONDARY NOTIFICATION ON CCCH

406: PRESENT SECONDARY NOTIFICATION TO USER OF UE
Some radio communication systems are set up to provide notifications about public safety threats such as, for example, earthquakes and/or tsunamis.

There exists the challenge of providing a technique by which any communication device in an affected area has rapid and reliable access to even detailed notifications about a public safety threat.

There is hereby provided a method comprising: controlling a node of a radio access network to push to a communication device via a control channel of the radio access network an explicit indication of the availability via the radio access network of a notification relating to a public safety threat.

According to one embodiment, said explicit indication is included in a single radio resource control message together with an initial indicator of the public safety threat.

According to one embodiment, said notification is available to the communication device via a common control channel.

According to one embodiment, said notification is available to the communication device via a cell broadcast message.

According to one embodiment, the notification indicates one or more of the following: a geographical location of a danger zone, an extent of the threat to public safety; and a geographical location of one or more shelter or relief zones.
According to one embodiment, the public safety threat is an earthquake and/or tsunami; and the notification indicates one of more of the following: a geographical area affected by the earthquake and/or tsunami; a magnitude of the earthquake and/or tsunami; and a geographical location of one or more shelter or relief zones.

There is also hereby provided a method comprising: controlling a node of a radio access network to push to a communication device via a control channel of the radio access network a primary notification relating to the public safety threat together with a secondary notification relating to the public safety threat.

According to one embodiment, said primary and secondary notifications are included in a single radio resource control message.

According to one embodiment, the primary notification comprises an alert about a public safety threat, and the secondary notification indicates one or more of the following: the geographical location of a danger zone, the extent of the threat to public safety; and the geographical location of one or more shelter or relief zones.

According to one embodiment, the public safety threat is an earthquake and/or tsunami; and the primary notification comprises an alert about the earthquake and/or tsunami, and the secondary notification indicates one of more of the following: the geographical area affected by the earthquake and/or tsunami; the magnitude of the earthquake and/or tsunami; and the geographical location of one or more shelter or relief zones.

There is also hereby provided a method comprising: in response to detecting at a communication device an explicit indication from a radio access network of the availability via the radio access network of a notification relating to a public safety
threat; controlling the communication device to receive said notification on a common control channel of the radio access network.

There is also hereby provided a method comprising: in response to detecting at a communication device an explicit indication from a radio access network of the availability of a notification relating to a public safety threat via a channel accessible to the communication device in its current service state; controlling the communication device to refrain from switching to a different service state in which said channel is not accessible to said communication device, until after accessing said notification via said first channel.

According to one embodiment, said notification is available to the communication device via a cell broadcast service channel.

There is also hereby provided a method comprising: in response to receiving from a radio access network at a communication device an explicit indication of the availability via the radio access network of a secondary notification relating to a public safety threat; control the communication device to present a user of the communication device with a choice to interrupt an on-going service in order to access said notification.

According to one embodiment, said explicit indication of the notification is transmitted by the radio access network together with an initial indicator of the public safety threat.

According to one embodiment, said explicit indication is included in a single radio resource control message together with said initial indicator of the public safety threat.
According to one embodiment, the notification indicates one or more of the following: a geographical location of a danger zone, an extent of the threat to public safety; and a geographical location of one or more shelter or relief zones.

According to one embodiment, the public safety threat is an earthquake and/or tsunami; and the notification indicates one of more of the following: a geographical area affected by the earthquake and/or tsunami; a magnitude of the earthquake and/or tsunami; and a geographical location of one or more shelter or relief zones.

There is also hereby provided an apparatus comprising: a processor and memory including computer program code, wherein the memory and computer program code are configured to, with the processor, cause the apparatus to: control a node of a radio access network to push to a communication device via a control channel of the radio access network an explicit indication of the availability via the radio access network of a notification relating to a public safety threat.

According to one embodiment of the apparatus, said explicit indication is included in a single radio resource control message together with an initial indicator of the public safety threat.

According to one embodiment of the apparatus, said notification is available to the communication device via a common control channel.

According to one embodiment of the apparatus, said notification is available to the communication device via a cell broadcast message.

According to one embodiment of the apparatus, the notification indicates one or more of the following: a geographical location of a danger zone, an extent of the
threat to public safety; and a geographical location of one or more shelter or relief zones.

According to one embodiment of the apparatus, the public safety threat is an earthquake and/or tsunami; and the notification indicates one of more of the following: a geographical area affected by the earthquake and/or tsunami; a magnitude of the earthquake and/or tsunami; and a geographical location of one or more shelter or relief zones.

There is also hereby provided an apparatus comprising: a processor and memory including computer program code, wherein the memory and computer program code are configured to, with the processor, cause the apparatus to: control a node of a radio access network to push to a communication device via a control channel of the radio access network a primary notification relating to the public safety threat together with a secondary notification relating to the public safety threat.

According to one embodiment of the apparatus, said primary and secondary notifications are included in a single radio resource control message.

According to one embodiment of the apparatus, the primary notification comprises an alert about a public safety threat, and the secondary notification indicates one or more of the following: the geographical location of a danger zone, the extent of the threat to public safety; and the geographical location of one or more shelter or relief zones.

According to one embodiment of the apparatus, the public safety threat is an earthquake and/or tsunami; and the primary notification comprises an alert about the earthquake and/or tsunami, and the secondary notification indicates one of
more of the following: the geographical area affected by the earthquake and/or tsunami; the magnitude of the earthquake and/or tsunami; and the geographical location of one or more shelter or relief zones.

There is also hereby provided an apparatus comprising: a processor and memory including computer program code, wherein the memory and computer program code are configured to, with the processor, cause the apparatus to: in response to detecting at a communication device an explicit indication from a radio access network of the availability via the radio access network of a notification relating to a public safety threat; control the communication device to receive said notification on a common control channel of the radio access network.

There is also hereby provided an apparatus comprising: a processor and memory including computer program code, wherein the memory and computer program code are configured to, with the processor, cause the apparatus to: in response to detecting at a communication device an explicit indication from a radio access network of the availability of a notification relating to a public safety threat via a channel accessible to the communication device in its current service state; control the communication device to refrain from switching to a different service state in which said channel is not accessible to said communication device, until after accessing said notification via said first channel.

According to one embodiment of the apparatus, said notification is available to the communication device via a cell broadcast service channel.

There is also hereby provided an apparatus comprising: a processor and memory including computer program code, wherein the memory and computer program
code are configured to, with the processor, cause the apparatus to: in response to receiving from a radio access network at a communication device an explicit indication of the availability via the radio access network of a secondary notification relating to a public safety threat; control the communication device to present a user of the communication device with a choice to interrupt an on-going service in order to access said notification.

According to one embodiment of the apparatus, said explicit indication of the notification is transmitted by the radio access network together with an initial indicator of the public safety threat.

According to one embodiment of the apparatus, said explicit indication is included in a single radio resource control message together with said initial indicator of the public safety threat.

According to one embodiment of the apparatus, the notification indicates one or more of the following: a geographical location of a danger zone, an extent of the threat to public safety; and a geographical location of one or more shelter or relief zones.

According to one embodiment of the apparatus, the public safety threat is an earthquake and/or tsunami; and the notification indicates one of more of the following: a geographical area affected by the earthquake and/or tsunami; a magnitude of the earthquake and/or tsunami; and a geographical location of one or more shelter or relief zones.
There is also hereby provided an apparatus comprising: means for controlling a node of a radio access network to push to a communication device via a control channel of the radio access network an explicit indication of the availability via the radio access network of a notification relating to a public safety threat.

There is also hereby provided an apparatus comprising: means for controlling a node of a radio access network to push to a communication device via a control channel of the radio access network a primary notification relating to the public safety threat together with a secondary notification relating to the public safety threat.

There is also hereby provided an apparatus comprising: means for, in response to detecting at a communication device an explicit indication from a radio access network of the availability via the radio access network of a notification relating to a public safety threat, controlling the communication device to receive said notification on a common control channel of the radio access network.

There is also hereby provided an apparatus comprising: means for, in response to detecting at a communication device an explicit indication from a radio access network of the availability of a notification relating to a public safety threat via a channel accessible to the communication device in its current service state, controlling the communication device to refrain from switching to a different service state in which said channel is not accessible to said communication device, until after accessing said notification via said first channel.

There is also hereby provided an apparatus comprising: means for, in response to receiving from a radio access network at a communication device an explicit indi-
cation of the availability via the radio access network of a secondary notification relating to a public safety threat, controlling the communication device to present a user of the communication device with a choice to interrupt an on-going service in order to access said notification.

There is also hereby provided a computer program product comprising program code means which when loaded into a computer controls the computer to: control a node of a radio access network to push to a communication device via a control channel of the radio access network a primary notification relating to the public safety threat together with a secondary notification relating to the public safety threat.

There is also hereby provided a computer program product comprising program code means which when loaded into a computer controls the computer to: in response to detecting at a communication device an explicit indication from a radio access network of the availability via the radio access network of a notification relating to a public safety threat, control the communication device to receive said notification on a common control channel of the radio access network.

There is also hereby provided a computer program product comprising program code means which when loaded into a computer controls the computer to: in response to detecting at a communication device an explicit indication from a radio access network of the availability of a notification relating to a public safety threat via a channel accessible to the communication device in its current service state, control the communication device to refrain from switching to a different service state in which said channel is not accessible to said communication device, until after accessing said notification via said first channel.
There is also hereby provided a computer program product comprising program code means which when loaded into a computer controls the computer to: in response to receiving from a radio access network at a communication device an explicit indication of the availability via the radio access network of a secondary notification relating to a public safety threat, control the communication device to present a user of the communication device with a choice to interrupt an on-going service in order to access said notification.

Embodiments of the present invention are described in detail hereunder, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 illustrates an example of a system in which an embodiment of the present invention is implemented;

Figure 2 illustrates an example of apparatus for use at user equipment (UE) in Figure 1;

Figure 3a illustrates an example of apparatus for use at the base stations in Figure 1;

Figure 3b illustrates an example of apparatus for use at the radio network controllers (RNCs) of Figure 1; and

Figures 4 to 7 illustrate examples of operations according to embodiments of the present invention.

Techniques according to embodiments of the invention are described in detail below, by way of example only, in the context of a system including a UMTS (Universal Mobile Telecommunications System) radio access network (UTRAN); but the
same kind of techniques are applicable also to systems including other types of radio access networks.

The system illustrated in Figure 1 includes a UTRAN comprising base stations 2 referred to as NodeBs (NBs) 2 for making radio transmissions to and receiving radio transmissions from the UEs 8. The UTRAN also includes radio network controllers (RNCs) 10 which control respective groups of NBs 2.

Only a small number of base stations 2 and one UE 8 are shown in Figure 1, but a network would typically comprise thousands of base stations, and a large number of UEs would be served by each base station at any one time.

Figure 2 shows a schematic view of an example of user equipment 8 that may be used for communicating with the base stations 2 of Figure 1 via a wireless interface. The user equipment (UE) 8 may be used for various tasks such as making and receiving phone calls, for receiving and sending data from and to a data network and for experiencing, for example, multimedia or other content.

The UE 8 may be any device capable of at least sending or receiving radio signals to or from the base stations 2 of Figure 1. The UE 8 may also, for example, be capable of transmitting and receiving radio signals to and from another UE directly (i.e. other than via a base station or other kind of transceiver). Non-limiting examples include a mobile station (MS), a portable computer provided with a wireless interface card or other wireless interface facility, personal data assistant (PDA) provided with wireless communication capabilities, or any combinations of these or the like. The UE 8 may communicate via an appropriate radio interface arrangement 205 of the UE 8. The interface arrangement may be provided for example by
means of a radio part and associated antenna arrangement. The antenna arrangement may be arranged internally or externally to the UE 8.

The UE 8 may be provided with at least one data processing entity 203 and at least one memory or data storage entity 217 for use in tasks it is designed to perform. The data processor 203 and memory 217 may be provided on an appropriate circuit board and/or in chipsets.

The user may control the operation of the UE 8 by means of a suitable user interface such as key pad 201, voice commands, touch sensitive screen or pad, combinations thereof or the like. A display 215, a speaker and a microphone may also be provided. Furthermore, the UE 8 may comprise appropriate connectors (either wired or wireless) to other devices and/or for connecting external accessories, for example hands-free equipment, thereto.

Figure 3 shows an example of apparatus for use at the base stations 2 of Figure 1. The apparatus comprises a radio frequency antenna array 301 configured to receive and transmit radio frequency signals; radio frequency interface circuitry 303 configured to interface the radio frequency signals received and transmitted by the antenna 301 and the data processor 306. The radio frequency interface circuitry 303 may also be known as a transceiver. The apparatus also comprises an interface 309 via which, for example, it can communicate with other network elements such as the core network 10. The data processor 306 is configured to process signals from the radio frequency interface circuitry 303, control the radio frequency interface circuitry 303 to generate suitable RF signals to communicate information to the UE 8 via the wireless communications link, and also to exchange infor-
mation with other network nodes via the interface 309. The memory 307 is used for storing data, parameters and instructions for use by the data processor 306.

Figure 4 shows an example of apparatus for use at the RNC 10. The apparatus 400 includes one or more memories 402 for storing program code, and one or more data processors 404 for controlling the actions described below in accordance with program code stored at the one or more memories 402. The apparatus also comprises an interface 406 via which it can send and receive information to and from other network nodes, such as NBs 2.

The memories 217, 307, 402 may be implemented using an suitable data storage technology, such as, for example, semiconductor based memory devices, flash memory, magnetic memory devices and systems, optical memory devices and systems, fixed memory and removable memory. The processors 203, 306, 404 may, for example, include one or more of microprocessors, digital signal processors (DSPs) and processors based on a multi-core processor architecture.

References below to data processors 203, 306, 404 controlling the operation of the UE refer to the data processors operating in accordance with program code stored at memories 217, 307, 402.

It would be appreciated that the apparatus shown in each of figures 2, 3a and 3b described above may comprise further elements which are not directly involved with the embodiments of the invention described hereafter.

The system of Figure 1 also includes a Cell Broadcast Centre (CBC) 12, which operates in accordance with 3GPP TS 25.419 V11.0.0, except for where otherwise indicated below.
An embodiment of the invention is described below for the example of providing information about an earthquake and/or tsunami, but the same kind of technique is also applicable to distributing information about other public safety threats.

An earthquake and tsunami warning system is designed to provide information about an imminent threat of an earthquake and/or tsunami, or information about the occurrence of an earthquake and/or tsunami to people in the affected area. Central government and/or local governments collect and validate information about earthquakes and tsunamis. In the event that it is confirmed that there is an imminent threat of an earthquake and/or tsunami, or that an earthquake and/or tsunami has just occurred, the authorities send data about the earthquake and/or tsunami to the CBCs 12 of one or more radio communication networks providing mobile communication services in the affected area. The CBC 12 sends earthquake and tsunami warning system (ETWS) information to the RNCs as information elements in a WRITE-REPLACE message of the kind defined in 3GPP TS 25.419. The data processors at each RNC 10 control the transmission of RRC messages via interface 406 and NBs 2 to all UEs 8 currently served by the cells under the control of the respective RNC. The ETWS information will include a primary ETWS notification and may also include a secondary ETWS notification including more detailed information about the earthquake and/or tsunami such as information about the geographical location of the epicentre of the earthquake, information about the magnitude of the earthquake, information about the nearest place of shelter. For example, some of the information could be designed for presentation to the user in the form of a geographical map. The inclusion of a secondary notification in the WRITE-REPLACE message could be indicated by a ded-
icated information element in the WRITE-REPLACE message, or by the absence from the WRITE-REPLACE message of the "Broadcast Message Content Validity Indicator" information element (IE) detailed at Section 9.2.24 of 3GPP 25.419 V11.0.0.

The UEs 8 served by the cells under the control of the RNCs 10 will typically be in a range of RRC (Radio Resource Control) service states. Some will typically be in idle mode, and some will be in a RRC connected state such as URA_PCH, CELL_PCH, CELL_FACH and CELL_DCH. These services states are detailed at Section 7 of 3GPP TS 25.331 V11.4.0. The type of RRC message sent to each UE 8 will depend on the current service state for the UE. PAGING TYPE 1 messages are transmitted to UEs in idle mode and UEs in the URA_PCH, CELL_PCH state without a dedicated H-RNTI. SYSTEM INFORMATION CHANGE INDICATION messages are transmitted to UEs in CELL-FACH state and UEs in the CELL_PCH state with a dedicated H-RNTI. ETWS PRIMARY NOTIFICATION WITH SECURITY messages are transmitted to UEs in CELL_DCH state. These RRC messages are detailed at Sections 10.2.20, 10.2.49 and 10.2.12a of 3GPP 25.331 V11.4.0. In each case, the RRC message includes a primary notification about the earthquake and/or tsunami as the information element named "ETWS Information", which is detailed at Section 10.3.8.4ea of 3GPP TS 25.331 V11.4.0 and Section 9.3.24 of 3GPP TS 23.041 V8.1.0.

According to one embodiment of the present invention illustrated in Figures 4 and 5: in the event that a secondary notification happens to be included in the WRITE-REPLACE message received at the RNCs 10, the one or more data processors 404: (a) control the inclusion of the secondary notification into the ETWS PRIMA-
RY NOTIFICATION WITH SECURITY messages transmitted to UEs 8 in the CELL_DCH (STEP 502 of Figure 5); and (b) control the inclusion of an explicit indication of the availability of a secondary notification in the PAGING TYPE 1 and SYSTEM INFORMATION INDICATION CHANGE INDICATION messages transmitted to UEs 8 in the idle mode and UEs in the URA_PCH, CELL-PCH and CELL_FACH states (STEP 402 of Figure 4), which explicit indication is recognised by data processors 203 at the UEs 8 as a direction to receive on CCCH a RRC message including the secondary notification. The RRC message including the secondary notification could be a ETWS PRIMARY NOTIFICATION WITH SECURITY message including the secondary notification as an information element. The explicit indication could for example take the form of a predetermined value for an additional information element in the PAGING TYPE 1 and SYSTEM INFORMATION INDICATION CHANGE INDICATION messages.

The data processors 203 of UEs 8 control the presentation of the secondary notification (either included in the ETWS PRIMARY NOTIFICATION WITH SECURITY message received on CCCH or DCCH or received via a new RRC message on CCCH in response to the detection of an explicit indication of the availability thereof in PAGING TYPE 1 or SYSTEM INFORMATION INDICATION CHANGE INDICATION messages) to the user in a visual and/or audio form (STEP 406 and STEP 504 of Figures 4 and 5).

According to a second embodiment of the present invention, the data processors 404 at the RNCs 10 control the inclusion of any secondary notification that happens to be included in the WRITE-REPLACE message received at the RNCs 10 into the same RRC message as the primary notification for all UEs, irrespective of
their current service state. Again, the data processors 203 at the UEs 8 control the presentation of the secondary notification to the user in a visual and/or audio form.

According to a third embodiment of the present invention illustrated in Figures 6 and 7, any secondary notification that happens to be included in the WRITE-REPLACE message received at the RNCs 10 is not included in the RRC message together with the primary notification, and is not available via logical channel CCCH; but the data processors 404 at RNCs 10 instead control the broadcast via logical traffic channel CTCH (Common Traffic Channel), which is accessible to UEs 8 in idle mode, URA_PCH and CELL_PCH state, but not to UEs in CELL_FACH or CELL_DCH states. According to this third embodiment, in the event that the WRITE-REPLACE message received at the RNC includes a secondary notification, the data processors 404 at the RNCs 10 control the addition to the RRC message including the primary notification of an explicit indication of the availability of a secondary notification via CTCH (STEP 602 AND STEP 702 of Figures 6 and 7). Again, this explicit indication could take the form of a predetermined value for an additional information element in the RRC message including the primary notification.

Data processors 203 at UEs 8 currently in the idle mode or URA_PCH or the CELL_PCH state (i.e. service states in which CTCH is accessible) check for the inclusion of such explicit indication in the RRC message (STEP 604 of Figure 6), and respond to the detection of any such explicit indication by preventing the UE 8 from entering any higher service state (i.e. CELL_FACH or CELL-DCH) until after the data processors 203 control the reception of the secondary notification via
CTCH (STEP 608 of Figure 6). For example, for any UEs 8 in these service states that happen to have data in their buffer for uplink transmission, the data processors 203 at such UEs 8 act to prevent the UE 8 from moving to a new service state for the transmission of that data, until after the data processors 203 control the reception of the secondary notification via CTCH. Alternatively, the network prevents the UE 8 from switching to a new service state for the transmission of data, by rejecting any request from the UE 8 for such a switch. The data processors 203 at the UEs 8 control the reception of the secondary notification via CTCH (STEP 610 of Figure 6), and control the presentation of the secondary notification to the user in visual or audio form (STEP 612 of Figure 6). On the other hand, if the data processors 203 at the UEs 8 detect no explicit indication in the RRC message of the availability of secondary notification, the data processors 203 at the UEs 8 do not act to prevent the UEs 8 from switching to service states via which CTCH is not accessible; and the network does not prevent the UE 8 from making such a switch.

For UEs 8 that are in the CELL-FACH state or the CELL_DCH state, the data processors 203 at these UEs control the UEs to alert the user of the UEs (by visual or audio means) of the availability of further information about the earthquake and/or tsunami, and control the presentation to the user of the option of interrupting ongoing packet-switching activity in order to receive the secondary notification via CTCH (STEP 704 of Figure 7). If the data processors 203 at such UEs 8 detect that the user has decided to receive the secondary notification, the data processors 203 at such UEs 8: control the interruption of the on-going packet-switching activity, control the transmission to the network of a request to switch the UE 8 to a
RRC state in which UE, can receive the secondary notification via CTCH (STEP 710 of Figure 7), and control the presentation of the received secondary notification to the user in visual or audio form (STEP 712 of Figure 7). On the other hand, if the data processors 203 at such UEs detect that the response of the user is not to receive the secondary notification, the data processors 203 at such UEs control a continuation of the on-going packet switching activity (STEP 708 of Figure 7).

The program code may for example include software routines, applets and macros. Program code may, for example, be copied into the one or memories 203, 307, 402 from any apparatus-readable non-transitory data storage medium. Computer program code may be coded by a programming language, which may be a high-level programming language, such as objective-C, C, C++, C#, Java, etc., or a low-level programming language, such as a machine language, or an assembler.

Alternatively, some of the above-described functions or other functions performed at the UE, NB or RNC may be implemented by application specific integrated circuits (ASICs). The design of integrated circuits is by and large a highly automated process. Complex and powerful software tools are available for converting a logic level design into a semiconductor circuit design ready to be etched and formed on a semiconductor substrate.

Programs, such as those provided by Synopsys, Inc. of Mountain View, California and Cadence Design, of San Jose, California automatically route conductors and locate components on a semiconductor chip using well established rules of design as well as libraries of pre stored design modules. Once the design for a semiconductor circuit has been completed, the resultant design, in a standardized electron-
ic format (e.g., Opus, GDSII, or the like) may be transmitted to a semiconductor fabrication facility or "fab" for fabrication.

In addition to the modifications explicitly mentioned above, it will be evident to a person skilled in the art that various other modifications of the described embodiment may be made within the scope of the invention.
CLAIMS

1. A method comprising: controlling a node of a radio access network to push to a communication device via a control channel of the radio access network an explicit indication of the availability via the radio access network of a notification relating to a public safety threat.

2. A method according to claim 1, wherein said explicit indication is included in a single radio resource control message together with an initial indicator of the public safety threat.

3. A method according to claim 1 or claim 2, wherein said notification is available to the communication device via a common control channel.

4. A method according to claim 1 or claim 2, wherein said notification is available to the communication device via a cell broadcast message.

5. A method according to any preceding claim, wherein the notification indicates one or more of the following: a geographical location of a danger zone, an extent of the threat to public safety; and a geographical location of one or more shelter or relief zones.

6. A method according to any preceding claim, wherein the public safety threat is an earthquake and/or tsunami; and the notification indicates one of more of the following: a geographical area affected by the earthquake and/or tsunami; a magnitude of the earthquake and/or tsunami; and a geographical location of one or more shelter or relief zones.
7. A method comprising: controlling a node of a radio access network to push to a communication device via a control channel of the radio access network a primary notification relating to the public safety threat together with a secondary notification relating to the public safety threat.

8. A method according to claim 7, wherein said primary and secondary notifications are included in a single radio resource control message.

9. A method according to claim 7 or claim 8, wherein the primary notification comprises an alert about a public safety threat, and the secondary notification indicates one or more of the following: the geographical location of a danger zone, the extent of the threat to public safety; and the geographical location of one or more shelter or relief zones.

10. A method according to claim 7 or claim 8, wherein the public safety threat is an earthquake and/or tsunami; and the primary notification comprises an alert about the earthquake and/or tsunami, and the secondary notification indicates one of more of the following: the geographical area affected by the earthquake and/or tsunami; the magnitude of the earthquake and/or tsunami; and the geographical location of one or more shelter or relief zones.

11. A method comprising: in response to detecting at a communication device an explicit indication from a radio access network of the availability via the radio access network of a notification relating to a public safety threat; controlling the communication device to receive said notification on a common control channel of the radio access network.
12. A method comprising: in response to detecting at a communication device an explicit indication from a radio access network of the availability of a notification relating to a public safety threat via a channel accessible to the communication device in its current service state; controlling the communication device to refrain from switching to a different service state in which said channel is not accessible to said communication device, until after accessing said notification via said first channel.

13. A method according to claim 12, wherein said notification is available to the communication device via a cell broadcast service channel.

14. A method comprising: in response to receiving from a radio access network at a communication device an explicit indication of the availability via the radio access network of a secondary notification relating to a public safety threat; control the communication device to present a user of the communication device with a choice to interrupt an on-going service in order to access said notification.

15. A method according to any of claims 11 to 14, wherein said explicit indication of the notification is transmitted by the radio access network together with an initial indicator of the public safety threat.

16. A method according to claim 15, wherein said explicit indication is included in a single radio resource control message together with said initial indicator of the public safety threat.

17. A method according to any of claims 11 to 16, wherein the notification indicates one or more of the following: a geographical location of a danger zone, an
extent of the threat to public safety; and a geographical location of one or more shelter or relief zones.

18. A method according to any of claims 11 to 16, wherein the public safety threat is an earthquake and/or tsunami; and the notification indicates one of more of the following: a geographical area affected by the earthquake and/or tsunami; a magnitude of the earthquake and/or tsunami; and a geographical location of one or more shelter or relief zones.

19. An apparatus comprising: a processor and memory including computer program code, wherein the memory and computer program code are configured to, with the processor, cause the apparatus to: control a node of a radio access network to push to a communication device via a control channel of the radio access network an explicit indication of the availability via the radio access network of a notification relating to a public safety threat.

20. An apparatus according to claim 19, wherein said explicit indication is included in a single radio resource control message together with an initial indicator of the public safety threat.

21. An apparatus according to claim 19 or claim 20, wherein said notification is available to the communication device via a common control channel.

22. An apparatus according to claim 19 or claim 20, wherein said notification is available to the communication device via a cell broadcast message.

23. An apparatus according to any of claims 19 to 22, wherein the notification indicates one or more of the following: a geographical location of a danger zone,
an extent of the threat to public safety; and a geographical location of one or more shelter or relief zones.

24. An apparatus according to any of claims 19 to 23, wherein the public safety threat is an earthquake and/or tsunami; and the notification indicates one of more of the following: a geographical area affected by the earthquake and/or tsunami; a magnitude of the earthquake and/or tsunami; and a geographical location of one or more shelter or relief zones.

25. An apparatus comprising: a processor and memory including computer program code, wherein the memory and computer program code are configured to, with the processor, cause the apparatus to: control a node of a radio access network to push to a communication device via a control channel of the radio access network a primary notification relating to the public safety threat together with a secondary notification relating to the public safety threat.

26. An apparatus according to claim 25, wherein said primary and secondary notifications are included in a single radio resource control message.

27. An apparatus according to claim 25 or claim 26, wherein the primary notification comprises an alert about a public safety threat, and the secondary notification indicates one or more of the following: the geographical location of a danger zone, the extent of the threat to public safety; and the geographical location of one or more shelter or relief zones.

28. An apparatus according to claim 25 or claim 26, wherein the public safety threat is an earthquake and/or tsunami; and the primary notification comprises an alert about the earthquake and/or tsunami, and the secondary notification indicates
one of more of the following: the geographical area affected by the earthquake and/or tsunami; the magnitude of the earthquake and/or tsunami; and the geographical location of one or more shelter or relief zones.

29. An apparatus comprising: a processor and memory including computer program code, wherein the memory and computer program code are configured to, with the processor, cause the apparatus to: in response to detecting at a communication device an explicit indication from a radio access network of the availability via the radio access network of a notification relating to a public safety threat; control the communication device to receive said notification on a common control channel of the radio access network.

30. An apparatus comprising: a processor and memory including computer program code, wherein the memory and computer program code are configured to, with the processor, cause the apparatus to: in response to detecting at a communication device an explicit indication from a radio access network of the availability of a notification relating to a public safety threat via a channel accessible to the communication device in its current service state; control the communication device to refrain from switching to a different service state in which said channel is not accessible to said communication device, until after accessing said notification via said first channel.

31. An apparatus according to claim 30, wherein said notification is available to the communication device via a cell broadcast service channel.

32. An apparatus comprising: a processor and memory including computer program code, wherein the memory and computer program code are configured to,
with the processor, cause the apparatus to: in response to receiving from a radio access network at a communication device an explicit indication of the availability via the radio access network of a secondary notification relating to a public safety threat; control the communication device to present a user of the communication device with a choice to interrupt an on-going service in order to access said notification.

33. An apparatus according to any of claims 29 to 32, wherein said explicit indication of the notification is transmitted by the radio access network together with an initial indicator of the public safety threat.

34. An apparatus according to claim 33, wherein said explicit indication is included in a single radio resource control message together with said initial indicator of the public safety threat.

35. An apparatus according to any of claims 29 to 34, wherein the notification indicates one or more of the following: a geographical location of a danger zone, an extent of the threat to public safety; and a geographical location of one or more shelter or relief zones.

36. An apparatus according to any of claims 29 to 34, wherein the public safety threat is an earthquake and/or tsunami; and the notification indicates one of more of the following: a geographical area affected by the earthquake and/or tsunami; a magnitude of the earthquake and/or tsunami; and a geographical location of one or more shelter or relief zones.
37. An apparatus comprising: means for controlling a node of a radio access network to push to a communication device via a control channel of the radio access network an explicit indication of the availability via the radio access network of a notification relating to a public safety threat.

38. An apparatus comprising: means for controlling a node of a radio access network to push to a communication device via a control channel of the radio access network a primary notification relating to the public safety threat together with a secondary notification relating to the public safety threat.

39. An apparatus comprising: means for, in response to detecting at a communication device an explicit indication from a radio access network of the availability via the radio access network of a notification relating to a public safety threat, controlling the communication device to receive said notification on a common control channel of the radio access network.

40. An apparatus comprising: means for, in response to detecting at a communication device an explicit indication from a radio access network of the availability of a notification relating to a public safety threat via a channel accessible to the communication device in its current service state, controlling the communication device to refrain from switching to a different service state in which said channel is not accessible to said communication device, until after accessing said notification via said first channel.

41. An apparatus comprising: means for, in response to receiving from a radio access network at a communication device an explicit indication of the availability via the radio access network of a secondary notification relating to a public safety
threat, controlling the communication device to present a user of the communication device with a choice to interrupt an on-going service in order to access said notification.

42. A computer program product comprising program code means which when loaded into a computer controls the computer to: control a node of a radio access network to push to a communication device via a control channel of the radio access network a primary notification relating to the public safety threat together with a secondary notification relating to the public safety threat.

43. A computer program product comprising program code means which when loaded into a computer controls the computer to: in response to detecting at a communication device an explicit indication from a radio access network of the availability via the radio access network of a notification relating to a public safety threat, control the communication device to receive said notification on a common control channel of the radio access network.

44. A computer program product comprising program code means which when loaded into a computer controls the computer to: in response to detecting at a communication device an explicit indication from a radio access network of the availability of a notification relating to a public safety threat via a channel accessible to the communication device in its current service state, control the communication device to refrain from switching to a different service state in which said channel is not accessible to said communication device, until after accessing said notification via said first channel.
45. A computer program product comprising program code means which when loaded into a computer controls the computer to: in response to receiving from a radio access network at a communication device an explicit indication of the availability via the radio access network of a secondary notification relating to a public safety threat, control the communication device to present a user of the communication device with a choice to interrupt an on-going service in order to access said notification.
FIG 4

402: TRANSMIT RRC MESSAGE INCLUDING SECONDARY NOTIFICATION INDICATION IE TO UE IN IDLE MODE, URA_PCH, CELL_PCH OR CELL_FACH STATE

404: IN RESPONSE TO DETECTING SECONDARY NOTIFICATION INDICATION IE IN RRC MESSAGE RECEIVED AT UE, DIRECT UE TO RECEIVE RRC MESSAGE INCLUDING SECONDARY NOTIFICATION ON CCCH

406: PRESENT SECONDARY NOTIFICATION TO USER OF UE

FIG 5

502: TRANSMIT RRC MESSAGE INCLUDING BOTH PRIMARY NOTIFICATION OF PUBLIC SAFETY THREAT AND SECONDARY NOTIFICATION ABOUT PUBLIC SAFETY THREAT TO UE IN CELL_DCH CONNECTED STATE

504: RECEIVE RRC MESSAGE AT UE, AND PRESENT SECONDARY NOTIFICATION TO USER
FIG 6

602: TRANSMIT RRC MESSAGE INCLUDING PRIMARY NOTIFICATION OF PUBLIC SAFETY THREAT AT UE IN IDLE MODE OR,URA_PCH OR CELL_PCH STATE

604: DETERMINE AT UE IF RRC MESSAGE INCLUDES SECONDARY NOTIFICATION INDICATION IE

NO

YES

608: UE IS PROHIBITED FROM SWITCHING TO CELL_FACH OR CELL_DCH STATE UNTIL AFTER RECEIVING SECONDARY NOTIFICATION VIA CBS CHANNEL

610: RECEIVE SECONDARY NOTIFICATION AT UE VIA CBS

606: UE IS NOT PROHIBITED FROM SWITCHING TO CELL_FACH OR CELL_DCH STATE

612: PRESENT SECONDARY NOTIFICATION TO USER OF UE
FIG 7

702: TRANSMIT RRC MESSAGE INCLUDING SECONDARY NOTIFICATION INDICATION IE TO UE IN CELL_FACH OR CELL_DCH STATES

704: IN RESPONSE TO DETECTING SECONDARY NOTIFICATION INDICATION IE IN RRC MESSAGE RECEIVED AT UE, PRESENT USER OF UE WITH CHOICE TO INTERRUPT ONGOING PACKET SWITCHING ACTIVITY IN ORDER TO ACCESS SECONDARY NOTIFICATION

706: DOES USER INDICATE DESIRE TO RECEIVE SECONDARY NOTIFICATION?

NO  YES

708: CONTINUE WITH ONGOING PACKET-SWITCHING ACTIVITY

710: INTERRUPT ONGOING PACKET-SWITCHING ACTIVITY AND RECEIVE SECONDARY NOTIFICATION

712: PRESENT SECONDARY NOTIFICATION TO USER
# INTERNATIONAL SEARCH REPORT

## A. CLASSIFICATION OF SUBJECT MATTER

INV. H94W4/22
ADD.

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)

H04W

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

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

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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</table>

- col umn 6, paragraph 29
- col umn 7, paragraph 34 - col umn 10, paragraph 46
- col umn 11, paragraph 49

-/--

Further documents are listed in the continuation of Box C.

See patent family annex.

- "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 invention 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
- "Z" document member of the same patent family

Data of the actual completion of the international search: 13 December 2013

Data of mailing of the international search report: 25/02/2014

Name and mailing address of the ISA:
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NL-2280 HV Rijswijk
Tel (+31-70) 340-2040,
Fax (+31-70) 340-3048

Authorized officer:
Blanco Cardona, P
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<td>3 October 2008 (2008-10-03), XP050320669, section 1, section 5.2.1.4 and section</td>
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<td>XP050140 117, page 1</td>
<td>5, 6, 9, 10, 23, 24, 27, 28</td>
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INTERNATIONAL SEARCH REPORT

Box No. II  Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 64(a).

Box No. III  Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those searchable claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by only claims Nos.:

1-11, 19-29, 37-39, 42, 43

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ These additional search fees were accompanied by the applicant's protest but the applicable protest was received after the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.
<table>
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<td>WO 2009116797 A2</td>
<td>24-09-2009</td>
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</table>
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-11, 19-29, 37-39, 42, 43
   Method and apparatus for sending public safety notifications via logical control channels
   ---

2. claims: 12-18, 30-36, 40, 41, 44, 45
   Method and apparatus for sending public safety notification making use of logical traffic channels
   ---