



(51) International Patent Classification:

H04M 3/428 (2006.01) H04M 3/523 (2006.01)  
H04M 3/51 (2006.01)

(21) International Application Number:

PCT/EP2016/059268

(22) International Filing Date:

26 April 2016 (26.04.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(71) Applicant: TELEFONAKTIEBOLAGET LM ERICSSON (PUBL) [SE/SE]; SE-164 83 Stockholm (SE).

(72) Inventors: LIANG, Hongxin; Husarvägen 12, SE-19479 Upplands Väsby (SE). INAM, Rafia; Ringduvegatan 63, 1101, SE-724 70 Västerås (SE). MOKRUSHIN, Leonid; Murargatan 5, SE-75437 Uppsala (SE).

(74) Agent: ERICSSON; Torshamnsgatan 21-23, 164 80 Stockholm (SE).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA,

LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: METHOD AND MANAGING MODULE FOR MANAGING VOICE DATA GENERATED BY A CALL MANAGING SYSTEM

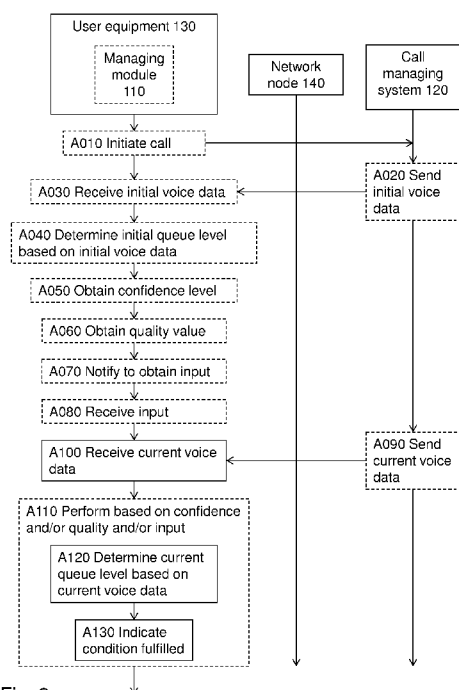


Fig. 2

(57) Abstract: A method and a managing module (110) for managing voice data generated by a call managing system (120) are disclosed. The managing module (110) receives (A100), from the call managing system (120), current voice data indicating a current queue level of a call to the call managing system (120), wherein the current queue level is given in relation to a queue of calls, wherein the queue of calls is managed by the call managing system (120) to keep track of which call, among the calls in the queue, is to be served next. Moreover, the managing module (110) determines (A120) the current queue level based on the current voice data by use of voice recognition. Furthermore, the managing module (110) indicates (A130) that the condition is fulfilled, when the current queue level fulfils a condition relating to that the call is to be served. A corresponding computer program (603) and a carrier (605) therefore are also disclosed.

WO 2017/186271 A1

METHOD AND MANAGING MODULE FOR MANAGING  
VOICE DATA GENERATED BY A CALL MANAGING SYSTEM

TECHNICAL FIELD

5           Embodiments herein relate to computer systems, such as telecommunication systems. In particular, a method and a managing module for managing voice data generated by a call managing system are disclosed. A corresponding computer program and a carrier therefor are also disclosed.

10   BACKGROUND

          Computer systems are used to perform various tasks. One task that a computer system may be designed to perform is to manage customer support services and help lines via telephone.

          An existing computer system, designed to manage customer support, works as  
15 follows. When a customer makes a call to a customer support service through a phone, the call is handled by the computer system, before the customer can talk to a person who will attempt to help the customer with its questions and/or concerns. Sometimes the computer system handles the call before the customer is allowed to be served by an automated customer support, i.e. a computer. If all lines to an automated or manual  
20 support person are busy, the computer system puts the customer's call in a call waiting queue, in which a latest arrived call is put last in the queue. While the customer waits in the queue, the computer system keeps the customer notified about the current position in the queue at regular intervals by playing back a synthesized and/or recorded voice message, such as "your current position in the queue is fifteen" or "your current  
25 estimated waiting time is fifteen minutes". If the waiting time is long or number of preceding calls is high, it can be very annoying for the customer.

          A disadvantage is that the customer has to keep listening to the voice messages while waiting for its turn. While waiting for its turn, the customer cannot do anything useful because the call itself is very distracting even when using hands-free methods  
30 such as headphones or speakers.

          A known solution, sometimes referred to as "virtual queueing", to this problem allows the customer to express a desire to receive a callback when there is available capacity for serving the customer, and then hang up in order to do other things. A

problem with this solution is that a call center having such functionality needs to be adapted. For companies employing call centers, a disadvantage is that an adaptation of the call center may be costly.

## 5 SUMMARY

An object may be to provide an alternative solution for making the user free to do other tasks while waiting to be served, e.g. by a person.

According to an aspect, the object is achieved by a method, performed by a managing module, for managing voice data generated by a call managing system. The managing module receives, from the call managing system, current voice data indicating a current queue level of a call to the call managing system, wherein the current queue level is given in relation to a queue of calls, wherein the queue of calls is managed by the call managing system to keep track of which call, among the calls of the queue, is to be served next. The managing module determines the current queue level based on the current voice data by use of voice recognition. The managing module indicates that the condition is fulfilled, when the current queue level fulfils a condition relating to that the call is to be served.

According to another aspect, the object is achieved by a managing module configured for managing voice data generated by a call managing system. The managing module is configured for receiving, from the call managing system, current voice data indicating a current queue level of a call to the call managing system, wherein the current queue level is given in relation to a queue of calls, wherein the queue of calls is managed by the call managing system to keep track of which call, among the calls of the queue, is to be served next. Moreover, the managing module is configured for determining the current queue level based on the current voice data by use of voice recognition. Furthermore, the managing module is configured for indicating that the condition is fulfilled, when the current queue level fulfils a condition relating to that the call is to be served.

According to further aspects, the object is achieved by a computer program and a carrier therefor corresponding to the aspects above.

Thanks to that the managing module determines the current queue level based on the current voice data by use of voice recognition, the managing module is able to monitor the current queue level of the call. The current queue level may refer to a current number of calls to be served before the call, i.e. the call whose queue level is monitored.

5 The current queue level may, also or alternatively, refer to an estimated number of minutes left before the call is to be served, i.e. when the estimated number of minutes has lapsed it is expected that the call is to be served.

Hence, when the current queue level fulfils a condition relating to that the call is to be served, the managing module indicates that the condition is fulfilled, e.g. such that  
10 a user of a user equipment, eventually, is made aware of that the call is expected to be served. The condition may be given by a threshold for number of calls to be served before the call, or alternatively or additionally, the condition may be given by a limit for minutes left before the call is expected to be served. In this manner, the user will be notified sufficiently in advance of a point in time at which the call is actually served, e.g.  
15 by a person designated to serve at least some of the calls or by the call managing system.

Advantageously, the user does not have to occupy her/him-self with monitoring of the queue. Thus, the user may beneficially focus on other activities when queuing to be  
20 served.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The various aspects of embodiments disclosed herein, including particular features and advantages thereof, will be readily understood from the following detailed  
25 description and the accompanying drawings, in which:

Figure 1 is a schematic overview of an exemplifying network in which embodiments herein may be implemented,

Figure 2 is a combined signaling and flowchart illustrating some first  
embodiments herein,

30 Figure 3a - Figure 3d are illustrations of display appearances of a user equipment,

Figure 4 is a combined signaling and flowchart illustrating some second  
embodiments herein,

Figure 5 is a combined signaling and flowchart illustrating some third embodiments herein, and

Figure 6 is a block diagram illustrating embodiments of the network node.

## 5 DETAILED DESCRIPTION

Throughout the following description similar reference numerals have been used to denote similar features, such as nodes, actions, steps, modules, circuits, parts, items elements, units or the like, when applicable. In the Figures, features that appear in some embodiments are indicated by dashed lines.

10

**Figure 1** depicts an exemplifying **network 100** in which embodiments herein may be implemented.

The network 100 may for example be a network such as Long-Term Evolution (LTE), e.g. LTE Frequency Division Duplex (FDD), LTE Time Division Duplex (TDD),  
15 LTE Half-Duplex Frequency Division Duplex (HD-FDD), LTE operating in an unlicensed band, or a Wideband Code Division Multiple Access (WCDMA), Universal Terrestrial Radio Access (UTRA) TDD, Ultra-Mobile Broadband (UMB), Global System for Mobile communications (GSM) network, GSM/Enhanced Data Rate for GSM Evolution (EDGE) Radio Access Network (GERAN) network, EDGE network, a network comprising of any  
20 combination of Radio Access Technologies (RATs) such as e.g. Multi-Standard Radio (MSR) base stations, multi-RAT base stations etc., any 3rd Generation Partnership Project (3GPP) cellular network, WiFi networks, Worldwide Interoperability for Microwave Access (WiMax), 5G system or any cellular network or system.

25 The embodiments herein may in particular be implemented in a **managing module 110**, which may be **communicatively connected 101** to a **call managing system 120**. Communication between the managing module 110 and the call managing system 120 may be handled by the network 100.

30 The network 100 may be said to comprise a **user equipment 130**. This means that the user equipment 130 is present in the network 100. The user equipment 130 may be **communicatively connected 102** to a **network node 140**. The network node 140

may be comprised in the network 100, which thus handles communication to/from the user equipment 130.

As used herein, the term “user equipment” may refer to a wireless communication device, a machine-to-machine (M2M) device, a mobile phone, a cellular phone, a Personal Digital Assistant (PDA) equipped with radio communication capabilities, a smartphone, a laptop or personal computer (PC) equipped with an internal or external mobile broadband modem, a tablet PC with radio communication capabilities, a portable electronic radio communication device or the like. The term “user” may indirectly refer to the wireless device. Sometimes, the term “user” may be used to refer to the user equipment or the like as above. It shall be understood that the user may not necessarily involve a human user. The term “user” may also refer to a machine, a software component or the like using certain functions, methods and similar.

According to a first set of embodiments, referred to as “first embodiments” herein, the managing module 110 may be comprised in the user equipment 130. The first embodiments are described with reference to Figure 2 and 3a - 3d.

According to a second set of embodiments, referred to as “second embodiments” herein, the managing module 110 may be comprised in the network node 140. The second embodiments are described with reference to Figure 4.

According to a third set of embodiments, referred to as “third embodiments” herein, the user equipment 130 and the network node 140 comprises **a respective managing module 110a, 110b**. The respective managing modules 110a, 110b may negotiate with each other in order to determine which one of the respective managing module 110a, 110b that shall be active. The third embodiments are described with reference to Figure 5.

With the embodiments herein, a user of the user equipment 130 wishes to get through a queue of calls to become served by e.g. a person or a machine. The queue of calls is managed by the call managing system 120 to keep track of which call, among the calls of the queue, is to be served next. The call managing system 120 may inform the user of a queue level by sending voice data, such as an audio stream, to the user equipment 130. The queue level may relate to an estimated time left before the call is served and/or the queue level may relate to a number of calls in the queue, which calls are to be served before the call.

Moreover, the network 100 is represented by the network node 140, even though the network 100 typically includes a plurality of network nodes designated for various tasks.

5           **Figure 2** thus illustrates an exemplifying method according to the first embodiments herein when implemented in the network 100 of Figure 1. The managing module 110 performs a method for managing voice data generated by the call managing system 120.

10           One or more of the following actions may be performed in any suitable order.

#### **Action A010**

The user equipment 130 may initiate a call to the call managing system 120.

15           In some examples, this means that the user makes the call, i.e. a phone call, to the call managing system 120, such as a customer support line hosted in a call center. The call is established via the network node 140 according to known manners. See Figure 3a.

#### **Action A020**

20           In response to the call, the call managing system 120 responds to the user equipment 130 by sending initial voice data, e.g. a recorded or synthesized message that e.g. greets the user and informs about the initial queue level. The message may be “your position in the queue is seven”, “time to wait is estimated to be eight minutes”, or the like. As mentioned before concerning the term “queue level”, the initial queue level  
25           may refer to expected time in queue before being served or number of calls to be served before the call currently made by the user.

#### **Action A030**

30           Subsequent to action A020, the managing module 110 may receive, from the call managing system 120, the initial voice data. The initial voice data indicates an initial queue level of the queue of calls, i.e. the initial queue level relates to a first point in time, which precedes a second point in time mentioned in action A100 below.

#### **Action A040**

Now that the managing module 110 has received the initial voice data, the managing module 110 may determine the initial queue level based on the initial voice data by use of the voice recognition. In this manner, the managing module 110 may convert the initial voice data, such as an audio stream, into a value representing the initial queue level. Accordingly, the managing module 110 interprets the initial voice data to extract the value representing the initial queue level. As mentioned above, the value may be x minutes, x calls before the present call, or the like.

#### **Action A050**

As an output from the voice recognition, the managing module 110 may obtain a confidence level of the determined initial queue level. The confidence level may be used in action A110 below in order to determine whether or not to allow the queue level to be monitored by use of voice recognition as in action A120.

In actions A030, A040 and A050, an initial analysis loop may be performed in order to validate that analysis of the voice data presents an outcome that is correct at a certain confidence level. As an example, it may be that when the voice recognition is performed, the initial voice data, i.e. a digital representation of acoustic sound/voice, may be match against predefined patterns, i.e. known digital representations of acoustic sound/voice, for which patterns it is known which number, word or phrase it represents. This mapping may not be 100% accurate. A deviation of the initial voice data from the predefined patterns may give the confidence level. See for example Figure 3b.

#### **Action A060**

In this action, the managing module 110 may obtain a quality value relating to quality of a channel for the user equipment 130 handling the call. In this context, the quality of the channel may relate to radio conditions, traffic load, bit rate or the like. The quality of the channel may be obtained by the user equipment 130 by measuring on reference signals or the like from the network node 140 or the like. The quality of the channel may be obtained according to any other known manner.

Similarly as for the confidence level above, the managing module 110 may use the quality value in action A110 in order to determine whether or not to allow the queue level to be monitored by use of voice recognition as in action A120.

#### **Action A070**

The managing module 110 may notify, e.g. the user directly or indirectly, to obtain an input concerning whether or not the determining of current queue level is to be performed. The input is determined by the user of the user equipment 130.

5 As an example, the managing module 110 may display, see Figure 3c, a question, such as “click to enable automatic queue monitoring”, to the user whether or not the user wishes to be alerted when the user is about to be served, as given by a condition detailed in action A130 below. It may also be that the notification is in the form of a vibration of the user equipment 130, a beep from the user equipment 130 or the like.

10 In other examples, the managing module 110 may read a user preference setting by which the user can select whether or not to perform voice recognition, e.g. based on the confidence level and/or the quality value. In this manner, the managing module 110 has in advance and indirectly notified to be able to obtain the input as the user preference setting. High enough confidence level and/or quality value would imply that voice recognition would be allowed, and should, be performed.

15

#### **Action A080**

Following action A070, the managing module 110 may receive the input, such as receive a response to the displayed question or read the user preference setting. This may e.g. happen when the user selects “yes” to the question displayed in action A070.  
20 The user may now put the user equipment 110 aside without hanging up.

#### **Action A090**

The call managing system 120, being unaware of whether or not, the managing module 110 is set to monitor the queue level, sends current voice data to the user  
25 equipment 130. The current voice data indicates a current queue level of the queue of calls, i.e. the current queue level relates to the aforementioned second point in time.

#### **Action A100**

30 Subsequent to action A090, the managing module 110 receives, from the call managing system 120, the current voice data indicating the current queue level of the call to the call managing system 120. The current queue level is given in relation to the queue of calls. As mentioned, the queue of calls is managed by the call managing system 120 to keep track of which call, among the calls of the queue, is to be served next.

**Action A110**

The managing module 110 may perform or not perform actions A120 and A130 based on at least one of the confidence level, the quality value and the input.

5 As an example, the managing module 110 may only perform actions A120 and A130 when the confidence level is above a confidence threshold and when the quality value is above a quality threshold and when the input indicates that the user wishes the managing module 110 to perform these actions.

10 As another example, the managing module 110 may only perform actions A120 and A130 when the confidence level is above a confidence threshold and when the input indicates that the user wishes the managing module 110 to perform these actions. In this example, it may be that if the quality level is high enough it supports, or enables a high confidence level, but it is not enough that the quality level is high if the confidence level still is low. Of course, if the input indicates that the user does not wish to perform actions  
15 A120 and A130, these actions will not be performed regardless how high the confidence level and/or quality level is.

**Action A120**

20 When the managing module 110 has established, in action A110, that this action is to be performed, the managing module 110 determines the current queue level based on the current voice data by use of voice recognition. See Figure 3d as well.

Again, as explained in action A110, the managing module 110 may perform the determining of the current queue level based on at least one of the confidence level and the quality value and the input.

25

**Action A130**

Now that the managing module 110 is aware of the current queue level, the managing module 110 indicates that the condition is fulfilled, when the current queue level fulfils a condition relating to that the call is to be served.

30 When the current queue level relates to an estimated time left before the call is served, the condition may be fulfilled when the current queue level is below a time threshold for indicating how much, e.g. in terms of minutes, in advance the user wishes to be alerted about that the queue level has passed below the time threshold.

When the current queue level relates to a number of calls in the queue, which calls are to be served before the call, the condition may be fulfilled when the current queue level is below a calls threshold for indicating how much, e.g. in terms of number of calls, in advance the user wishes to be alerted about that the queue level has passed  
5 below the calls threshold.

The indicating A130 that the condition is fulfilled may comprise alerting a user of the user equipment 130 by means of one or more of a sound, a light indication, a vibration of the user equipment 130, and a display message.

10 As mentioned before, the queue level may relate to an estimated time left before the call is served and/or the queue level may relate to a number of calls in the queue, which calls are to be served before the call.

At this stage, the user takes over the call and waits to be served. The user may thus depending on the condition determine how much in advance of expected serving to  
15 be alerted that it is time to take over the call.

The method may be performed by the user equipment 130 based on at least one of the quality value and the confidence level. As an example, it may be that action A070 and A080 are only performed when at least one of the quality value and the confidence  
20 level fulfills certain conditions. As mentioned above, the main criteria is that the confidence level fulfills the certain condition, such as that the confidence level is above the confidence threshold. Accordingly, actions A120 and A130 are also only performed when these conditions are fulfilled as well as when the input indicates that these  
25 actions should be performed.

According to the second embodiments, as illustrated in **Figure 4**, an exemplifying method when implemented in the network 100 of Figure 1 will be described in the following. The managing module 110 performs a method for managing voice data generated by the call managing system 120. The same reference numeral have been  
30 used for the same or similar actions as in Figure 2.

One or more of the following actions may be performed in any suitable order.

#### **Action A010**

The user typically uses the user equipment 130 to make a call to the call managing system 120. The network node 140 may then initiate, such as establish, the call to the call managing system 120. Reference is made to action A010 of Figure 2 as applicable.

5 In some examples, the managing module 110 may intercept the call in order to determine whether or not the call is destined for the call managing system 120.

#### **Action A020**

10 In response to the call, the call managing system 120 responds to the network node 140, and thus also to the managing module 110, by sending initial voice data, e.g. a recorded or synthesized message that e.g. greets the user and informs about the initial queue level. Reference is made to action A020 of Figure 2 as applicable.

#### **Action A030**

15 Subsequent to action A020, the managing module 110 may receive, from the call managing system 120, the initial voice data. The initial voice data indicates an initial queue level of the queue of calls, i.e. the initial queue level relates to a first point in time, which precedes a second point in time mentioned in action A100 below. Reference is made to action A030 of Figure 2 as applicable. The initial voice data may also be  
20 received by the user equipment 130.

#### **Action A040**

Now that the managing module 110 has received the initial voice data, the managing module 110 may determine the initial queue level based on the initial voice  
25 data by use of the voice recognition. Reference is made to action A040 of Figure 2 as applicable.

#### **Action A050**

30 As an output from the voice recognition, the managing module 110 may obtain a confidence level of the determined initial queue level. The confidence level may be used in action A110 below in order to determine whether or not to allow the queue level to be monitored by use of voice recognition as in action A120.

In actions A030, A040 and A050, an initial analysis loop may be performed in order to validate that analysis of the voice data presents an outcome that is correct at a certain confidence level. Reference is made to action A050 of Figure 2 as applicable.

#### 5 **Action A060**

In this action, the managing module 110 may obtain a quality value relating to quality of a channel for the user equipment 130 handling the call. In this context, the quality of the channel may relate to radio conditions, traffic load, bit rate or the like. The quality of the channel may be obtained by the network node 140 by receiving reports  
10 about quality of the channel from the user equipment 130. The quality of the channel may be obtained according to any other known manner. Reference is made to action A060 of Figure 2 as applicable.

Similarly as for the confidence level above, the managing module 110 may use the quality value in action A110 in order to determine whether or not to allow the queue  
15 level to be monitored by use of voice recognition as in action A120.

#### **Action A070**

The managing module 110 may notify, e.g. the user directly or indirectly, to obtain an input concerning whether or not the determining of current queue level is to be  
20 performed. The input is determined by the user of the user equipment 130. Reference is made to action A070 of Figure 2 as applicable.

As an example, the managing module 110 may send, to the user equipment 130, a message for requesting the user equipment 130 to obtain the input from the user. The input may be obtained by the user equipment 130 as explained in action A070 when  
25 described in relation to Figure 2.

#### **Action A080**

Following action A070, the managing module 110 may receive, e.g. from the user equipment 130, the input. Reference is made to action A080 of Figure 2 as applicable.

30

#### **Action A090**

The call managing system 120, being unaware of whether or not, the managing module 110 is set to monitor a current queue level, sends current voice data to the user equipment 130. The current voice data indicates the current queue level of the queue of

calls, i.e. the current queue level relates to the aforementioned second point in time. Reference is made to action A090 of Figure 2 as applicable.

#### **Action A100**

5           Subsequent to action A090, the managing module 110 as well as the network node 140 receives, from the call managing system 120, the current voice data indicating the current queue level of the call to the call managing system 120. The current queue level is given in relation to the queue of calls. Reference is made to action A100 of Figure 2 as applicable.

10

#### **Action A110**

The managing module 110 may perform or not perform actions A120 and A130 based on at least one of the confidence level, the quality value and the input.

15           As an example, the managing module 110 may only perform actions A120 and A130 when the confidence level is above a confidence threshold and when the quality value is above a quality threshold and when the input indicates that the user wishes the managing module 110 to perform these actions. Reference is made to action A110 of Figure 2 as applicable.

#### **Action A120**

20           When the managing module 110 has established, in action A110, that this action is to be performed, the managing module 110 determines the current queue level based on the current voice data by use of voice recognition. Reference is made to action A120 of Figure 2 as applicable.

25           Again, as explained in action A110, the managing module 110 may perform the determining of the current queue level based on at least one of the confidence level and the quality value and the input.

#### **Action A130**

30           Now that the managing module 110 is aware of the current queue level, the managing module 110 indicates that the condition is fulfilled, when the current queue level fulfils a condition relating to that the call is to be served. Reference is made to action A130 of Figure 2 as applicable.

When the current queue level relates to an estimated time left before the call is served, the condition may be fulfilled when the current queue level is below a time threshold for indicating how much, e.g. in terms of minutes, in advance the user wishes to be alerted about that the queue level has passed below the time threshold.

5           When the current queue level relates to a number of calls in the queue, which calls are to be served before the call, the condition may be fulfilled when the current queue level is below a calls threshold for indicating how much, e.g. in terms of number of calls, in advance the user wishes to be alerted about that the queue level has passed below the calls threshold.

10

At this stage, the managing module 110 re-establishes, or instructs the network node 140 to re-establish, the call.

The indicating A130 that the condition is fulfilled may then comprise sending, to the user equipment 130, an alert message for instructing the user equipment 130 to  
15           indicate by means of one or more of a sound, a light indication, a vibration of the user equipment 130, and a display message, that the condition is fulfilled.

The user may thus depending on the condition determine how much in advance of expected serving to be alerted that it is soon the users turn to be served.

As mentioned before, the current queue level may relate to an estimated time left  
20           before the call is served and/or the current queue level may relate to a number of calls in the queue, which calls are to be served before the call.

The method may be performed by the network node 140 based on at least one of the quality value and the confidence level. As an example, it may be that action A070  
25           and A080 are only performed when at least one of the quality value and the confidence level fulfills certain conditions. Accordingly, actions A120 and A130 are also only performed when these conditions are fulfilled as wells as when the input indicates that these actions should be performed.

30           In **Figure 5**, schematic flowcharts of exemplifying methods in the respective managing modules 110a, 110b are shown. These embodiments illustrate a particular example of the third embodiments, in which the respective managing module 110a, 110b cooperate with each other to find out where, i.e. in the network node 140 or in the user

equipment 130, it appears to be most beneficial to perform the method according to Figure 2 or Figure 4.

One or more of the following actions may be performed in any suitable order.

5

#### **Action B010**

Subsequently to at least one of actions A050, A060 and A080, the user equipment, i.e. the respective managing module 110a, may obtain at least one of the confidence level, the quality value and the input.

10

#### **Action B020**

In order to for the user equipment 130 to be able to compare its ability to perform at least action A120 with the network node's 140 ability to perform the corresponding action, the user equipment 130 may generate a user equipment (UE) score based on at least one of the confidence level, the quality value and the input.

15

The UE score may be a weighted sum of the confidence level, the quality value and the input, a product of the confidence level, the quality value and the input or the like. As used herein, the term "product" as its conventional meaning within mathematics, i.e. the product is a result of a multiplication of factors, where the factors are one or more of the confidence level, the quality value and the input.

20

#### **Action B030**

Subsequently to at least one of actions A050, A060 and A080, the network node 140, i.e. the respective managing module 110b, may obtain at least one of the confidence level, the quality value and the input.

25

#### **Action B040**

In order to for the network node 140 to be able to compare its ability to perform at least action A120 with the user equipment's 130 ability to perform the corresponding action, the network node 140 may generate a network score based on at least one of the confidence level, the quality value and the input.

30

The network score, similarly to the UE score, may be a weighted sum of the confidence level, the quality value and the input, a product of the confidence level, the quality value and the input or the like.

**Action B050**

The user equipment 130 may send the UE score to the network node 140 and the user equipment 130 may receive the network score from the network node 140.

5

**Action B060**

The network node 140 may send the network score to the user equipment 130 and the network node 140 may receive the UE score from the user equipment 130.

10 **Action B070**

The user equipment 130 may perform action A120, and possibly also action A110 and A130, when the UE score is greater than the network score. Otherwise, i.e. when the UE score is less than or equal to the network score the user equipment 130 does not perform action A120 of Figure 2.

15

**Action B080**

The network node 140 may perform action A120, and possibly also action A110 and A130, when the network score is greater than or equal to the UE score. Otherwise, i.e. when the network score is less than the UE score the network node 140 does not perform action A120 of Figure 4.

20

In a particular example, not taking advantage of voice recognition as with the embodiments herein, the call managing module 120 may implement, e.g. by means of a software upgrade, a function which causes the call managing module 120 to send a signal to the network node 140, wherein the signal, or message, indicates the current queue level, e.g. directly as a numerical value.

25

With this particular example, there will be no need to send voice data and to perform voice recognition. The network node 140 will thus not need to implement such functionality, i.e. the network node 140 will save on complexity. Moreover, reliability of a solution according to this particular example may increase compared to the embodiments making use of voice recognition since of course the voice recognition may not always interpret the voice data correctly.

30

With reference to **Figure 6**, a schematic block diagram of embodiments of the managing module 110 of Figure 1 is shown. As shown in Figure 1, the managing module 110 may be comprised in the user equipment 130 or the network node 140, or both as illustrated with the respective managing modules 110a, 110b.

5

The managing module 110 may comprise **a processing module 601**, such as a means for performing the methods described herein. The means may be embodied in the form of one or more hardware modules and/or one or more software modules

The managing module 110 may further comprise **a memory 602**. The memory  
10 may comprise, such as contain or store, instructions, e.g. in the form of **a computer program 603**, which may comprise computer readable code units.

According to some embodiments herein, the managing module 110 and/or the processing module 601 comprises **a processing circuit 604** as an exemplifying  
15 hardware module. Accordingly, the processing module 601 may be embodied in the form of, or 'realized by', the processing circuit 604. The instructions may be executable by the processing circuit 604, whereby the managing module 110 is operative to perform the methods of Figure 2 and/or Figure 4. As another example, the instructions, when executed by the managing module 110 and/or the processing circuit 604, may cause the  
20 managing module 110 to perform the method according to Figure 2 and/or 4.

Figure 6 further illustrates **a carrier 605**, or program carrier, which comprises the computer program 603 as described directly above.

25 In some embodiments, the processing module 601 comprises **an Input/Output module 606**, which may be exemplified by a receiving module and/or a sending module as described below when applicable.

In further embodiments, the managing module 110 and/or the processing module  
30 601 may comprise one or more of **a receiving module 610, a determining module 620, an indicating module 630, an obtaining module 640, a notifying module 650, a performing module 660, and a generating module 670** as exemplifying hardware modules. In other examples, one or more of the aforementioned exemplifying hardware modules may be implemented as one or more software modules.

Accordingly, the managing module 110 is configured for managing voice data generated by a call managing system 120.

Therefore, according to the various embodiments described above, the managing  
5 module 110 and/or the processing module 601 and/or the receiving module 610 is  
configured for receiving, from the call managing system 120, current voice data  
indicating a current queue level of a call to the call managing system 120, wherein the  
current queue level is given in relation to a queue of calls, wherein the queue of calls is  
managed by the call managing system 120 to keep track of which call, among the calls  
10 of the queue, is to be served next.

Moreover, the managing module 110 and/or the processing module 601 and/or  
the determining module 620 is configured for determining the current queue level based  
on the current voice data by use of voice recognition.

Furthermore, the managing module 110 and/or the processing module 601  
15 and/or the indicating module 630 is configured for indicating that the condition is fulfilled,  
when the current queue level fulfils a condition relating to that the call is to be served.

According to some embodiments, the managing module 110 and/or the  
processing module 601 and/or the receiving module 610, or a further receiving module  
20 (not shown), may be configured for receiving, from the call managing system 120, initial  
voice data, wherein the initial voice data indicates an initial queue level of the queue of  
calls.

In these embodiments, the managing module 110 and/or the processing module  
601 and/or the determining module 620, or a further determining module (not shown),  
25 may be configured for determining the initial queue level based on the initial voice data  
by use of the voice recognition.

Moreover, in these embodiments, the managing module 110 and/or the  
processing module 601 and/or the obtaining module 640 may be configured for obtaining  
a confidence level of the determined initial queue level.

30

The managing module 110 and/or the processing module 601 and/or the  
obtaining module 640, or a further obtaining module (not shown), may be configured for  
obtaining a quality value relating to quality of a channel for a user equipment 130  
handling the call.

The managing module 110 and/or the processing module 601 and/or the notifying module 650 may be configured for notifying to obtain an input concerning whether or not the determining of current queue level is to be performed, wherein the  
5 input is determined by a user of a user equipment 130.

The managing module 110 and/or the processing module 601 and/or the notifying module 650 may be configured for notifying based on at least one of the confidence level and the quality value.  
10

The managing module 110 and/or the processing module 601 and/or the performing module 660 may be configured for performing the determining of the current queue level based on at least one of the confidence level and the quality value and the input.  
15

The current/initial queue level may relate to an estimated time left before the call is served and/or the current/initial queue level may relate to a number of calls in the queue, which calls are to be served before the call.

The managing module 110 and/or the processing module 601 and/or the performing module 660 may be configured for performing the method above according to Figure 2 when the managing module 110 is comprised in the user equipment 130 based on at least one of the quality value and the confidence level.  
20

The managing module 110 and/or the processing module 601 and/or the indicating module 630 may be configured for indicating that the condition is fulfilled by alerting a user of the user equipment 130 by means of one or more of a sound, a light indication, a vibration of the user equipment 130, and a display message.  
25

The managing module 110 may be configured for performing a method according to Figure 4 when the managing module 110 is comprised in the network node 140 based on at least one of the quality value and the confidence level.  
30

The managing module 110 and/or the processing module 601 and/or the indicating module 630 may be configured for indicating that the condition is fulfilled by

sending, to the user equipment 130 involved in the call, a message indicating that the condition is fulfilled.

As used herein, the term “node”, or “network node”, may refer to one or more  
5 physical entities, such as devices, apparatuses, computers, servers or the like. This may mean that embodiments herein may be implemented in one physical entity. Alternatively, the embodiments herein may be implemented in a plurality of physical entities, such as an arrangement comprising said one or more physical entities, i.e. the embodiments may be implemented in a distributed manner, such as on a set of server machines of a cloud  
10 system.

As used herein, the term “module” may refer to one or more functional modules, each of which may be implemented as one or more hardware modules and/or one or more software modules and/or a combined software/hardware module in a node. In some examples, the module may represent a functional unit realized as software and/or  
15 hardware of the node.

As used herein, the term “program carrier”, or “carrier”, may refer to one of an electronic signal, an optical signal, a radio signal, and a computer readable medium. In some examples, the program carrier may exclude transitory, propagating signals, such as the electronic, optical and/or radio signal. Thus, in these examples, the carrier may be  
20 a non-transitory carrier, such as a non-transitory computer readable medium.

As used herein, the term “processing module” may include one or more hardware modules, one or more software modules or a combination thereof. Any such module, be it a hardware, software or a combined hardware-software module, may be a determining means, estimating means, capturing means, associating means, comparing means,  
25 identification means, selecting means, receiving means, sending means or the like as disclosed herein. As an example, the expression “means” may be a module corresponding to the modules listed above in conjunction with the Figures.

As used herein, the term “software module” may refer to a software application, a Dynamic Link Library (DLL), a software component, a software object, an object  
30 according to Component Object Model (COM), a software component, a software function, a software engine, an executable binary software file or the like.

As used herein, the term “processing circuit” may refer to a processing unit, a processor, an Application Specific Integrated Circuit (ASIC), a Field-Programmable Gate

Array (FPGA) or the like. The processing circuit or the like may comprise one or more processor kernels.

As used herein, the expression “configured to/for” may mean that a processing circuit is configured to, such as adapted to or operative to, by means of software configuration and/or hardware configuration, perform one or more of the actions described herein.

As used herein, the term “action” may refer to an action, a step, an operation, a response, a reaction, an activity or the like. It shall be noted that an action herein may be split into two or more sub-actions as applicable. Moreover, also as applicable, it shall be noted that two or more of the actions described herein may be merged into a single action.

As used herein, the term “memory” may refer to a hard disk, a magnetic storage medium, a portable computer diskette or disc, flash memory, random access memory (RAM) or the like. Furthermore, the term “memory” may refer to an internal register memory of a processor or the like.

As used herein, the term “computer readable medium” may be a Universal Serial Bus (USB) memory, a DVD-disc, a Blu-ray disc, a software module that is received as a stream of data, a Flash memory, a hard drive, a memory card, such as a MemoryStick, a Multimedia Card (MMC), Secure Digital (SD) card, etc. One or more of the aforementioned examples of computer readable medium may be provided as one or more computer program products.

As used herein, the term “computer readable code units” may be text of a computer program, parts of or an entire binary file representing a computer program in a compiled format or anything there between.

As used herein, the expression “transmit” and “send” are considered to be interchangeable. These expressions include transmission by broadcasting, uni-casting, group-casting and the like. In this context, a transmission by broadcasting may be received and decoded by any authorized device within range. In case of uni-casting, one specifically addressed device may receive and decode the transmission. In case of group-casting, a group of specifically addressed devices may receive and decode the transmission.

As used herein, the terms “number” and/or “value” may be any kind of digit, such as binary, real, imaginary or rational number or the like. Moreover, “number” and/or

“value” may be one or more characters, such as a letter or a string of letters. “Number” and/or “value” may also be represented by a string of bits, i.e. zeros and/or ones.

As used herein, the term “set of” may refer to one or more of something. E.g. a set of devices may refer to one or more devices, a set of parameters may refer to one or  
5 more parameters or the like according to the embodiments herein.

As used herein, the expression “in some embodiments” has been used to indicate that the features of the embodiment described may be combined with any other embodiment disclosed herein.

Further, as used herein, the common abbreviation “e.g.”, which derives from the  
10 Latin phrase “exempli gratia,” may be used to introduce or specify a general example or examples of a previously mentioned item, and is not intended to be limiting of such item. If used herein, the common abbreviation “i.e.”, which derives from the Latin phrase “id est” may be used to specify a particular item from a more general recitation. The common abbreviation “etc.”, which derives from the Latin expression “et cetera” meaning  
15 “and other things” or “and so on” may have been used herein to indicate that further features, similar to the ones that have just been enumerated, exist.

Even though embodiments of the various aspects have been described, many different alterations, modifications and the like thereof will become apparent for those  
20 skilled in the art. The described embodiments are therefore not intended to limit the scope of the present disclosure.

## CLAIMS

1. A method, performed by a managing module (110), for managing voice data generated by a call managing system (120), wherein the method comprises:
  - receiving (A100), from the call managing system (120), current voice data
  - 5 indicating a current queue level of a call to the call managing system (120), wherein the current queue level is given in relation to a queue of calls, wherein the queue of calls is managed by the call managing system (120) to keep track of which call, among the calls of the queue, is to be served next,
  - determining (A120) the current queue level based on the current voice data
  - 10 by use of voice recognition, and
  - when the current queue level fulfils a condition relating to that the call is to be served, indicating (A130) that the condition is fulfilled.
  
2. The method according to claim 1, wherein the method comprises:
  - 15 receiving (A030), from the call managing system (120), initial voice data, wherein the initial voice data indicates an initial queue level of the queue of calls,
  - determining (A040) the initial queue level based on the initial voice data by use of the voice recognition, and
  - obtaining (A050) a confidence level of the determined initial queue level.
  - 20
  
3. The method according to claim 1 or 2, wherein the method comprises:
  - obtaining (A060) a quality value relating to quality of a channel for a user equipment (130) handling the call.
  
- 25 4. The method according to any one of claim 1-3, wherein the method comprises:
  - notifying (A070) to obtain an input concerning whether or not the determining of current queue level is to be performed, wherein the input is determined by a user of a user equipment (130).
  
- 30 5. The method according to the preceding claim, when dependent on claim 2 and/or claim 3, wherein the notifying (A070) is performed based on at least one of the confidence level and the quality value.
  
6. The method according to any one of claims 2-5, wherein the method comprises:

performing (A110) the determining of the current queue level based on at least one of the confidence level and the quality value and the input.

- 5 7. The method according to any one of the preceding claims, wherein the current queue level relates to an estimated time left before the call is served and/or the current queue level relates to a number of calls in the queue, which calls are to be served before the call.
- 10 8. The method according to any one of the preceding claims, wherein the managing module (110) is comprised in a user equipment (130).
- 15 9. The method according to claim 8, when dependent on claim 2 and/or 3, wherein the method is performed by the user equipment (130) based on at least one of the quality value and the confidence level.
- 20 10. The method according to claim 8 or 9, wherein the indicating (A130) that the condition is fulfilled comprises alerting a user of the user equipment (130) by means of one or more of a sound, a light indication, a vibration of the user equipment (130), and a display message.
- 25 11. The method according to any one of the preceding claims, wherein the managing module (110) is comprised in a network node (140).
- 30 12. The method according to claim 11, when dependent on claim 2 and/or 3, wherein the method is performed by the network node (140) based on at least one of the quality value and the confidence level.
13. The method according to claim 11 or 12, wherein the indicating (A130) that the condition is fulfilled comprises sending, to a user equipment (130) involved in the call, a message indicating that the condition is fulfilled.
14. A computer program (603), comprising computer readable code units which when executed on a managing module (110) causes the managing module (110) to perform the method according to any one of claims 1-13.

15. A carrier (605) comprising the computer program according to the preceding claim, wherein the carrier (605) is one of an electronic signal, an optical signal, a radio signal and a computer readable medium.

5

16. A managing module (110) configured for managing voice data generated by a call managing system (120), wherein the managing module (110) is configured for:  
receiving, from the call managing system (120), current voice data indicating a current queue level of a call to the call managing system (120), wherein the current queue level is given in relation to a queue of calls, wherein the queue of calls is managed by the call managing system (120) to keep track of which call, among the calls of the queue, is to be served next,

10

determining the current queue level based on the current voice data by use of voice recognition, and

15

when the current queue level fulfils a condition relating to that the call is to be served, indicating that the condition is fulfilled.

17. The managing module (110) according to claim 16, wherein the managing module (110) is configured for:

20

receiving, from the call managing system (120), initial voice data, wherein the initial voice data indicates an initial queue level of the queue of calls,

determining the initial queue level based on the initial voice data by use of the voice recognition, and

obtaining a confidence level of the determined initial queue level.

25

18. The managing module (110) according to claim 16 or 17, wherein the managing module (110) is configured for:

obtaining a quality value relating to quality of a channel for a user equipment (130) handling the call.

30

19. The managing module (110) according to any one of claims 16-18, wherein the managing module (110) is configured for:

notifying to obtain an input concerning whether or not the determining of current queue level is to be performed, wherein the input is determined by a user of a user equipment (130).

35

20. The managing module (110) according to claim 19, when dependent on claim 17 and/or claim 18, wherein the managing module (110) is configured for notifying based on at least one of the confidence level and the quality value.

5

21. The managing module (110) according to any one of claims 16-20, wherein the managing module (110) is configured for:

performing the determining of the current queue level based on at least one of the confidence level and the quality value and the input.

10

22. The managing module (110) according to any one of claims 16-21, wherein the current queue level relates to an estimated time left before the call is served and/or the current queue level relates to a number of calls in the queue, which calls are to be served before the call.

15

23. The managing module (110) according to any one of claims 16-23, wherein the managing module (110) is comprised in a user equipment (130).

24. The managing module (110) according to claim 23, when dependent on claim 17 and/or 18, wherein the managing module (110) is configured for performing a method according to any one of claims 1-13 based on at least one of the quality value and the confidence level.

20

25. The managing module (110) according to claim 23 or 24, wherein the managing module (110) is configured for indicating that the condition is fulfilled by alerting a user of the user equipment (130) by means of one or more of a sound, a light indication, a vibration of the user equipment (130), and a display message.

25

26. The managing module (110) according to any one of claims 16-22, wherein the managing module (110) is comprised in a network node (140).

30

27. The managing module (110) according to claim 26, when dependent on claim 17 and/or 18, wherein the managing module (110) is configured for performing a

method according to any one of claims 1-13 based on at least one of the quality value and the confidence level.

- 5 28. The managing module (110) according to claim 26 or 27, wherein the managing module (110) is configured for indicating that the condition is fulfilled by sending, to a user equipment (130) involved in the call, a message indicating that the condition is fulfilled.

1/6

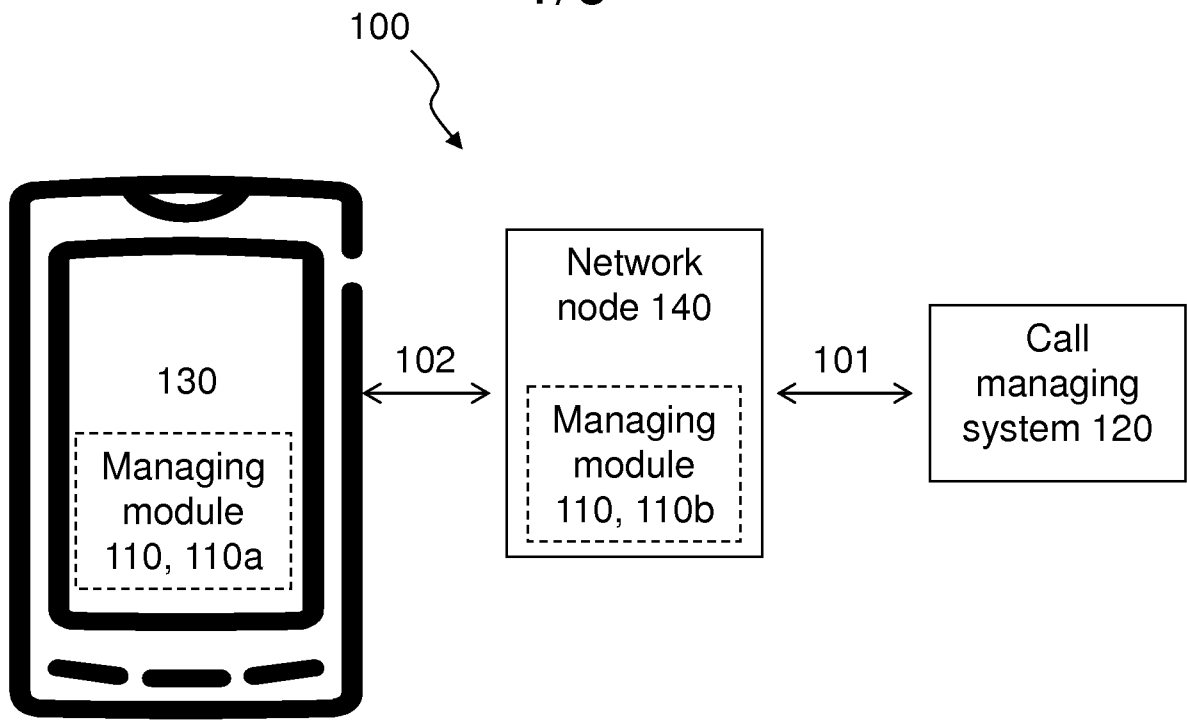


Fig. 1

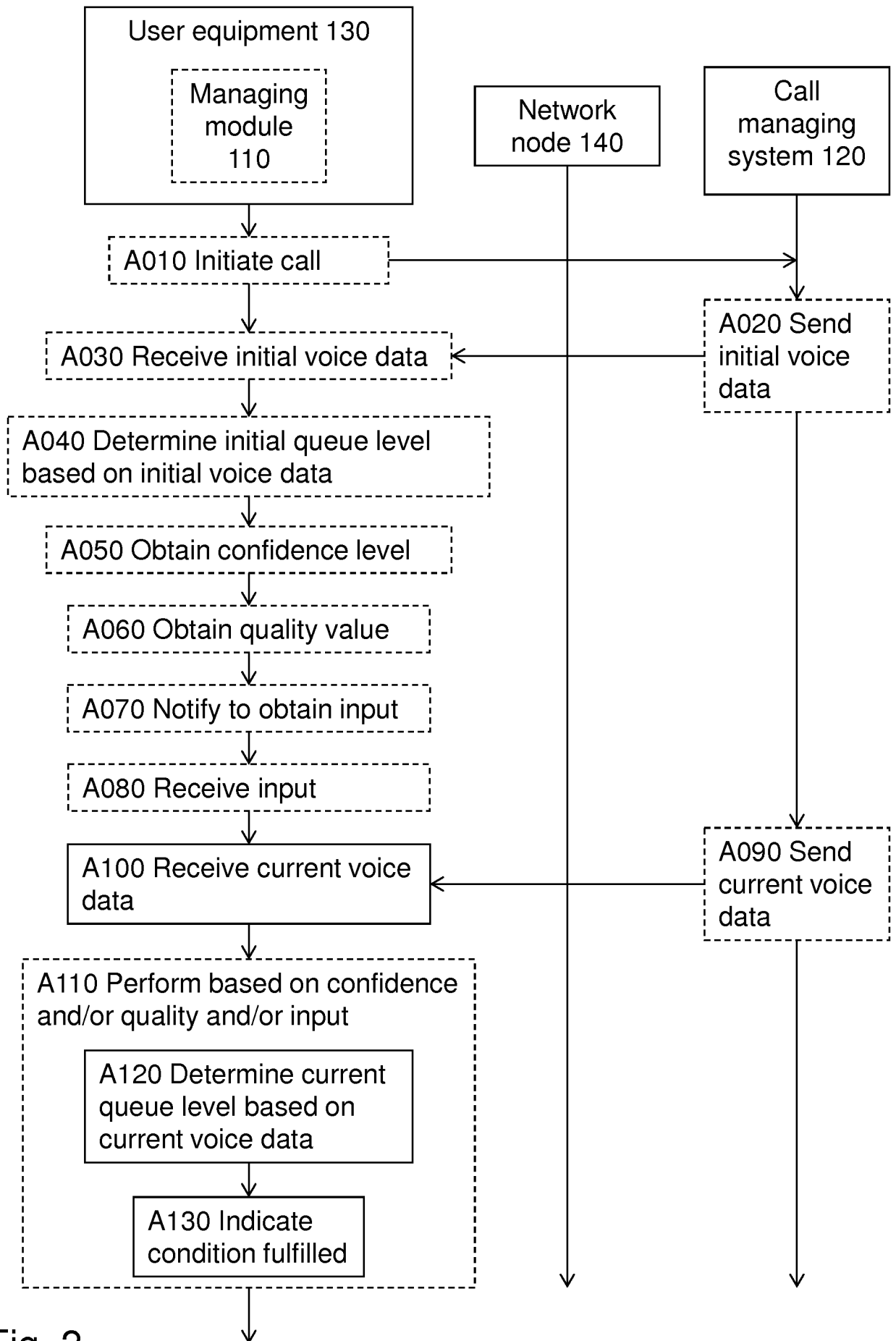


Fig. 2

3/6

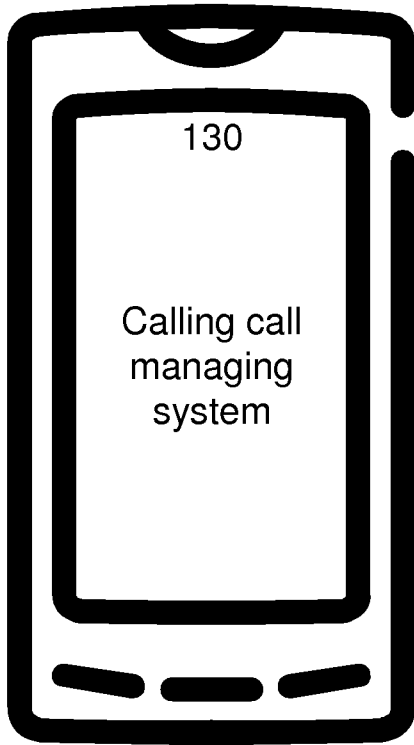


Fig. 3a

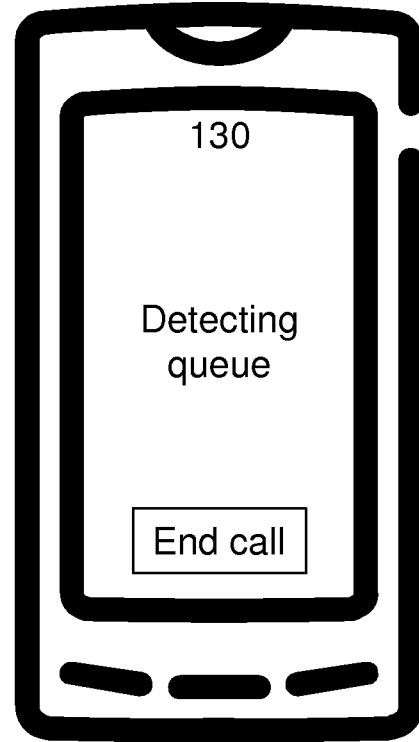


Fig. 3b

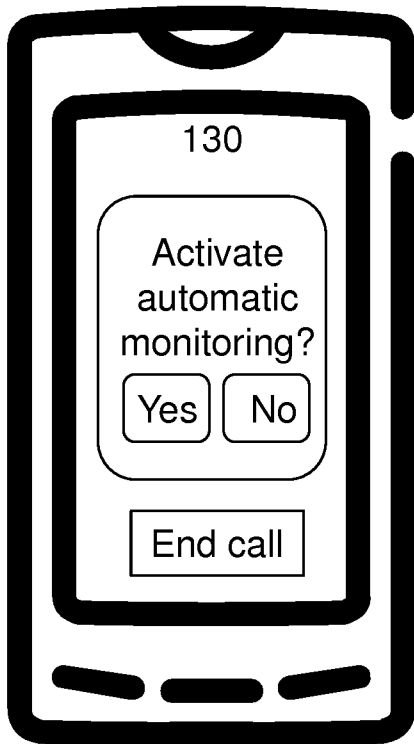


Fig. 3c

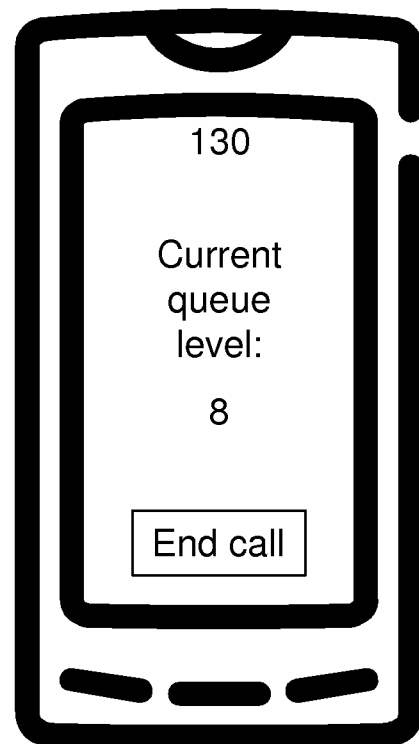


Fig. 3d

4/6

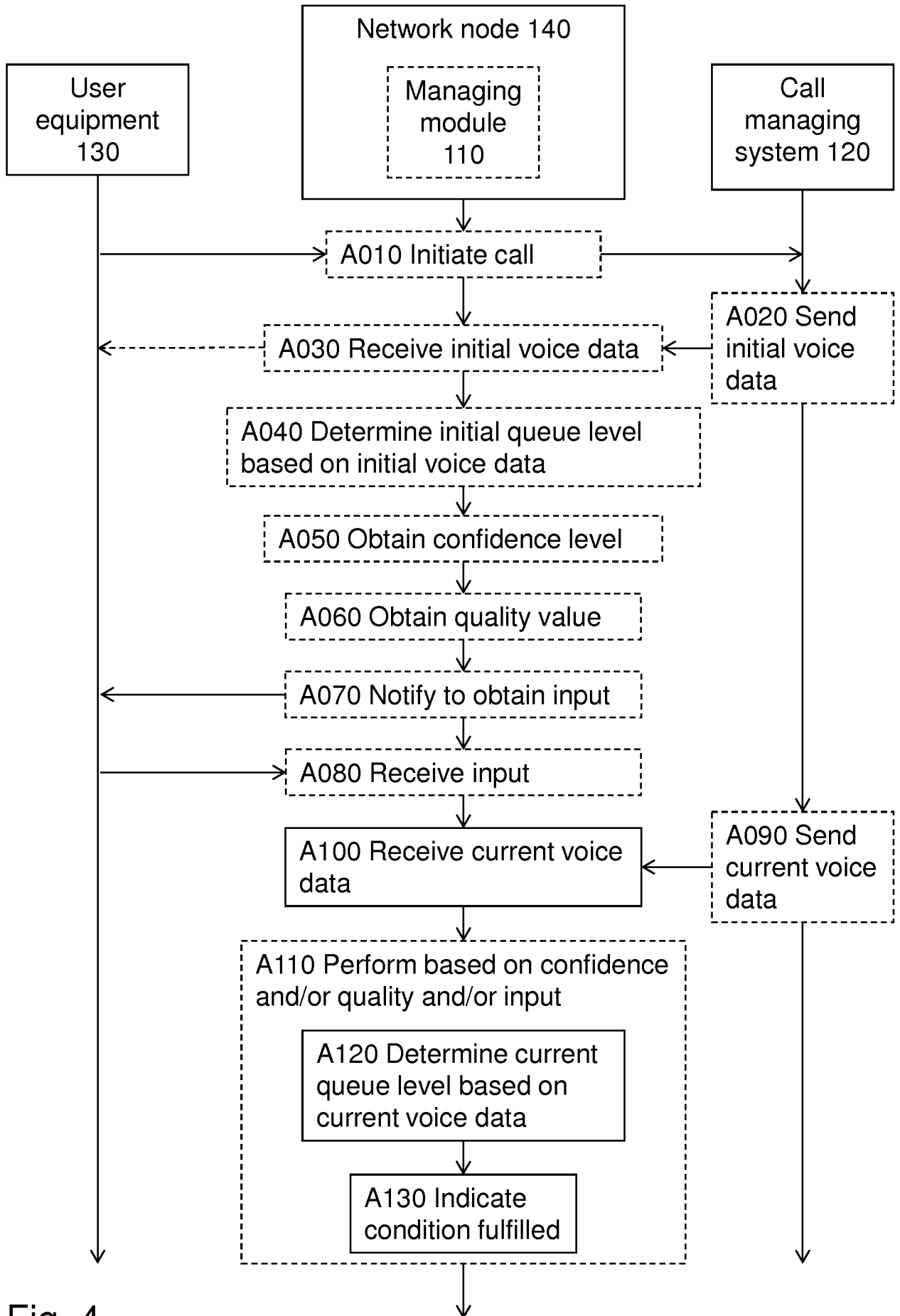


Fig. 4

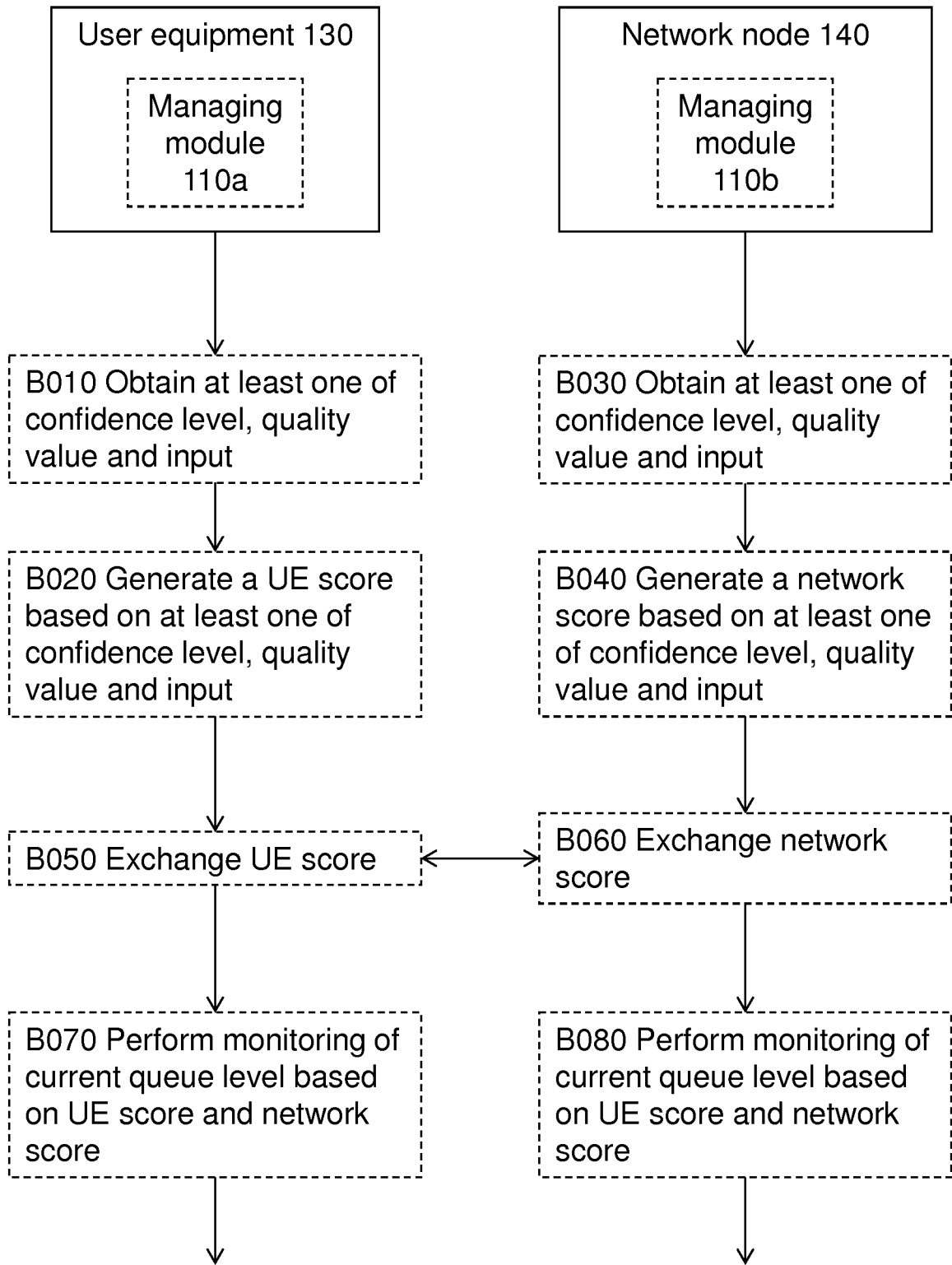


Fig. 5

6/6

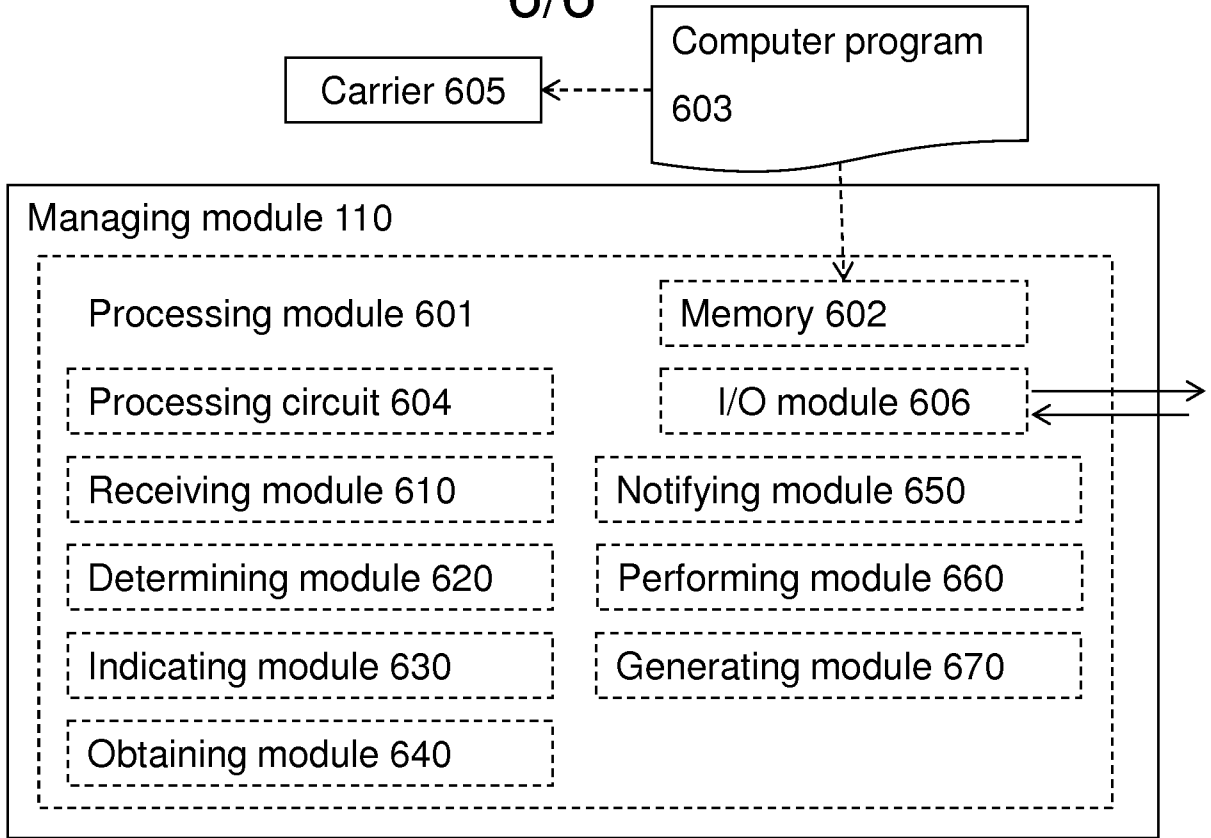


Fig. 6

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/EP2016/059268

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. H04M3/428  
 ADD. H04M3/51                      H04M3/523

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)  
 H04M

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/303227 A1 (GUPTA KSHITIJ [US]) 2 December 2010 (2010-12-02) abstract figures 1,2,3,5,6,8 paragraph [0002] paragraph [0004] - paragraph [0009] paragraph [0039] - paragraph [0040] paragraph [0043] paragraph [0049] - paragraph [0050] paragraph [0052] - paragraph [0056] paragraph [0067] - paragraph [0069] -----	1-28

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search  8 November 2016	Date of mailing of the international search report  16/11/2016
--	--

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Molinari, Fausto
--	--

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/059268

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010303227	A1	NONE	