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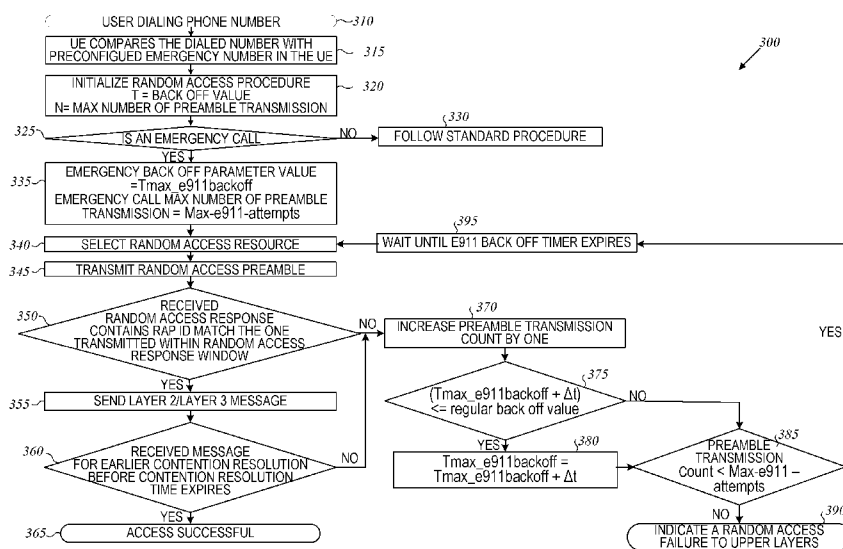
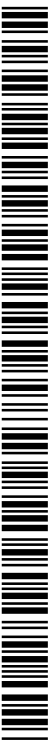


FIG. 3

(57) Abstract: A mobile device implemented method includes receiving a request at the mobile device from a user to make an emergency call over a network, attempting to place the emergency call via the mobile device, detecting a failure of random access attempt procedure for the emergency call by the mobile device, using a reduced back off parameter value as compared to a back off parameter value for a non-emergency call, and re-attempting the random access procedure for the emergency call via the mobile device as a function of the reduced back off parameter value.



EMERGENCY CALL PRIORITIZATION

Cross Reference

5 [0001] This application claims priority to U.S. non-provisional patent application Serial No. 15/006,896, filed on January 26, 2016 and entitled “EMERGENCY CALL PRIORITIZATION”, which is incorporated herein by reference as if reproduced in its entirety.

Technical Field

10 [0002] The present application is related to contention-based random access procedures for call establishment, and in particular to a give preference to emergency calls in contention-based random access procedures to reduce latency when a collision occurs.

Background

15 [0003] Mobile phones initiate a random access procedure first when attempting to place a call. If an access attempt fails, the phone will wait a random back off time according to a uniform distribution between 0 and a back off parameter value prior to starting the random access procedure again. When
20 multiple devices are competing for network resources at the same time, the risk of collision increases. It may take several access attempts to get radio resource for an emergency call establishment, which can result in long delays.

Summary

25 [0004] A mobile device implemented method includes receiving a request at the mobile device from a user to make an emergency call over a network, attempting to place the emergency call via the mobile device, detecting a failure of random access attempt procedure for the emergency call by the mobile device, using a reduced back off parameter value as compared to a back
30 off parameter value for a non-emergency call, and re-attempting the random access procedure for the emergency call via the mobile device as a function of the reduced back off parameter value.

[0005] A machine readable storage device has instructions for execution by a processor to cause the machine to perform operations. The operations

include receiving a request to make an emergency call over a network, attempting to place the emergency call via a random access procedure, detecting a failure of placement of the emergency call, detecting a failure of a random access procedure for the emergency call, using a reduced back off parameter value as compared to a back off parameter value for a non-emergency call, and re-attempting the random access procedure as function of the reduced back off parameter value.

[0006] A device includes a processor and a transceiver coupled to the processor. A memory device is coupled to the processor and has a program stored thereon for execution by the processor to perform operations. The operations include receiving a request from a user to make an emergency call over a network, attempting to place the emergency call, detecting a failure of the random access procedure of the emergency call, using a reduced back off parameter value as compared to a back off parameter value for a non-emergency call, and re-attempting the random access procedure for the emergency call responsive to the reduced back off parameter value.

Brief Description of the Drawings

[0007] FIG. 1 is a block diagram of a wireless communication network according to an example embodiment.

[0008] FIG. 2 is an example timing diagram illustrating timing between access attempts according to an example embodiment.

[0009] FIG. 3 is a flowchart illustrating a method of random access procedure for an emergency call according to an example embodiment.

[0010] FIG. 4 is a block schematic diagram of circuitry for executing one or more methods according to an example embodiment.

Detailed Description

[0011] In the following description, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration specific embodiments which may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that structural, logical and electrical changes may be made without

departing from the scope of the present invention. The following description of example embodiments is, therefore, not to be taken in a limited sense, and the scope of the present invention is defined by the appended claims.

[0012] The functions or algorithms described herein may be implemented in software in one embodiment. The software may consist of computer executable instructions stored on computer readable media or computer readable storage device such as one or more non-transitory memories or other type of hardware based storage devices, either local or networked. Further, such functions correspond to modules, which may be software, hardware, firmware or any combination thereof. Multiple functions may be performed in one or more modules as desired, and the embodiments described are merely examples. The software may be executed on a digital signal processor, ASIC, microprocessor, or other type of processor operating on a computer system, such as a personal computer, server or other computer system, turning such computer system into a specifically programmed machine.

[0013] In various embodiments, preference is given to emergency calls in a contention based random access procedure to reduce the latency of user equipment (UE) emergency call at random access procedure phase and to improve emergency call establishment time. Example UEs include mobile phones and other wireless network connected devices. A back off time between access attempts by UE attempting to establish a call over a network is decreased for emergency calls, effectively giving emergency calls increased prioritization. Reducing the time between access attempts for emergency calls decreases latency for establishing emergency calls as compared to non-emergency calls, which are referred to as regular calls. In some embodiments, a larger maximum number of preamble transmissions is used as compared to the maximum number of preamble transmissions for a non-emergency call.

[0014] FIG. 1 is a block diagram of a wireless communication network 100 including multiple UEs at 110, 112, and 114 generating preamble transmissions to establish a call via an eNodeB (evolved node B) 120 device. A preamble transmission is a first message (Random Access Preamble sent over a Random Access Channel (RACH)) of a Random Access Procedure sent to the network eNodeB 120 device to let the network know that it is trying to get access to the network. The Random Access Preamble differentiates requests

coming from different UEs. At this stage, the UE does not have any resource or channel available to inform the network about its desire to connect to the network. Therefore the UE will send its request over the RACH. If there are many other UEs in the same area sending same request to the same eNodeB (cell), there is a possibility of collision among the requests coming from various other UEs. If two UEs use same RACH preambles at same time then there can be a collision. Various random access procedures are defined in CDMA (code division multiple access), GSM (global system for mobile communications), WCDMA (Wideband CDMA), and LTE (long term evolution – 3GPP 4G) specifications.

[0015] In some embodiments, the back off time is a selected random value between 0 and a back off parameter value. The back off parameter value for an emergency call may be referred to as a reduced back off parameter value. Using the reduced back off parameter value reduces the delay of subsequent random access attempt transmissions for emergency calls. Based on the number of access attempts that have failed, such as 2, 3, or more, the value of the reduced back off parameter may be increased until the value reaches the regular back off parameter value.

[0016] A maximum number of random access preamble transmissions may also be configurable in further embodiments. The maximum number of random access preamble transmissions may be set by a UE or a network, and may be increased for an emergency call compared to a corresponding parameter for regular calls. Modification of the maximum number of access attempts parameter may further increase the likelihood that an emergency call will be established.

[0017] In further embodiments, both parameters may be set by a network operator or an OEM (original equipment manufacturer) and the network can dynamically change the values while regular calls follow a current standard specification such as 3GPP (3rd Generation Partnership Project) and 3GPP2 (3rd Generation Partnership Project 2) and may apply to all radio access technology (RAT).

[0018] In still a further embodiment, based on a real time network condition, networks may provide a dedicated range of the back off parameter for emergency calls and optionally a larger time range that is dedicated for regular

calls. If a large volume of emergency calls are occurring, such as due to a large fire or other large emergency being witnessed by many people, the back off parameter value for emergency calls may be increased towards or to the regular call back off parameter value.

5 [0019] In one embodiment, under certain network conditions, the network may also give emergency calls a specific back off parameter value range, and provide a different range for regular calls. The range can be dynamically changed by the network based on the network information and condition. The emergency call back-off parameter value range may be [0 to Δb],
10 and the regular call back off parameter value range may be from (Δb , max_back_off_value]. The Δb may be the emergency back off parameter value.

[0020] FIG. 2 is an example timing diagram illustrating timing between access attempts generally at 200 for both emergency calls at 210 and non-emergency or regular calls at 215. The back off time is a selected random value
15 between 0 and a back off parameter value. The timing diagram example of FIG. 2 is a simplified illustration of timing for an emergency call with a back off time of 10 ms, where the selected random value is thus between 0 and 10 ms. For a non-emergency call, the back off time is illustrated as 960 ms, corresponding to a selected random value between 0 and 960 ms.

20 [0021] The actual time between access attempts will be based on the random values, which will on average be less than the 10 ms and 960 ms back off times shown. Various contention based random access procedures are described in CDMA (code division multiple access), GSM (global system for mobile communications), WCDMA (Wideband CDMA), and LTE (long term
25 evolution – 3GPP 4G) RATs, and FIG. 2 is a simplified representation of a timing diagram of one example.

[0022] Access attempts for regular calls 215 occur with a back off time of 960ms in one embodiment and emergency calls 210 occur with a back off time of 10ms. A first access attempt occurs when a user, such as a human,
30 presses a button to dial a number as indicated at 220 and 225 for regular and emergency calls respectively. The time interval is referred to as a back off time. The time interval starts when a collision is detected responsive to an access attempt as indicated by lines 230 and 231 for regular calls and 235 and 236 for emergency calls. As represented in FIG. 2, three access attempts occur in a

much shorter time for the emergency call as compared to the regular call, increasing the odds of the emergency call being established with lower latency than the regular call. It is assumed that both calls are established on the third attempt in this depiction. If not, further attempts may be made in accordance with the respective back off times.

[0023] The back off parameter value for emergency calls may be referred to as a reduced back off parameter value. The reduced back off parameter value in one embodiment is a value range to reduce the delay of subsequent random access attempt transmissions. Based on the number of access attempts that have failed, such as 2, 3, or more, the reduced back off parameter value may be increased until the value reaches the regular back off parameter value.

[0024] A maximum number of access attempts parameter may also be configurable in further embodiments. The maximum number of access attempts parameter may be set by the UE or network, and may be increased over a corresponding parameter for regular calls. Modification of the maximum number of access attempts parameter may further increase the likelihood that an emergency call will be established.

[0025] In further embodiments, both parameters may be set by UE or network, and the network can dynamically change the values while regular calls follow a current network standard specification such as 3GPP and 3GPP2 and may apply to all radio access technology (RAT).

[0026] In still a further embodiment, based on a real time network condition, networks may provide a dedicated range of the back off parameter for emergency calls and a larger time range that is dedicated for regular calls. Note that the term “range” refers to a randomization of the back off parameter that may be performed by the UE to reduce the chances that multiple UE will keep repeating attempts on a same schedule, increasing the chances of a collision. Thus, the term back off time parameter results in a random amount of time between additional access attempts. The range may be centered about the parameter in some embodiments, effectively being an average time between access attempts.

[0027] A call box, commonly referred to as a network emulator, may be configured to detect whether or not a reduced back off parameter is being used by a UE. The call box simply does not respond to attempts, causing the UE to

continue access attempts. If the time between access attempts for emergency calls is shorter than the time between access attempts for regular calls, it can be determined that a shorter back off parameter is being used for emergency calls.

[0028] FIG. 3 is a flowchart illustrating a random access procedure for an emergency call at 300. Method 300 begins at 310 with a user entering a phone number in a UE, such as by pressing numbers or selecting a contact or already entered number and making a selection to begin a call. The UE compares the selected number at 315 with preconfigured emergency numbers known to the UE. A random access procedure is initialized at 320 with a parameter, T, set to a back off parameter value, and a parameter, N, set to a maximum number of preamble transmissions, where preamble corresponds to an uplink resource, and some other parameters initialization.

[0029] At 325, UE determines whether or not the call is an emergency call. Operation 315 may set a flag indicating the call is an emergency call in one embodiment, with operation 325 checking the flag to make the determination, or operation 325 may directly check the selected call number against the list of known emergency numbers in the location of the UE in order to make the determination. If the call is not an emergency call, a standard random access procedure is followed for non-emergency, regular, calls at 330.

[0030] If the call is determined to be an emergency call, the back off parameter value is set to a shorter value, referred to as for example, $T_{max_e911backoff}$. The emergency call back off parameter value may be set by the network or the UE in various embodiments. The back off parameter value may be very small, and gradually increased until the emergency call back off parameter value is the same as the regular call back off parameter value in some embodiments. The emergency call back off parameter value may be initially set to zero in some embodiments. In some embodiments, the max number of preamble transmissions is set to a larger number as compared to the maximum number of random access preamble transmissions for a non-emergency call, referred to as for example, $Max-e911-attempts$. The emergency call max number of random access preamble transmissions may be set by the network or the UE in various embodiments.

[0031] At 340, a random access resource is selected. The random access preamble is transmitted at 345.

[0032] At 350, a random access response is received and contains a random access preamble identifier (RAP ID). Operation 350 determines if the received RAP ID matches the RAP ID transmitted within a random access response window. If yes, a layer 2/layer 3 message is sent to 355, and an operation 360 determines if the received message for earlier contention resolution was received before a contention resolution time expires. If yes, the random access is successful at 365. A contention resolution timer may be used as a timer for contention resolution. If the UE does not receive the contention resolution message in this time frame, the UE will start to obtain an access resource again, essentially starting over. If the UE does not receive the random access response which contains a random access preamble identifier transmitted within a random access response window, method 300 proceeds to operation 370.

[0033] If the access is not successful, corresponding to the UE not receiving the earlier contention resolution within the contention resolution time, a preamble transmission count is increased by one at 370. In one embodiment, it is determined if the emergency call back off parameter value plus an increment, Δt , is less than or equal to the maximum back off parameter value for a regular call. If yes, Δt is added to $T_{max_e911backoff}$. Δt maybe set to 0 or a small value and it is configurable.

[0034] The method proceeds to operation 385 from either operation 380, or operation 375 if the back off parameter value plus an increment, Δt , is greater than the maximum back off parameter value for a regular call. At operation 385, the preamble transmission count is checked to determine whether it is still less than the maximum number of random access preamble transmissions, $Max_e911-attempts$. If not, an indication of the random access procedure failing is provided to upper protocol stack layers of the UE, at 390, such as a medium access control layer and a radio resource control layer. If yes, the method 300 waits until an emergency back off timer expires at 395, and the method continues at 340 to make another attempt to establish the call. The back off time is a selected random value between 0 and a back off parameter value.

[0035] FIG. 4 is a block schematic diagram of a computer system 410 to implement methods according to example embodiments. All components need not be used in various embodiments. One example computing device in the form of a computer 410, may include a processing unit 402, memory 404,

removable storage 412, and non-removable storage 414. Although the example computing device is illustrated and described as computer 410, the computing device may be in different forms in different embodiments. For example, the computing device may instead be a smartphone, a tablet, smartwatch, or other
5 computing device including the same or similar elements as illustrated and described with regard to FIG. 4. Devices such as smartphones, tablets, and smartwatches are generally collectively referred to as mobile devices. Further, although the various data storage elements are illustrated as part of the computer 410, the storage may also or alternatively include cloud-based storage accessible
10 via a network, such as the Internet.

[0036] Memory 404 may include volatile memory 406 and non-volatile memory 408. Computer 410 may include – or have access to a computing environment that includes – a variety of computer-readable media, such as volatile memory 406 and non-volatile memory 408, removable storage 412 and
15 non-removable storage 414. Computer storage includes random access memory (RAM), read only memory (ROM), erasable programmable read-only memory (EPROM) & electrically erasable programmable read-only memory (EEPROM), flash memory or other memory technologies, compact disc read-only memory (CD ROM), Digital Versatile Disks (DVD) or other optical disk storage,
20 magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices capable of storing computer-readable instructions for execution to perform functions described herein.

[0037] Computer 410 may include or have access to a computing environment that includes input 416, output 416, and a communication
25 connection 420. In one embodiment, the communication connection 420 is a transceiver coupled to an antenna and operable to communicate via a wireless network, such as a cellular network. Processing unit 104 may include multiple processors for executing code related to multiple different levels of a wireless protocol stack in accordance with one or more wireless standards to transmit and
30 receive signals wirelessly via the communication connection. Output 418 may include a display device, such as a touchscreen, that also may serve as an input device. The input 416 may include one or more of a touchscreen, touchpad, mouse, keyboard, camera, one or more device-specific buttons, one or more sensors integrated within or coupled via wired or wireless data connections to

the computer 410, and other input devices. The computer may operate in a networked environment using a communication connection to connect to one or more remote computers, such as database servers, including cloud based servers and storage. The remote computer may include a personal computer (PC),
5 server, router, network PC, a peer device or other common network node, or the like. The communication connection may include a Local Area Network (LAN), a Wide Area Network (WAN), cellular, WiFi, Bluetooth, or other networks.

[0038] Computer-readable instructions stored on a computer-readable storage device are executable by the processing unit 402 of the computer 410. A
10 hard drive, CD-ROM, and RAM are some examples of articles including a non-transitory computer-readable medium such as a storage device. The terms computer-readable medium and storage device do not include carrier waves. For example, a computer program 425 capable of providing a generic technique to perform access control check for data access and/or for doing an operation on
15 one of the servers in a component object model (COM) based system may be included on a CD-ROM and loaded from the CD-ROM to a hard drive. The computer-readable instructions allow computer 410 to provide generic access controls in a COM based computer network system having multiple users and servers.

20 Examples

[0039] 1. In example 1, a mobile device implemented method includes receiving a request at the mobile device from a user to make an emergency call over a network, attempting to place the emergency call via the mobile device, detecting a failure of a random access procedure for the
25 emergency call by the mobile device, using a reduced back off parameter value as compared to a back off parameter value for a non-emergency call, and re-attempting the random access procedure for the emergency call via the mobile device as a function of the reduced back off parameter value.

[0040] 2. The method of example 1 wherein the request to make an
30 emergency call is detected as an emergency call by the mobile device comparing a phone number with known emergency call phone numbers.

[0041] 3. The method of any of examples 1-2 wherein re-attempting the random access procedure is based on a network or mobile device configurable reduced back off parameter value.

- [0042] 4. The method of any of examples 1-3 and further comprising repeating re-attempting the emergency call random access procedure.
- [0043] 5. The method of example 4 wherein a maximum number of random access preamble transmissions to place the emergency call is higher than a maximum number of random access preamble transmissions for regular calls.
- [0044] 6. The method of any of examples 4-5 wherein the reduced back off parameter value is increased responsive to a number of access attempts until a non-emergency back off parameter value is reached.
- [0045] 7. The method of any of examples 1-5 wherein the reduced back off parameter value for emergency calls is configured by the mobile device or received by the mobile device from the network.
- [0046] 8. The method of example 7 wherein the back off parameter value for non-emergency calls is dynamically set by the network to a parameter value greater than or equal to the emergency call back off parameter and up to a maximum back off parameter value.
- [0047] 9. The method of example 7 wherein the back off parameter value for emergency calls is changed as a function of volume of emergency calls being placed by devices coupled to the network.
- [0048] 10. In example 10, a machine readable storage device has instructions for execution by a processor to cause the machine to perform operations including receiving a request to make an emergency call over a network, attempting to place the emergency call, detecting a failure of a random access procedure for the emergency call, using a reduced back off parameter value as compared to a back off parameter value for a non-emergency call, and re-attempting random access procedure as function of the reduced back off parameter value.
- [0049] 11. The machine readable storage device of example 10 wherein the request to make an emergency call is detected as an emergency call by comparing a phone number with known emergency call phone numbers.
- [0050] 12. The machine readable storage device of any of examples 10-11 and further comprising repeating the random access procedure for the emergency call.
- [0051] 13. The machine readable storage device of example 12 wherein a maximum number of random access preamble transmissions to place

the emergency call is higher than a maximum number of random access preamble transmissions for regular calls.

5 [0052] 14. The machine readable storage device of example 12 wherein the reduced back off parameter value is increased responsive to a number of access attempts until a non-emergency back off parameter value is reached.

[0053] 15. The machine readable storage device of any of examples 10-14 wherein the reduced back off parameter value for emergency calls is configured by a mobile device or is received from the network.

10 [0054] 16. The machine readable storage device of example 15 wherein the back off parameter value for non-emergency calls is dynamically set by the network to a parameter value greater than or equal to the emergency call back off parameter and up to a maximum back off parameter value.

15 [0055] 17. The machine readable storage device of example 15 wherein the back off parameter value for emergency calls is changed as a function of a volume of emergency calls being placed by devices coupled to the network.

20 [0056] 18. In example 18, a device includes a processor, a transceiver coupled to the processor, and a memory device coupled to the processor and having a program stored thereon for execution by the processor to perform operations. The operations include receiving a request from a user to make an emergency call over a network, attempting to place the emergency call, detecting a failure of a random access procedure of the emergency call, using a reduced back off parameter value as compared to a back off parameter value for a non-emergency call, and re-attempting random access procedure responsive to a
25 reduced back off parameter value.

[0057] 19. The device of example 18 wherein the request to make an emergency call is detected as an emergency call by comparing a phone number with known emergency call phone numbers.

30 [0058] 20. The method of any of examples 18-19 and further comprising repeating the random access procedure to place the emergency call wherein a maximum number of random access preamble transmissions is higher than a maximum number of random access preamble transmission for regular calls.

[0059] Although a few embodiments have been described in detail above, other modifications are possible. For example, the logic flows depicted in the figures do not require the particular order shown, or sequential order, to achieve desirable results. Other steps may be provided, or steps may be eliminated, from the described flows, and other components may be added to, or removed from, the described systems. Other embodiments may be within the scope of the following claims.

CLAIMS

What is claimed is:

1. A mobile device implemented method comprising:
 - receiving a request at the mobile device from a user to make an emergency call over a network;
 - attempting to place the emergency call via the mobile device;
 - detecting a failure of a random access procedure for the emergency call by the mobile device;
 - using a reduced back off parameter value as compared to a back off parameter value for a non-emergency call; and
 - re-attempting the random access procedure for the emergency call via the mobile device as a function of the reduced back off parameter value.
2. The method of claim 1 wherein the request to make an emergency call is detected as an emergency call by the mobile device comparing a phone number with known emergency call phone numbers.
3. The method of claim 1 wherein re-attempting the random access procedure is based on a network or mobile device configurable reduced back off parameter value.
4. The method of claim 1 and further comprising repeating re-attempting the emergency call random access procedure.
5. The method of claim 4 wherein a maximum number of random access preamble transmissions to place the emergency call is higher than a maximum number of random access preamble transmissions for regular calls.
6. The method of claim 4 wherein the reduced back off parameter value is increased responsive to a number of access attempts until a non-emergency back off parameter value is reached.

7. The method of claim 1 wherein the reduced back off parameter value for emergency calls is configured by the mobile device or received by the mobile device from the network.
8. The method of claim 7 wherein the back off parameter value for non-emergency calls is dynamically set by the network to a parameter value greater than or equal to the emergency call back off parameter and up to a maximum back off parameter value.
9. The method of claim 7 wherein the back off parameter value for emergency calls is changed as a function of volume of emergency calls being placed by devices coupled to the network.
10. A machine readable storage device having instructions for execution by a processor to cause the machine to perform operations comprising:
 - receiving a request to make an emergency call over a network;
 - attempting to place the emergency call;
 - detecting a failure of a random access procedure for the emergency call;
 - using a reduced back off parameter value as compared to a back off parameter value for a non-emergency call; and
 - re-attempting random access procedure as function of the reduced back off parameter value.
11. The machine readable storage device of claim 10 wherein the request to make an emergency call is detected as an emergency call by comparing a phone number with known emergency call phone numbers.
12. The machine readable storage device of claim 10 and further comprising repeating the random access procedure for the emergency call.
13. The machine readable storage device of claim 12 wherein a maximum number of random access preamble transmissions to place the emergency call is higher than a maximum number of random access preamble transmissions for regular calls.

14. The machine readable storage device of claim 12 wherein the reduced back off parameter value is increased responsive to a number of access attempts until a non-emergency back off parameter value is reached.

15. The machine readable storage device of claim 10 wherein the reduced back off parameter value for emergency calls is configured by a mobile device or is received from the network.

16. The machine readable storage device of claim 15 wherein the back off parameter value for non-emergency calls is dynamically set by the network to a parameter value greater than or equal to the emergency call back off parameter and up to a maximum back off parameter value.

17. The machine readable storage device of claim 15 wherein the back off parameter value for emergency calls is changed as a function of a volume of emergency calls being placed by devices coupled to the network.

18. A device comprising:
a processor;
a transceiver coupled to the processor; and
a memory device coupled to the processor and having a program stored thereon for execution by the processor to perform operations comprising:
receiving a request from a user to make an emergency call over a network;
attempting to place the emergency call;
detecting a failure of a random access procedure of the emergency call;
using a reduced back off parameter value as compared to a back off parameter value for a non-emergency call; and
re-attempting the random access procedure responsive to the reduced back off parameter value.

19. The device of claim 18 wherein the request to make an emergency call is detected as an emergency call by comparing a phone number with known emergency call phone numbers.

20. The device of claim 18 and further comprising repeating the random access procedure to place the emergency call wherein a maximum number of random access preamble transmissions is higher than a maximum number of random access preamble transmission for regular calls.

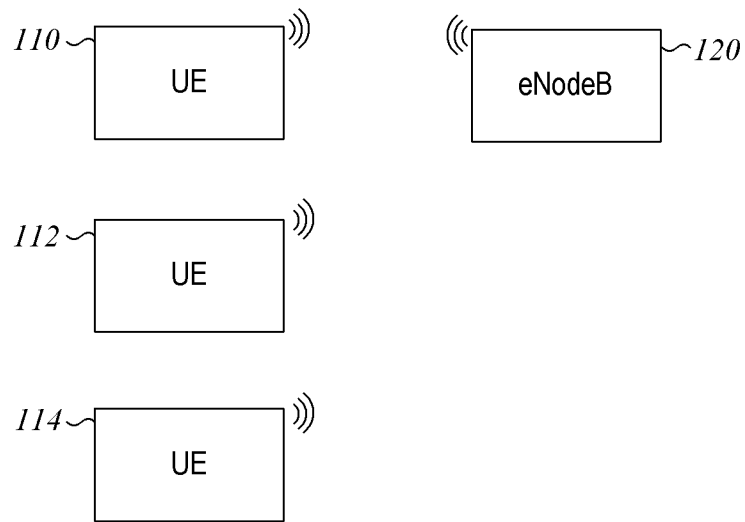


FIG. 1

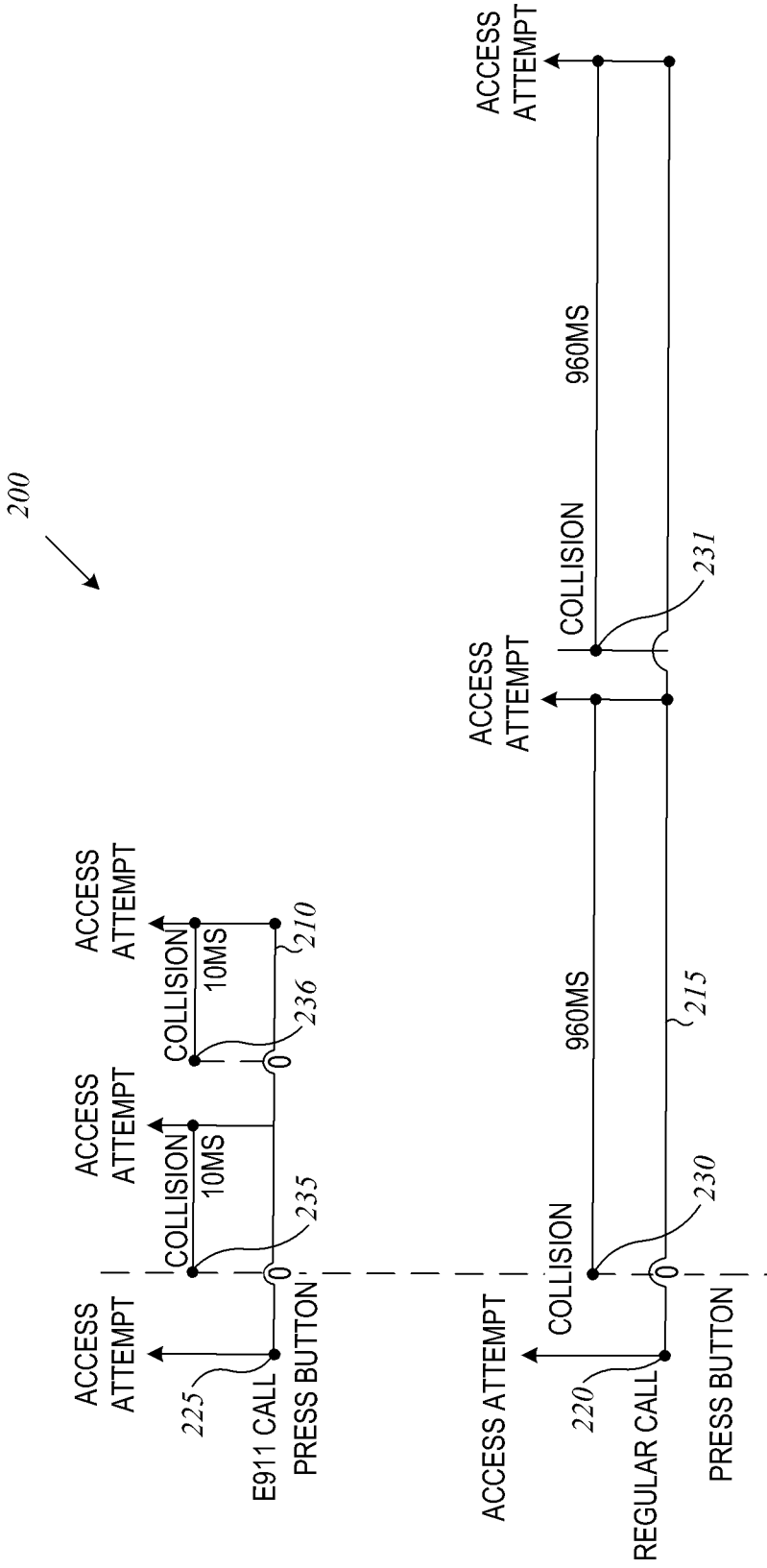


FIG. 2

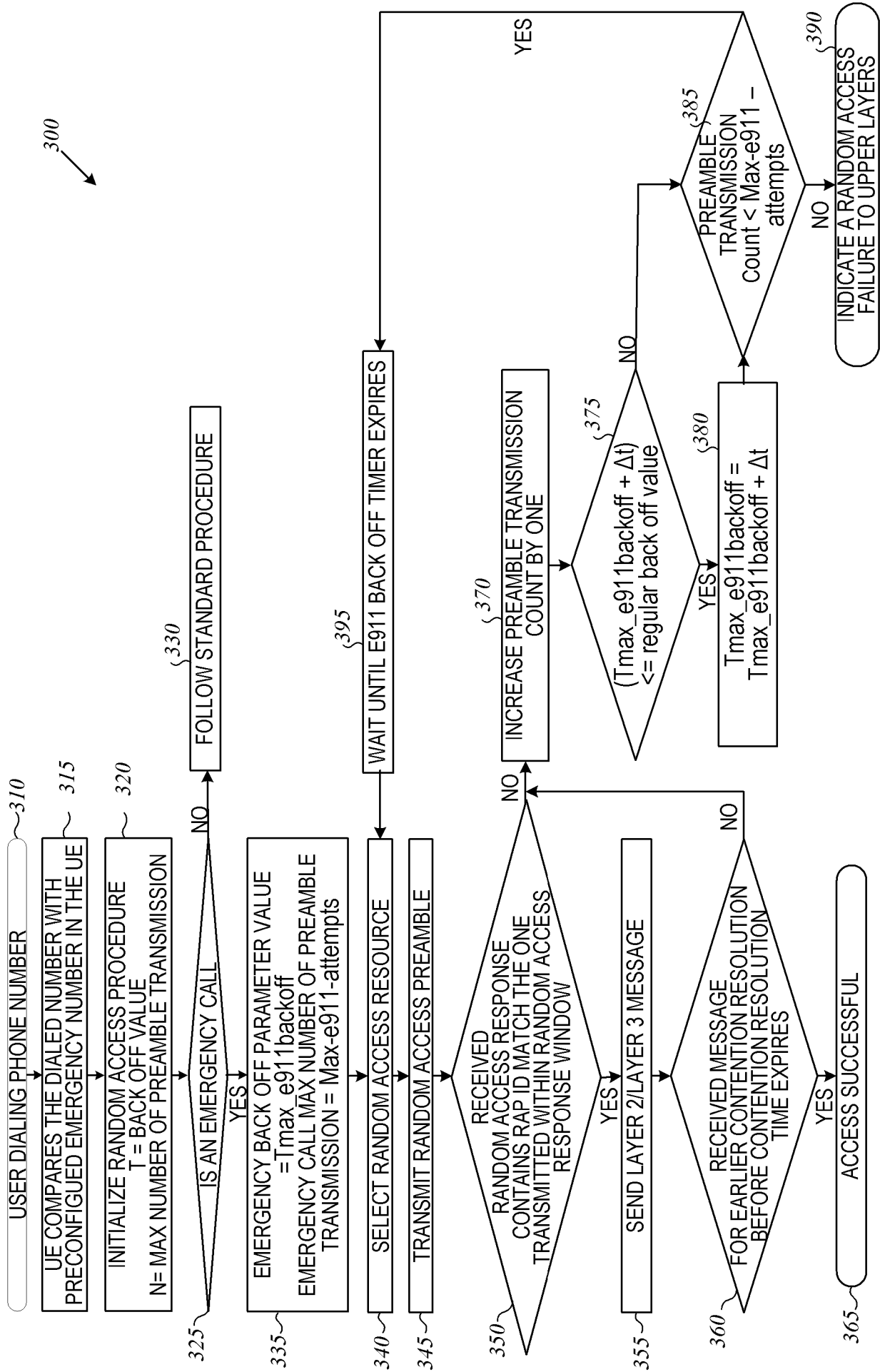


FIG. 3

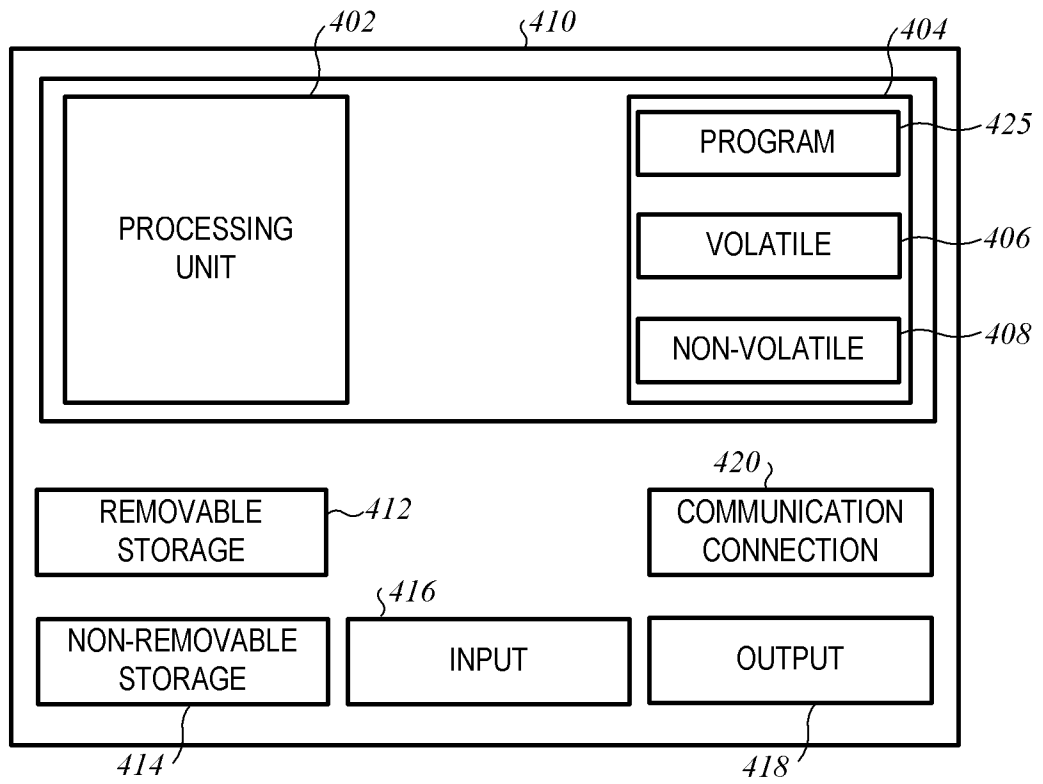


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/071516

A. CLASSIFICATION OF SUBJECT MATTER

H04W 4/22(2009.01)i; H04W 74/08(2009.01)i; H04W 72/12(2009.01)i

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)

CPRSABS, CNTXT, CNKI, VEN: emergency, call, phone, service, back off, time, value, random, access, collision, congestion, competition, high, priority

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 102291836 A (ZTE CORP.) 21 December 2011 (2011-12-21) description, paragraphs [0005]-[0164], and figures 1-9	1-20
X	CN 102469555 A (ZTE CORP.) 23 May 2012 (2012-05-23) description, paragraphs [0043]-[0136]	1-20
X	US 2010254365 A1 (AVAYA INC.) 07 October 2010 (2010-10-07) description, paragraphs [0009]-[0022]	1-3, 7, 10, 11, 15, 18, 19
A	WO 2010107354 A1 (TELEFONAKTIEBOLAGET ERICSSON L M) 23 September 2010 (2010-09-23) the whole document	1-20
A	CN 102740493 A (ZTE CORP.) 17 October 2012 (2012-10-17) the whole document	1-20

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

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"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

07 March 2017

Date of mailing of the international search report

01 April 2017

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2017/071516

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	102291836	A	21 December 2011	CN	102291836	B	20 January 2016
				WO	2011160519	A1	29 December 2011
CN	102469555	A	23 May 2012	CN	102469555	B	10 December 2014
				WO	2012058985	A1	10 May 2012
US	2010254365	A1	07 October 2010	US	8238378	B2	07 August 2012
				US	2004151144	A1	05 August 2004
				US	7539168	B2	26 May 2009
				US	2004151283	A1	05 August 2004
				US	7047002	B2	16 May 2006
				US	2004196864	A1	07 October 2004
				US	7817675	B2	19 October 2010
WO	2010107354	A1	23 September 2010	None			
CN	102740493	A	17 October 2012	None			