**Title:** APPARATUS AND METHOD FOR MANAGING QUEUES OF CALLS ADDRESSED TO A PLURALITY OF OPERATORS

**Abstract:** An apparatus for managing queues of calls addressed to a given addressee (10), wherein a plurality of agents (A1...An) are in charge of answering said calls, said apparatus comprising: an input interface (20) for receiving calls addressed to said given addressee (10); an output interface (30) for sending calls to said given addressee (10); a processing unit (40), connected to said input interface (20) and said output interface (30) and configured to: receive an incoming call, addressed to said given addressee (10), through said input interface (20); determine an estimated waiting time (ET) for said call, said estimated waiting time (IT) being representative of an estimated time that will elapse before one of said agents (A1...An) becomes available to pick up said call; communicate at least said estimated waiting time (ET) to the caller who is making said call; receive instructions from said caller following communication of said estimated waiting time (IT); make an outgoing call to said given addressee (10) through said output interface (30); receive a confirmation signal (S) from one of said agents (A1...An) when said agent becomes available to pick up said outgoing call: connect said caller to said agent through said outgoing call.
APPARATUS AND METHOD FOR MANAGING QUEUES OF CALLS ADDRESSED TO A PLURALITY OF OPERATORS

DESCRIPTION
The present invention relates to an apparatus and a method for managing queues of calls addressed to a plurality of operators.

In particular, the invention falls within the frame of so-called call centers, i.e. structures wherein a plurality of operators are in charge of answering telephone calls, all addressed to the same telephone number, and of providing information/services to callers.

A structure of this kind typically operates as follows: when a user calls, the call is forwarded to one of the operators who are available at that instant; if no operators are available, because all of them are busy talking to users/customers who called earlier, a waiting queue is created.

In such a circumstance, the caller is typically informed that no operators are currently available, and is advised to stay on hold to keep the priority acquired in the waiting queue.

When the call in question is first in the queue, it is forwarded to the first operator that becomes available again.

As is known, in this context it is not uncommon that very long queues are created, for example due to a number of calls that largely exceeds the total number of operators; the waiting time may then become as long as several minutes, thus creating much discomfort for those callers who have not yet been answered.

This problem is particularly felt because the user is clearly led to hang up without having been able to talk to an operator. This implies a sensation of manifest dissatisfaction, which may lead to lost customers, unsuccessful promotional campaigns, or failure of any other initiatives/activities based on calls made by the reference public to a certain structure.

One possible solution to this problem is to increase the number of answering operators.

Of course, this solution is wholly unsatisfying, since it involves higher costs and a more complex organization of the call center, as well as a waste of time and resources in those time intervals when the number of calls is lower than during the saturation periods.

In the light of the above, it is one object of the present invention to provide an apparatus
and a method for managing queues of calls, which allow to satisfy the callers without them being forced to wait for a long time, while also allowing the call center structure to remain small in size.

It is a further object of the invention to improve the management of waiting queues without requiring particular technologic additions to existing structures.

These and other objects are substantially achieved through an apparatus and a method for managing queues of calls as set out in the appended claims.

Further features and advantages will become more apparent from a detailed description of one preferred and non-limiting embodiment of the invention.

Said description refers to the annexed Figure 1, which is also supplied by way of non-limiting example, and which shows a block diagram representative of the invention.

With reference to the annexed drawings, reference numeral 1 designates as a whole an apparatus according to the present invention.

First of all, the apparatus 1 comprises an input interface 20 and an output interface 30.

Through the input interface 20, calls addressed to a given addressee 10 can be received.

Through the output interface 30, calls to said given addressee 10 can be made.

In practice, the first and second interfaces 20, 30 include all the hardware and/or software components which are necessary for managing incoming and outgoing calls in accordance with the present description.

The given addressee 10 may be, for example, a call center or a similar structure, wherein a plurality of agents Al...An are in charge of answering calls made by respective callers.

The given addressee 10 is preferably equipped with an automatic system for managing and addressing the received calls; by way of example, the given addressee may comprise a so-called automatic call distributor (hereafter referred to as ACD), i.e. a device which automatically and selectively distributes the received calls to a plurality of terminals or agents.

The calls received by the given addressee 10, in particular the ACD, are managed by the latter in accordance with a First In First Out (FIFO) mode, so that those calls which are received first will be the first to be answered, and, more in general, the calls will be answered in exactly the same order in which they have been received.

The given addressee 10 is identified by at least one identifier, such as, for example, a telephone number, through which the callers can make their calls to the given addressee
The agents Al...An may be, for example, human operators working in the call center and associated with respective devices or terminals, through which they can receive the calls sent to the given addressee 10 and can answer the inquiries made by the callers/customers.

It should be noted that, in the present description and in the appended claims, a "call" is preferably meant to be a telephone call, made by using any appropriate technology.

The apparatus 1 also comprises a processing unit 40, connected to the aforementioned input interface 20 and output interface 30.

The apparatus 1, in particular the processing unit 40, performs the task of managing the queues of calls originally addressed to the given addressee 10.

In other words, the apparatus 1 can be implemented in the form of a platform functionally interposed between the callers and the given addressee 10 in order to manage the calls as described and claimed below.

The calls addressed to the identifier (i.e. the telephone number) of the given addressee 10 are actually received by the apparatus 1 through the input interface 20.

For each incoming call received, the processing unit 40 makes a corresponding outgoing call to the given addressee 10, in particular to the aforementioned ACD.

In this manner, the processing unit 40 can separately handle the two corresponding channels, i.e. the one generated by the caller and the one generated by the processing unit 40 towards the given addressee 10.

In order to preserve the logical and functional association between the incoming call received and the call made towards the ACD, the processing unit 40 may use, for example, a correspondence table conveniently stored in a memory of the processing unit 40 itself.

By means of the call made to the ACD via the output interface 30, the processing unit 40 establishes a communication with the ACD; at this point, two scenarios may occur:

- there is at least one agent available;
- there are no agents available.

In the former case, the call made by the processing unit 40 is forwarded to the available agent (or to one of the available agents, if there are more than one). By answering said call, the latter sends a confirmation signal S, e.g. a DTMF tone, as a connection start confirmation. Note that the confirmation signal S may also be generated automatically,
as soon as the agent/operator picks up the call.
As it recognizes the confirmation signal, the processing unit 40 will put the agent in
connection with the caller.
In the latter case, i.e. when there are no agents available, the call made by the processing
unit 40 towards the ACD is queued after any other previously waiting calls.
Note that such previous calls are telephone sessions activated by the same processing
unit 40 following calls previously made by other callers that did not find any agent
available.
At the same time, the processing unit 40 determines an estimated waiting time ET for
the incoming call.
In other words, the processing unit 40 estimates the time that may elapse until the
incoming call can be picked up by an agent.
Preferably, the estimated waiting time ET is determined by the processing unit 40 as a
function of an average duration of calls received by the agents A1...An.
This datum can be calculated by the processing unit 40, for example, on the basis of the
number of confirmation signals S received by the processing unit 40 within a given time
interval.
Preferably, the average duration is updated in an adaptive manner, e.g. on a periodic
basis, by the processing unit 40.
The estimated waiting time ET is preferably determined as a function of the number of
calls which have been received before the call in question, and which have not yet been
picked up by the agents A1...An.
In particular, said number of calls may be determined as a difference between the total
number of calls made by the processing unit 40 to the given addressee 10 and the
number of DTMF tones transmitted by the agents A1...An.
By way of example, the estimated waiting time ET may be determined as follows:
- an average call duration is calculated by dividing a given time interval by the
  number of confirmation signals S received in such interval;
- the number of queued calls is calculated;
- the number of queued calls is multiplied by the average duration;
- the value thus obtained is divided by the number of agents A1...An working at
  the given addressee 10.
After having calculated said estimated waiting time ET, the processing unit 40 will
communicate it to the caller who is making the incoming call.
Preferably, the processing unit 40 will also communicate to the caller the number of
waiting calls received before the incoming call in question.
Note that communication from the processing unit 40 to the caller may occur through a
voice synthesizer, which artificially creates voice messages that are sent to the caller
during the telephone session, or through a composition of pre-stored partial messages,
which are appropriately assembled depending on the information to be provided.
Advantageously, the processing unit 40 is configured to give the caller a number of
possibilities, one of which can then be chosen by the caller depending on the estimated
waiting time ET that was previously communicated to him/her.
For example, the processing unit 40 may send to the caller who is making the incoming
call a request to choose whether to stay on hold or be called back later.
A further possibility that may be offered to the caller is to benefit from alternative
contents, e.g. navigating in an automatic answering system, where the caller may find
the desired information without having to wait for one of the agents A1...An to become
available.
After having received the estimated waiting time ET, the caller will in turn provide
instructions to the processing unit 40.
By way of example, the caller will choose whether to hang up and then be called back
as soon as an agent A1...An becomes available again (that is, reasonably, at the end of
the estimated waiting time ET) or to stay on hold and wait, or to divert his/her call
towards an automatic answering system.
In one embodiment, if the caller chooses to stay on hold, he/she may receive advertising
and/or marketing-oriented contents. When an agent becomes available again, the caller
will be connected to that agent.
If the caller chooses to be called back, the incoming call will be terminated, but the
Corresponding outgoing call, i.e. the call that the processing unit 40 made to the given
addressee 10 upon receiving the incoming call, will be kept alive.
Before the incoming call is terminated, the caller is allowed to input the data necessary
for being called back, e.g. first name, surname and telephone number, the latter being
useful especially when it is different from that from which the incoming call was
originated. Such data are suitably stored by the processing unit 40 and will be retrieved
later to call back the caller.
The outgoing call made by the processing unit 40 to the given addressee 10 will thus remain in the waiting queue of the ACD.

As soon as an agent becomes available again, such agent will be connected to said outgoing call and will send the confirmation signal S.

The use of DTMF tones is a simple, practical and effective way to allow the processing unit 40 to discern between the situation wherein the outgoing call is waiting and the situation wherein the agent is connected.

By way of example, an automatic message may be set in order to prompt the agent to press a key on his/her telephone or answering device when picking up the next call.

Following the reception of the confirmation signal S, the processing unit 40 will call back the caller and will connect him/her to the available agent.

Note that the processing unit 40 may also decide to call back the caller a certain time before receiving the confirmation signal S. For example, the processing unit 40 may call back the caller when the outgoing call has reached the top of the waiting queue, i.e. it will be the next call to be picked up by the agents A1...An. This circumstance can be recognized, for example, by comparing the number of confirmation signals S received with the number of outgoing calls made by the apparatus 1 prior to the call in question.

In a different embodiment, the processing unit 40 can be configured to call back the caller only after the estimated waiting time ET has elapsed, even if an agent A1...An has meanwhile become available.

This gives priority to compliance with the estimate given to the caller over the possibility of calling earlier than the estimated time.

Should no agent become available within the estimated waiting time ET, the processing unit 40 will call back the caller as soon as an agent becomes available, in compliance with the queue created in the ACD.

The above-described activity is preferably carried out by the processing unit 40 for each one of the incoming calls received. In this way, the corresponding outgoing calls made by the processing unit 40 to the given addressee 10 will virtually re-create the queue where the incoming calls would be in the absence of the apparatus 1. Due to the logical-functional interposition of the apparatus 1 between the callers and the given addressee 10, the callers are allowed to choose how to manage their waiting time, which is advantageously estimated and communicated by the processing unit 40. As aforesaid, the callers may decide, for example, to terminate the call and be called back later; in this
case, the outgoing call made by the processing unit 40 to the given addressee 10 will "replace" the original call made by the caller, and will keep its position in the queue without the caller being forced to keep listening while on hold. Other options that the caller may be allowed to choose from after having been informed about the estimated waiting time are, for example, forwarding to an automatic answering system, or a "traditional" wait, during which the caller may advantageously be offered commercial or promotional information, etc.

The apparatus 1 is implemented as a hardware/software structure capable of providing the functionalities described and claimed herein.

In the preferred embodiment, the apparatus 1 consists of a hardware/software structure which is distinct from the given addressee 10, in particular from the ACD of the latter. As aforesaid, the apparatus 1 may conveniently cooperate with an existing ACD, requiring only the latter, and/or the single agents A1...An referring there to, to send the above-mentioned confirmation signals S, e.g. DTMF tones, and the same ACD to manage the incoming queues in a FIFO mode.

The invention offers significant advantages.

First of all, the apparatus and the method according to the invention allow to fulfill the requests of the callers without the latter being compelled to go through long and boring waits, while at the same time allowing the answering structure to remain small in size.

Furthermore, the invention can be implemented and made operational without requiring any particular technologic additions to existing structures. In fact, the only requirement is that the ACD of the given addressee 10 must manage the incoming queues in FIFO mode (as it already happens in most cases), and that a confirmation signal, such as a DTMF tone, must be sent when an agent picks up a call.
CLAIMS

1. An apparatus for managing queues of calls addressed to a given addressee (10), wherein a plurality of agents (Al...An) are in charge of answering said calls, said apparatus comprising:
   - an input interface (20) for receiving calls addressed to said given addressee (10);
   - an output interface (30) for sending calls to said given addressee (10);
   - a processing unit (40), connected to said input interface (20) and to said output interface (30), and configured to:
     - receive an incoming call, addressed to said given addressee (10), through said input interface (20);
     - determine an estimated waiting time (ET) for said call, said estimated waiting time (ET) being representative of an estimated time that will elapse before one of said agents (Al...An) becomes available to pick up said call;
     - communicate at least said estimated waiting time (ET) to the caller who is making said call;
     - receive instructions from said caller following communication of said estimated waiting time (ET);
     - make an outgoing call to said given addressee (10) through said output interface (30);
     - receive a confirmation signal (S) from one of said agents (Al...An) when said agent can pick up said outgoing call;
     - connect said caller to said agent through said outgoing call.

2. An apparatus according to claim 1, wherein said confirmation signal (S) comprises a DTMF tone.

3. An apparatus according to claim 1 or 2, wherein said processing unit (40) is configured to determine said estimated waiting time (ET) as a function of an average duration of calls received by said agents (Al...An).

4. An apparatus according to claim 3, wherein said processing unit (40) is configured to update said average duration in an adaptive manner.

5. An apparatus according to any one of the preceding claims, wherein said processing unit (40) is configured to determine said estimated waiting time (ET) as a function of a number of calls which were received before said incoming call...
and which have not yet been picked up by said agents (Al...An).

6. An apparatus according to claim 5, wherein said processing unit (40) is configured to determine said number of calls as a function of the number of incoming calls received and of the number of confirmation signals (S) received.

7. An apparatus according to any one of the preceding claims, wherein said processing unit (40) is configured to determine said estimated waiting time (ET) as a function of the number of agents (Al...An) working at said given addressee (10).

8. An apparatus according to any one of the preceding claims, wherein said processing unit (40) is configured to communicate to the caller who is making said incoming call the number of waiting calls received earlier than said incoming call.

9. An apparatus according to any one of the preceding claims, wherein said processing unit (40) is configured to send to the caller who is making said incoming call a request to choose whether to stay on hold or be called back later, said instructions being sent by said caller following reception of said request.

10. An apparatus according to any one of the preceding claims, wherein said processing unit (40) is configured to allow said caller to benefit from alternative contents depending on said instructions received.

11. An apparatus according to claims 9 and 10, wherein said processing unit (40) is configured to allow said caller to benefit from alternative contents when said caller decides to stay on hold.

12. An apparatus according to any one of the preceding claims, which is configured to be functionally interposed between said callers and said given addressee (10), in particular between said callers and an automatic call distributor (ACD) of said given addressee.

13. A method for managing queues of calls addressed to a given addressee (10), wherein a plurality of agents (Al...An) are in charge of answering said calls, said method comprising:

- receiving an incoming call addressed to said given addressee (10);
- determining an estimated waiting time (ET) for said call, said estimated waiting time (ET) being representative of an estimated time that will elapse before one of said agents (Al...An) becomes available to pick up said call;
- communicating at least said estimated waiting time (ET) to the caller who is making said call;
- receiving instructions from said caller following communication of said estimated waiting time (ET);
- making an outgoing call to said given addressee (10);
- receiving a confirmation signal (S) from one of said agents (A1...An) when said agent can pick up said outgoing call;
- connecting said caller to said agent through said outgoing call.
### INTERNATIONAL SEARCH REPORT

**International application No**
PCT/IB2013/053482

**A. CLASSIFICATION OF SUBJECT MATTER**

| Inv. | H04M3/523 | ADD. | H04M3/428 |

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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**Further documents are listed in the combination of Box C.**

*See patent family annex.*

*Special categories of cited documents:

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**Date of the actual completion of the international search**
8 October 2013

**Date of mailing of the international search report**
16/10/2013

**Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel (31-70) 940-2040, Fax (31-70) 940-3018**

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