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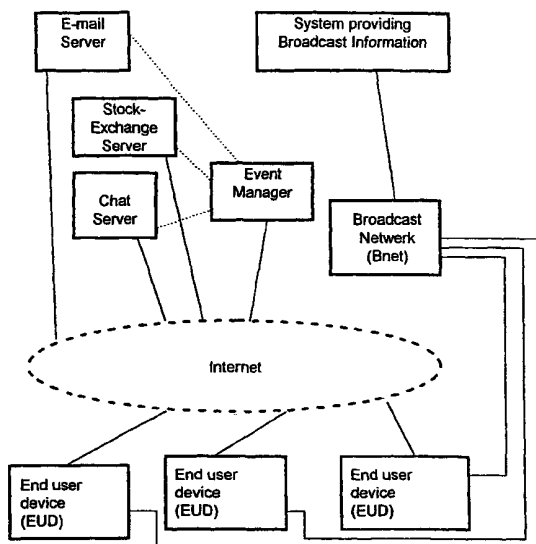
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(54) Title: BROADCAST SYSTEM AND METHOD



(57) Abstract: The invention provides a broadcast system comprising a broadcast network for transmitting broadcast information, an event manager being connected to said broadcast network for adding event information to said broadcast information, at least one end user device being connected to said broadcast network for receiving said broadcast information including said event information, and at least one server for providing a service to be accessed by said at least one end user device and for generating a service information related to said service, whereby said at least one server being connected to said event manager for transmitting said service information, wherein said event manager generates said event information in response to said service information. Also, the invention provides a method for operating a broadcast system according to the invention.



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Broadcast System And Method**Description**5 **Background of the invention**

The present invention is related in general to systems and methods for transmitting broadcast information. In particular, the present invention is related to a system and a method for transmitting broadcast information to end user devices, whereby the broadcast information comprises not only conventional broadcast information, such as a TV or radio
10 program, but additionally information related to a service provided by a server, such as an Internet provider, via a data network, such as the Internet.

Although, in the following description, the present invention is described with reference to broadcast applications operated in combination with Internet applications where different
15 servers are providing various services which can be accessed by end user devices upon demand, the present invention is not limited to such applications. The invention is also useful in any kind of broadcast application operated in combination with a data network wherein at least one device is providing data which are to be transferred via the network to an accessing device when the accessing device and/or an user thereof is interested in
20 the provided data and/or requires the same.

Problem underlying the invention

The number of servers providing various services via the Internet and end user devices and users thereof, respectively, is rapidly increasing. This results also in a rapidly in-
25 creasing amount of data transmitted via the Internet. Since the amount of data to be transmitted via the Internet at the same time is limited (e.g. due to the bandwidth restrictions), the data transmission rate between a specific server and a specific end user device can be significantly reduced especially when a large number of end user devices and servers are communicating simultaneously and/or large quantities of data have to be
30 transmitted. Consequently, the duration for which an active communication link between a server and an end user device has to be maintained on the Internet is increased. This leads to higher costs for data accesses via the Internet. Especially for the end user who is typically charged not only for the use of the Internet but sometimes also for using a public telephone network providing a data transmission link between the respective end user
35 device and the Internet. Moreover, a decreased data transmission rate between a server and an end user device results in an increased accessing time for the end user device.

Thus, the duration between the time, when an end user device has accessed data on a server, and the time, when the desired data are actually available on the end user device is sometimes excessively increased.

5 This problem has become more evident since various services provided by servers via the Internet are not accessed only once by an end user device in order to activate data transmission of desired data related to these services/servers. Often, such servers/services are accessed repeatedly, in predefined intervals or at predefined times, by the end user device in order to check the status of the accessed service and to determine
10 whether the accessed service is providing data being of actual interest for the end user. Such data transmissions from end user devices to service providing servers to check the status thereof are additionally increasing the amount of data transmitted via the Internet. Moreover, such data transmissions do not comprise information being of actual use for the end user except for the case when an accessed service has actually changed to a status
15 being of interest for the end user.

In order to reduce the amount of data transmissions related to such check accesses by end user devices, the number of check accesses can be limited and/or the intervals therebetween can be increased. But this approach has the drawback that end user de-
20 vices will receive information indicating that the status of the accessed server has at changed to a status of interest not immediately or a minimal period after the status has changed. Therefore, this foregoing approach is unsuitable for services/servers changing their status in short periods and/or providing data of high importance for the respective end user. Examples of such services are e-mail services, messaging services, and serv-
25 ices providing information related to stock exchanges and the money market.

Object of the invention

As described above, on one hand the amount of data transmissions via the Internet is limited. On the other hand the amount of data actually transmitted via the Internet is
30 steadily increasing. This leads to reduced data transmission rates and increased accessing times for services and end user devices, respectively, communicating via the Internet. This condition is undesired especially when end user devices should access services at the times when the accessed services are providing new, actual information being of high interest and importance for the end user.

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Therefore, there is a need for a solution which reduces the amount of data transmissions via the Internet without decreasing the performance/quality of servers providing services via the Internet and data transmissions being of actual/high interest/importance for respective end users. Such a reduction of the amount of data transmissions is especially
5 desired for data transmissions which do not provide data/information being not of real/actual interest/importance for end user devices, such as the check accesses described above.

Summary of the invention

10 The object of the invention is achieved by a broadcast system comprising a broadcast network for transmitting broadcast information, an event manager being connected to said broadcast network for adding event information to said broadcast information, at least one end user device being connected to said broadcast network for receiving said broadcast information including said event information, and at least one server for providing a service
15 to be accessed by said at least one end user device and for generating a service information related to said service, whereby said at least one server being connected to said event manager for transmitting said service information, wherein said event manager generates said event information in response to said service information.

Advantages and preferred embodiments of the invention

Preferably, said service information comprises information indicative of an event related to said service, and/or said event information being indicative of the occurrence of said event. Further, said event information comprises information indicative of said event, and/or information indicative of said service associated with said event, and/or information
25 indicative of said server providing said service associated with said event. In order to provide a specific end user device with information, said event information comprises at least one event message being related to said service, whereby said at least one event message is directed to said specific end user device. In order to provide a certain number of end user devices with information, said event information comprises a string of data each
30 thereof comprising at least one event message being related to said service, whereby each of said data of said string is directed to a respective end user device. The identification of specific end user devices to be informed is achieved when the position of each of said data within said data string is indicative of said at least one end user device to which the respective data has to be communicated. In one implementation of the invention, said
35 data comprises at least one bit of data. Optionally, each of said event messages com-

prises further information indicative of said at least one end user device to which the respective event message has to be communicated.

5 Further it is possible to use event information comprising at least two strings of data each thereof comprising at least one event message, whereby each of said data comprises further information indicative of said at least one end user device to which the respective data has to be communicated and the position of each of said strings is indicative of a group of end user devices to which respective data has to be communicated. Preferably, said data comprises at least one byte of data. In order to receive more detailed information related to said service and/or said server and/or said event, said at least one end user
10 device establishes a communication link to said event manager for requesting further information related to said service.

15 For actually accessing said server and said services, respectively, said at least one end user device establishes a communication link to said server in response to said further information provided by said event manager and related to said service. Furthermore, said at least one end user device establishes a communication link to said server in response to said event information and/or said event message for accessing said service. An improved performance of said event manager can be achieved by using an event manager comprising special purpose components. Accordingly, said event manager comprises at
20 least one front end event manager for receiving and managing said service information. Additionally or optionally, said event manager comprises at least one back end event manager for adding said event information to said broadcast information.

25 A further improved system performance can be accomplished by using a broadcast network comprising sub-area broadcast networks for regionally transmitting said broadcast information to end user devices being associated in a regionally grouped manner to one of said sub-area broadcast networks. Thus, only event information associated with end user devices serviced by a respective sub-area broadcast network is added to the broadcast information being regionally transmitted via the respective sub-area broadcast network.
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Moreover, said at least one back end event manager operates with at least one of said sub-area broadcast networks for adding said event information to said broadcast information being regionally transmitted. This reduces the load for each back end event manager
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and, therefore, the overall performance of the system according to the invention is increased.

Depending on actual implementations/applications of the present invention said broadcast system is an analogue TV-system and/or a digital TV-system and/or a cable broadcast system, and/or said server is a computer system providing at least one Internet service, and/or said at least one end user device is a set-top-box connected to a home television set or an integrated digital television terminal, a personal computer, a network computer or a network client capable of extracting information from an unidirectional broadcast signal (e.g. provided by a satellite, terrestrial or cable interface) and to establish a bi-directional narrow cast communication link to the event manager and/or the Internet.

Additionally, the object of the invention is achieved by a method for one of the above described broadcast systems. The method according to the invention comprises a transmitting of a broadcast information via a broadcast network, adding an event information to said broadcast information by an event manager, receiving of said broadcast information including said event information by at least one end user device, and providing of a service by a server and a communication link between said at least one end user device and said server for accessing said service by said at least one end user device, generating of a service information related to said service and transmitting of said service information to said event manager whereby said event information is generated by said event manager in response to said service information.

Preferably, said generating of said service information comprises a generating of information being indicative of an event related to said service, and/or a generation of information being indicative of the occurrence of said event, and/or a generating of information being indicative of said event. Further it is possible that said generating of said event information comprises a generating of information being indicative of said service associated with said event, and/or a generating of information being indicative of said server providing said service associated with said event, and/or a generating of at least one event messages being related to said service.

Moreover, said generating of said event information can comprise a generating of a string of data each thereof comprising at least one event message being related to said service, whereby it is preferred that said generating of said string of said data is performed such

that the position of each of said data within said string is indicative of said at least one end user device to which the respective data has to be communicated. In one embodiment of the invention said generating is performed such that said data comprises at least one bit of data. Further, said generating of said event messages comprises a generating of further information indicative of said at least one end user device to which the respective event message has to be communicated.

Also it is possible to implement the invention such that said generating of said event information comprises a generating of at least two strings of data each thereof comprising at least one event message, whereby said generating of said at least two data strings is performed such that each of said data comprises further information indicative of said at least one end user device to which the respective data has to be communicated and the position of each of said data strings within said event information is indicative of a group of end user devices to which respective data has to be communicated. Preferably, said generating of said data is performed such that each data comprises at least one byte of data.

In order to receive more information related to said service and/or said server and/or said event, a communication link to said event manager is established by said at least one end user device for requesting further information related to said service. Additionally, a further communication link is established to said server by said at least one end user device in response to said further information related to said service.

Moreover, a communication link to said server can be established by said at least one end user device directly in response to said event information and/or said event message for accessing said service. An even further enhanced method is achieved when said server information is received and managed by at least one front end event manager comprised by said event manager, and/or said event information is added to said broadcast information by at least one back end event manager comprised by said event manager.

A reduction of data to be transmitted is accomplished when said transmitting of said broadcast information is performed by sub-area broadcast networks comprised by said broadcast network such that said broadcast information is regionally transmitted to end user devices being associated to respective sub-area broadcast networks in a regionally grouped manner. Additionally, said adding of said event information to said broadcast

information is performed by said at least one back end event manager operating associated with at least one of said sub-area broadcast networks.

In the following, preferred embodiments of the present invention are described in detail with reference to the accompanying figures.

Short description of the figures

Fig. 1 schematically illustrates a broadcast system according to the invention.

Fig. 2 illustrates a first embodiment of the event manager according to invention.

10 Fig. 3 illustrates second embodiment of the event manager according to the invention.

Fig. 4 illustrates a third embodiment of the event manager according to the invention.

Fig. 5 illustrates a fourth embodiment of event manager according to the invention.

Fig. 6 illustrates a first embodiment of an event message for an event information according to the invention.

15 Fig. 7 illustrates a second embodiment of an event message for an event information according to the invention.

Fig. 8 illustrates the implicit event referencing according to the invention.

Fig. 9 illustrates a second embodiment of an event message for an event information according to the invention.

20 Fig. 10 illustrates the explicit event referencing according to the invention.

Fig. 11 illustrates the combined implicit/explicit event referencing according to the invention.

Fig. 12 illustrates a first protocol for the broadcast system according to the invention.

Fig. 13 illustrates a second protocol for the broadcast system according to the invention.

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Detailed description of the invention

As shown in Fig. 1, the broadcast system comprises an event manager connected to several servers. Preferably, the event manager and the servers are connected via the Internet but it is also possible to provide a special network connecting the event manager and the servers. This latter option of the present invention is indicated in Fig. 1 by the dashed lines connecting the servers and the event manager.

The servers are providing various services which can be accessed by end user devices, preferably via the Internet. Such services include advertising/commercial services, e-mail services, chat-services, money-market-services, stock-exchange-services, services pro-

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viding software, and services for controlling/testing end user devices. End user devices connected to the servers via the Internet access the provided services by sending respective request/demand messages to the respective server. In turn, the server receiving a demand/request message transmits data related to the service to be accessed by the requesting/demanding end user device to the same via the Internet.

Furthermore, the event manager is connected to a broadcast network, such as a terrestrial network, a satellite based network, a cable network, an analogue television network, a digital TV network, or any combination thereof. A television station or a cable network, providing broadcast information, such as a television program and/or a cable program, is connected to the broadcast network for feeding the broadcast information thereinto, in order to transmit the broadcast information to end user devices being connected to the broadcast network.

Following, the broadcast system according to the invention is described with reference to a server providing an e-mail service whereby this specific example has been chosen to promote the understanding of the invention and not to limitate the scope of the invention. Conventionally, an end user device utilising the server providing an e-mail service checks in predefined intervals, e.g. intervals of one minute, whether a new e-mail has been received by the e-mail server. This checking is performed by the end user device by sending respective data via the Internet to the server. In turn, the server returns data indicating that an new e-mail has been received, or not.

Using the broadcast system according to the invention, this checking procedure by the end user device is not required. Instead of checking whether a new e-mail has been received by the e-mail server, the e-mail server generates are respective service information when a new e-mail has been received. This service information indicative of the event "new e-mail has been received" is communicated to the event manager. Upon reception of the service information, the event manager generates an event information comprising an event message indicative of the event "new e-mail has been received by the e-mail server" .

This event information and event message, respectively, are added to the broadcast information transmitted via the broadcast network. In case the event manager adds the event information to the broadcast information only once, the event information is only

available for the duration of the transmission of the part of the broadcast information in which the event information has been embedded.

Since it is possible that an end user device is not active, i.e. not receiving any broadcast
5 information, an event information can be missed by the respective end user device, i.e.
the end user device does not receive an event information directed to it. Therefore, it is
preferred that the event manager adds the event information to the broadcast information
in predefined intervals or continuously. Thus, the event information is available as long as
a broadcast information is transmitted by the broadcast network and, therefore, no end
10 user device will miss an event information.

Now, the broadcast information includes not only the original broadcast information, e.g. a
TV program, but also the event information provided by the event manager. The broad-
cast information is transmitted via the broadcast network to the end user device. The end
15 user device extracts the event information and the event message, respectively, from the
received broadcast information. In response to the event information and the event mes-
sage, respectively, indicating that a new e-mail has been received by the e-mail server,
the end user device establishes a communication link to the event manager for obtaining
more detailed information related to the event and/or the service and/or the server. For
20 accessing the e-mail service and obtaining the new e-mail, based on the more detailed
information provided by the event manager, the end user device establishes a communi-
cation link to the e-mail server via the Internet.

Since several end user devices are connected to the broadcast network and receive the
25 broadcast information, the event information added thereto must comprise information
defining/identifying the specific end user device to which the event message "new e-mail
has been received by the e-mail server" is to be directed. Different solutions according to
the invention providing event information including such user defining information are de-
scribed below.

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The event manager being a central component of the broadcast system according to the
invention can be implemented with different embodiments, as shown in Figs. 2-5. Princi-
pally, the event manager according to the invention can be any system capable of receiv-
ing data, such as service information, and adding data, such as event information, to a
35 broadcast information transmitted via a broadcast network. In order to optimize the per-

formance of the event manager, especially in the case when a large number of services and/or servers and/or end user devices are connected to the event manager, front end event managers and back end event managers are used, as illustrated in Figs. 2-5.

5 The front end manager is directly connected to the servers and receives service information related to events associated with respective services. In response to the received service information, the front end event manager generates event information comprising event messages related to the different server information. This event information is transmitted to the back end event manager. The back end event manager communicating
10 with the end user devices via the broadcast network adds the received event information to the broadcast information originally provided.

In order to handle a large number of event information generated by the front end event manager, several back end event managers are used, each thereof adding the respective
15 event information to the broadcast information originally provided. Although, in Fig. 2, two back end event managers are shown, any number of back end event managers can be used, e.g. three, four, five, ... back end event managers. The number of back end event managers actually used in the broadcast system is determined by the specific implementation of the invention, i.e. the amount of server information, event information, the number of end user devices, and so on.
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Usually a broadcast network comprises sub-area broadcast networks for transmitting broadcast information in a regionally distributed manner to end user devices respectively regionally grouped. Here, it is preferred to use back end event managers associated with
25 the different regionally operated sub-area broadcast networks. In order to reduce the amount of event information to be handled by one back end event manager, each thereof, preferably, receives only those event information by the front end event manager which is to be transmitted to those end user devices associated to the receiving back end event manager via the respective sub-area broadcast network.

30 Referring to Fig. 3, two back end event managers are shown, each thereof operating with an associated sub-area broadcast network. Comparable to the embodiment of the invention shown in Fig. 2, the number of back end event managers actually used is determined by the actual implementation of the invention. So, two, three, four, five, ... back end event
35 managers can be used. Furthermore, it is possible to use several back end event manag-

ers whereby at least one of the back end event managers is operating with at least two sub-area broadcast networks. Moreover, it is possible to implement a broadcast system according to the invention wherein at least one sub-area broadcast network is supplied by at least two back end event managers. Of course, any combination of the above-

5 described embodiments of the invention comprising at least two back end event managers and at least two sub-area broadcast networks are possible.

If a large number of servers/services is used in combination with the event manager according to the invention, it is preferred to utilise more than one front end event manager.

10 As shown in Fig. 4, two front end event managers are receiving service information by several servers and generate event information transmitted to a back end event manager. Again, the number of front end event managers is not limited to the number of two front end managers, but three, four, five, ... front end event managers can be used depending on the actual requirements of an implementation of the invention.

15 In order to improve the performance of the event manager, the at least two front end event managers shown in Fig. 4 are associated to the servers providing service information in a manner regarding the regional distribution of the different servers and/or the types of servers and/or the types of services provided and/or the types of service information provided and/or any other criteria suitable to optimise the reception of service information and the generation of event information in response thereto.

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Fig. 5 illustrates an example of a broadcast system according to the invention comprising at least two front end event managers and at least two back end event managers. As already mentioned, the number of actually used front end event managers and the number of actually used back end event managers is determined by the specific implementation of the invention. So it is possible to use at least two front end event managers in combination with two, three, four, five, back end event managers, or to use at least two back end event managers in combination with two, three, four, five, ... front end event managers, and so on.

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In order to guarantee that all service information provided by the servers and received by the front end event managers is correctly transmitted by the back end event managers to the respective end user devices, it is necessary that the event manager comprises means connected between the front end event managers and the back end event managers for

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distributing the event information generated by the front end managers to respective back end event managers. These means for distributing the event information to respective back end event managers can be any means capable of receiving information/data and directing the received information/data to means connected downstream to the distribution means. Examples for such distribution means are digital/analogue switching devices, network distribution devices, personal computer, and the like. Since such distribution means are well known in the field of information/data transmission, no detailed description of the distribution means of the event manager is given.

10 The exemplary embodiments of the event manager comprising at least one front end event manager and at least one back end event manager show that the invention allows an flexible and easy adaptation of the broadcast system according to the invention depending on specific applications/implementations. For example, as the broadcast system according to the invention grows because the number of servers, services, events, and/or end user devices has increased, the only preoccupation is to allocate more front end event managers and/or more back end event managers in order to meet the grown demand. Any modifications/variations of other components of the broadcast system, such as servers, services, network links, end user devices, software and hardware components, are not required.

20 In the following, a detailed description of different embodiments of the event information and the event messages, respectively, is given. An event message is an information related to at least one event associated with a specific service/server and to be transmitted to a specific end user device.

25 Fig. 6 illustrates a simple implementation of the event messages according to the invention, namely the binary implementation. Here, an event message consisting of one bit having the value "0" indicates that no event has occurred and/or no service information has been received by the event manager. An event message comprising one bit having the value "1" indicates that an event associated with a specific service/server has occurred and respective service information has been received by the event manager. Assuming that several, at least two different service information for one end user device have been received by the event manager it is preferred that an event message consisting of a bit having the value "1" indicates that at least one event has occurred and that respective service information has been received by the event manager.

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A more complex implementation of the event messages according to the invention is shown in Fig. 7. Here, an event message comprising no data or consisting of a bit having the value "0" indicates that no event has occurred and/or no service information related to (an) event(s) has been received by the event manager. In case service information associated with (an) event(s) for a specific service(s)/server(s) is transmitted to the event manager, the event messages can comprise data not only indicating that an event has been registered but also data comprising information related to the event(s) and/or the service(s) and/or the server(s).

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As can be seen in Figs. 6 and 7, the event messages illustrated therein comprise no information defining the end user device to which the event message has to be transmitted. In this case, the broadcast system according to the invention utilises the so-called implicit event referencing.

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For the implicit event referencing, an event message is generated for each of the end user devices regardless whether an event has occurred for a specific end user device, or not. For example, in the binary implementation of an event message, for each end user device an event message is generated. Each thereof comprises one bit having the value "0" indicating that no event has occurred or comprises one bit having the value "1" indicating that an event has occurred.

20

Based on such event messages, the event information is generated by generating a stream or string of data comprising the event messages. In other words, the event information for the implicit event referencing comprises a string of event messages, as shown in Fig. 8. In order to associate a specific event message within the event information with the respective end user device, the position of each event message within the event message stream is related to a specific end user device. Referring to Fig. 8, the event message on position 12 within the event message string is dedicated to the end user device related to position 12. The correlation between event message positions and respective end user devices can be easily achieved by using so-called end user device ID's. For the example given in Fig. 8, the event message on position 12 is related to the end user device having the end user device ID 12. This correlation between event message positions and end user device ID's is just exemplary and any kind of predetermined correlation can be used.

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In certain situations, end user devices are provided with ID's prior being sold or leased to an end user. Usually, each ID is unique within the system. In this case, the ID can be used to address the specific end user device associated with the ID. In other situations, an end user is given a chip card or a smart card to be installed in his/her end user device when
5 subscribing with a certain provider. This chip/smart card is programmed to contain an ID to be used in the aforementioned manner.

Still another possibility to provide an end user device of a certain end user with a unique
10 ID is the following: When the end user device is connected to the system for the first time, the end user sends a (encrypted) message containing e.g. his/her name or similar identifying data to the event manager. The event manager generates an ID based on data base entries, random generators, and/or the like. This ID is sent back to the end user device via
15 the network (Internet) to be automatically and permanently stored in the respective end user device.

The event information generated as described above is added to the broadcast information and transmitted to the end user devices. The end user devices receive the event information and, therefore, all generated event messages. Based on the implicit event refer-
20 encing, each of the end user devices detects only the event messages directed to the same using the above described correlation between event message position and end user device ID.

The implicit event referencing according to the invention applies not only for event mes-
25 sages illustrated in Figs. 6 and 7 but for any type of event message. Using event messages comprising one bit having a value of "0" or "1", very low data transmission requirements for the broadcast network can be achieved. Furthermore, such "bit" event mes-
sages can be grouped in groups of eight, sixteen, thirty-two, event messages forming a
byte of data. Consequently, the amount of data for the event information can be signifi-
30 cantly reduced.

A further embodiment of an event message according to the invention is shown in Fig. 9. Here, an event message comprises not only data indicative of (an) event(s) (occurrence and/or type(s) of event(s)) but also data identifying the specific end user device to which
35 the event message has to be directed. This type of event message is used for the so-

called explicit event referencing used for the broadcast system according to invention. In this case, the event information comprises event messages as shown in Fig. 9. In contrast to the implicit event referencing, the event information comprises only those event messages which indicate that (an) event(s) has(ve) occurred. Furthermore, it is not necessary
5 that an event message is placed on a predefined position within the event information to identify the end user device to which the respective event message has to be directed, since each event message comprises information for identifying the respective end user device.

10 The information of each event message identifying the respective end user device can be, for example, an end user device ID. Again, it is also possible to utilise other kinds of end user device identifying information.

Furthermore, it is possible to combine the implicit event referencing and the explicit event
15 referencing as shown in Fig. 11. Here, the event information comprises at least two streams or strings of data, whereby each data comprises event messages having the type utilised for the explicit event referencing. Therefore, the correlation between data of one string within the event information and respective end user devices is accomplished by the explicit event reference. In turn, the position of each string within the event information is
20 related to a group of end user devices. As shown in Fig. 10, the first string is related to end user devices having end user device ID's in the range of 0-99, the second string within the event information is related to end user devices having end user device ID's in the range of 100-199, and so on.

25 Additionally, the implicit and the explicit event referencing mechanisms can be used in lieu of each other. For example, during low data traffic hours, the explicit event referencing might require less bandwidth whereas during peak data traffic hours the implicit event referencing is preferred due to its constant bandwidth. Since the length of the event information and the event message string, respectively, depends from the number of end user
30 devices, the bandwidth required for the implicit event referencing is determined by the transmission and/or repetition rate of the event information and the event message string, respectively.

Especially in the case of a large number of services and/or servers and/or end user de-
35 vices, this foregoing approach is useful. In order to optimise the performance of the

broadcast system according to the invention, extra functionality can be implemented in the event manager. A few examples of such extra functionality for the event manager are given below. For example, it is possible to implement priority algorithms in the event manager. Such priority algorithms manage incoming service information provided by the server(s) depending on importance of the event(s) and/or service(s) and/or server(s), the load of the event manager and/or components thereof, such as the front end event manager(s) or the back end event manager(s), or any other factors/parameters.

Further, the event manager can utilise timing algorithms, which allow to distribute the generation of event information and the transmission thereof over the time for avoiding high loads of the event manager and, especially, of the back end event manager. Based on such timing algorithms, for example, the generation and/or transmission of event information can be performed e.g. as soon as possible, no later than 1,5 hours after reception of the respective service information, between one and two hours after reception of the service information, and so on.

Moreover, it is possible that the event manager is capable of performing a so-called multiple event addition. In this case, a server transmits a service information to the event manager including information that the service information has to be transmitted to a group of end user devices, or to all end user devices. Using timing algorithms, the event manager is now able to transmit event information to the end user devices at different times whereby the load of the event manager and/or the amount of data to be transmitted is reduced.

In order to obtain/extract the event information and the respective event message from the received broadcast information, each end user device contains means (processors, software, signal demodulators,...) to analyse the received broadcast information to determine whether an event information is embedded and, if an event information is present, to separate the event information from the broadcast information originally provided. Further, such means process the event information such that respective event messages are extracted and analysed and the end user device is operated appropriately in response to the event message to access the service related for which an event has been received.

Such means can comprise hardware and/or software components and can be designed to control at least a part of the operation of the respective end user device and/or to provide

data/information to the end user device in order to perform a suitable operation in response to the event message.

5 Preferably, such means comprise software programs or packages implemented in the end user device. Furthermore, such means comprise components and/or software programs or packages provided by the broadcast information providing system and by the servers. For example, the components and/or software programs or packages provided by the broadcast information providing system are used to handle/process the broadcast information including the event information, while the components and/or software programs or packages provided by the servers are used by the end user device to react in a suitable manner in response to the event message, e.g. to access the service for which an event has been registered.

10 Referring to Figs. 12 and 13, protocols or communication steps for the broadcast system according to the invention are described. Again, in order to promote the understanding of the invention, the example of an e-mail service is chosen whereby these protocols or communication steps can be applied for any other kind of service.

20 At step 1 of Figs. 12 and 13, a new e-mail is received by the e-mail server. The receiving server generates a service information indicating that a new e-mail had been received and transmits the service information to the event manager (step 2 of Figs. 12, 13). In response to the received service information, the event manager generates a respective event message and event information, respectively. In step 3, the event information is added to the broadcast information by the event manager and, in step 4, the broadcast information including the event information is transmitted to the end user device.

25 The end user device receiving the broadcast information detects its event message by scanning the same based on the implicit event referencing, the explicit referencing or any combination thereof. Assume, the end user device is informed that an event has occurred which is of interest. Subsequently, the end user device is operated in a manner suitable to receive more detailed information on the event and/or the service and/or the server to actually access the service related to the event.

30 When the event message only comprises information that an event has occurred, the end user device establishes a communication link to the event manager (step 5 of Fig. 12) via

Internet. Using the communication link, the end user device transmits a request to the event manager to provide further, detailed information related to the event and/or to the service associate with the event and/or the server.

5 In turn, the event manager transmits the requested information back to the end user device (step 6 of Fig. 12). Based on the further information received from the event manager, the end user device now establishes a communication link to the server providing the e-mail service (step 7 of Fig. 12). The communication link between the end user device and the e-mail server is established via the Internet, typically in combination with a
10 public telephone network. Upon establishment of the communication link between the end user device and of the server, the end user device accesses the e-mail server via at the network (Internet) in any conventional manner in order to receive the new e-mail. Preferably, the request transmitted by the end user device to the event manager in step 5 of Fig. 12 comprises information indicating that the end user device has received its event messages
15 in order to inform the event manager that it is not necessary any longer to transmit the event information and the event message, respectively.

If the event message comprises not only information that an event has occurred but also information indicative of the service and/or server and/or event, the above-mentioned
20 request for further information transmitted from the end user device to the event manager is not required. In this case, the end user device directly establishes a communication link to the e-mail server in order to access the e-mail service (step 7 of Fig. 13). In order to avoid that the event manager is still transmitting the event message to the end user devices by adding the event information to the broadcast information, it is preferred to transmit information
25 from the end user device to the event manager indicating that the end user device has received the event message. Comparable to the protocol of Fig. 12, such information is transmitted from the end user device to the event manager by establishing a communication link via the Internet (step 5' of Fig. 13).

30 In view of the objective of the invention to reduce in the amount of data to be transmitted for accessing a service, e.g. provided via the Internet, in the following, the invention is discussed in relation to known service accesses in order to show the amount of reduction of data to be transmitted which is achieved by the invention.

Assuming a number of one million end user devices checking whether an event related to a service has occurred, as known in the art, by transmitting check requests via the Internet to the respective server(s) and further assuming that a single check request comprises twenty bytes, it would be necessary to transmit 152,59 Mbit of data (1 million users * 20 bytes check request = 152,59 Mbit). Further assuming that events, e.g. new e-mails are received by the server(s), has occurred for x% of the one million end user devices, in response to the check requests, the server (s) transmit(s) data comprising twenty bytes to the x% of the one million end user devices indicating that respective events have occurred. So, the server(s) must transmit a data amount of $x * 152,59$ Mbit. Thus, the total data amount necessary to inform end user devices of occurred events is $(1+x) * 152,59$ Mbit. Using the invention implemented in an embodiment incorporating the binary implementation of the event messages and the implicit event referencing, only $x * 0,95$ Mbit of data have to be transmitted from the event manager to the x% of the one million end user devices to inform the same that respective events associated with services/servers have occurred ($x * 1$ million end user devices * 1 bit = $x * 0,95$ Mbit).

If an embodiment of the invention incorporating the explicit event referencing is used, each event message must comprise twenty-two bit for identifying each of the one million end user devices (22 bit are required to represent 1 million in binary form). Using the explicit event referencing, event messages have to be generated only for those end user devices for which an event has occurred. Therefore, $x * 20,98$ Mbit of data have to be transmitted from the event manager to the x% of the one million end user devices in order to inform the same that respective events have occurred ($x * 1$ million end user devices * 22 bit = $x * 20,98$ Mbit). The foregoing comparison shows that the present invention represents a significant advantage in this field, namely a significant reduction of the amount of data. Moreover, the data amount to be transmitted can be further reduced when the invention is utilized in embodiments incorporating sub-area broadcast networks. Assuming that the above-mentioned one million end user devices are grouped in groups of 100.000 end user devices whereby each of the groups is serviced by a sub-area broadcast network and further assuming that the explicit event referencing is used, in order to inform the x% of the one million end user devices that respective events have occurred, only $x * 11,4$ Mbit of data have to be transferred from the event manager and its back end event managers, respectively, to the sub-area broadcast networks and the respective end user devices, respectively. This further reduction of data amount results from the fact that each event message must comprise only twelve bit for identifying each of the end user devices

in the ten groups, each thereof comprising 100.000 end user devices (12 bit are necessary to represent 100.000 in a binary form). Additionally, the invention allows to reduce the complexity of server-network-end user device-systems and single components thereof, since less data have to be transmitted, handled, controlled, managed, and so on.

5 For example, servers providing services via the Internet would need a less complex architecture to support service accesses by end user devices such as the above described check requests. Further due to the fact that the data to be transmitted via the network connecting servers and end user devices is significantly reduced when using the invention, the bandwidth of the network, now available again, can be provided for further data
10 transmissions between servers and end user devices.

In the above, the invention has been described with references to an e-mail service provided by an e-mail server. In order to give a more general impression of possible applications of the present invention, some application examples of the present invention are
15 given in the following. The application examples are just exemplary and are not intended to limit the scope of the invention. As already mentioned, the invention can be used in combination with an e-mail service provided by an e-mail server whereby event information is generated by the event manager upon each reception of an new e-mail by the e-mail server. A possible modification of this embodiment is to generate an event information
20 by the event manager not in response to each service information by the server indicating that a new e-mail has been received but to generate an event information when a certain number of "new e-mail has arrived" service information has been received and/or the e-mail server transmits information to the event manager that the e-mail box for an end user device comprises a certain number of new e-mails.

25 Further, the invention can be used in combination with a message server which generates and transmits respective signal information when a new message is due to be send to at least one end user device. In response to the service information indicative of a new message, the event manager transmits a respective event information to the end user device(s), which, in turn, establish(es) (a) communication link (s) to the event manager
30 and/or the message server in order to receive the new message. Depending on the actual implementation of the invention and/or the type of messages to be transmitted, it is possible that the event information transmitted to end user device (s) comprises the new message provided by the message server.

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The present invention is of particular benefit when it is used in combination with servers providing time critical information e.g. related to stock exchanges and/or the money market. Here, end users are interested to be informed as soon as possible when the stock exchanges, a certain value and/or the money market fluctuate. Conventionally, an active communication link between the end user device and such a server has to be maintained and check requests have to be transmitted by the end user device to the server in rather short intervals since the stock exchanges/money market can change rapidly. Using the invention, the server providing information related to certain stocks and/or the money market, transmits a respective service information to the event manager, when fluctuations thereof exceed predefined limits. In turn, the event manager informs the end user device of the fluctuations and, in response thereto, the end user device establishes an active communication link to the server to obtain more detailed information. As shown, the continuous maintenance of an active communication link between an end user device and such a server is not required when using the invention. This can dramatically reduce the costs for the end user device accessing such servers.

In general, the invention can be used in combination with any kind of server providing a service for which events can occurred any time and end users are interested to be informed of the occurrence of such events. Such applications of the invention include so-called "chat" applications available on the Internet, advertising applications wherein servers provide advertisements/commercial information, applications providing software downloads and up-grades by a server (here, the end user devices are informed via the event manager when new software can be down-loaded or new software up-grades are available), applications providing maintenance services by a server (e.g. hardware/software tests for the end user device performed by a respective server via the network connecting both of them), and so on.

Claims

1. A broadcast system comprising a broadcast network for transmitting broadcast information, an event manager being connected to said broadcast network for adding event information to said broadcast information, at least one end user device being connected to said broadcast network for receiving said broadcast information including said event information, and at least one server for providing a service to be accessed by said at least one end user device and for generating a service information related to said service, whereby said at least one server being connected to said event manager for transmitting said service information, wherein said event manager generates said event information in response to said service information.
2. System of claim 1, characterized in that said service information comprises information indicative of an event related to said service, and/or said event information is indicative of the occurrence of said event, and/or comprises information indicative of said event, and/or of said service associated with said event, and/or of said server providing said service associated with said event.
3. System of one of the claims 1-2, characterized in that said event information comprises a string of data each comprising at least one event message being related to said service.
4. System of claim 3, characterized in that the position of each of said data within said string is indicative of said at least one end user device to which the respective data comprising at least one event message has to be communicated.
5. System of one of the claims 1-4, characterized in that each of said event messages comprises further information indicative of said at least one end user device to which the respective event message has to be communicated.
6. System of one of the claims 1-5, characterized in that said event information comprises at least two strings of data each comprising at least one event message being related to said service, whereby each of said data comprises further information indicative of said at least one end user device to which the respective data has to be communicated, and whereby the position of each of said strings within said event information is indicative of a group of end user devices to which respective data has to be communicated.

7. System of one of the claims 1-6, characterized in that said at least one end user device establishes a communication link to said event manager for requesting further information related to said service, and said at least one end user device establishes a communication link to said server in response to said further information for accessing said service.

8. System of one of the claims 1-7, characterized in that said at least one end user device establishes a communication link to said server in response to said event information for accessing said service.

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9. System of one of the claims 1-8, characterized in that said event manager comprises at least one front end event manager for receiving and managing said server information, and/or said event manager comprises at least one back end event manager for adding said event information to said broadcast information.

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10. System of one of the claims 1-9, characterized in that said broadcast network comprises at least one sub-area broadcast network for regionally transmitting said broadcast information to end user devices being associated in a regionally grouped manner to said at least one sub-area broadcast network, and/or said at least one back end event manager is arranged to be operated in combination with at least one of said at least one sub-area broadcast network for adding said event information to said broadcast information being regionally transmitted.

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11. A method for an interactive broadcast system of one of the claims 1-10, said method comprising the steps of: transmitting a broadcast information via a broadcast network, adding at least one event information to said broadcast information by an event manager, receiving said broadcast information including said at least one event information by at least one end user device, and providing at least one service by at least one server, providing at least one communication link between said at least one end user device and said at least one server for accessing said at least one service by said at least one end user device, generating at least one service information related to at least one of said at least one service by said at least one server, and transmitting said at least one service information to said event manager, characterized by generating said at least one event information by said event manager in response to said at least one service information.

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12. Method of claim 11, characterized in that said generating of said service information comprises a generating of information indicative of an event related to said service, and/or said generating of said event information comprises a generation of information being indicative of the occurrence of said event, and/or a generating of information being indicative of said event, and/or a generating of information being indicative of said service associated with said event, and/or a generating of information being indicative of said server providing said service associated with said event.

13. Method of one of the claims 11-12, characterized in that said generating of said event information comprises a generating of a string of data each comprising at least one event message being related to said service.

14. Method of claim 13, characterized in that said generating of said string of said data is performed such that the position of each of said data within said string is indicative of said at least one end user device to which the respective data has to be communicated.

15. Method of one of the claims 11-14, characterized in that said generating of said event messages comprises a generating of further information indicative of said at least one end user device to which the respective event message has to be communicated.

16. Method of one of the claims 11-15, characterized in that said generating of said event information comprises a generating of at least two strings of data each comprising at least one event message being related to said service, whereby said generating of said at least two strings is performed such that each of said data comprises further information indicative of said at least one end user device to which the respective data has to be communicated, and whereby the position of each of said strings within said event information is indicative of a group of end user devices to which respective data has to be communicated.

17. Method of one of the claims 11-16, characterized by establishing a communication link to said event manager by said at least one end user device for requesting further information related to said at least one service, and establishing a communication link to said at least one server by said at least one end user device in response to said further information for accessing said at least one service.

18. Method of one of the claims 11-17, characterized by establishing a communication link to said at least one server by said at least one end user device in response to said at least one event information for accessing said at least one service.

5 19. Method of one of the claims 11-18, characterized by receiving and managing said at least one server information by at least one front end event manager of said event manager, and/or characterized in that said adding of said at least one event information to said broadcast information is performed by at least one back end event manager of said event manager.

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20. Method of one of the claims 11-20, characterized in that said transmitting of said broadcast information is performed by at least one sub-area broadcast network of said broadcast network such that said broadcast information is regionally transmitted to end user devices being regionally associated with said at least one sub-area broadcast network, and

15

- said adding of said at least one event information to said broadcast information is performed by said at least one back end event manager being operated in combination with at least one of said at least one sub-area broadcast network.

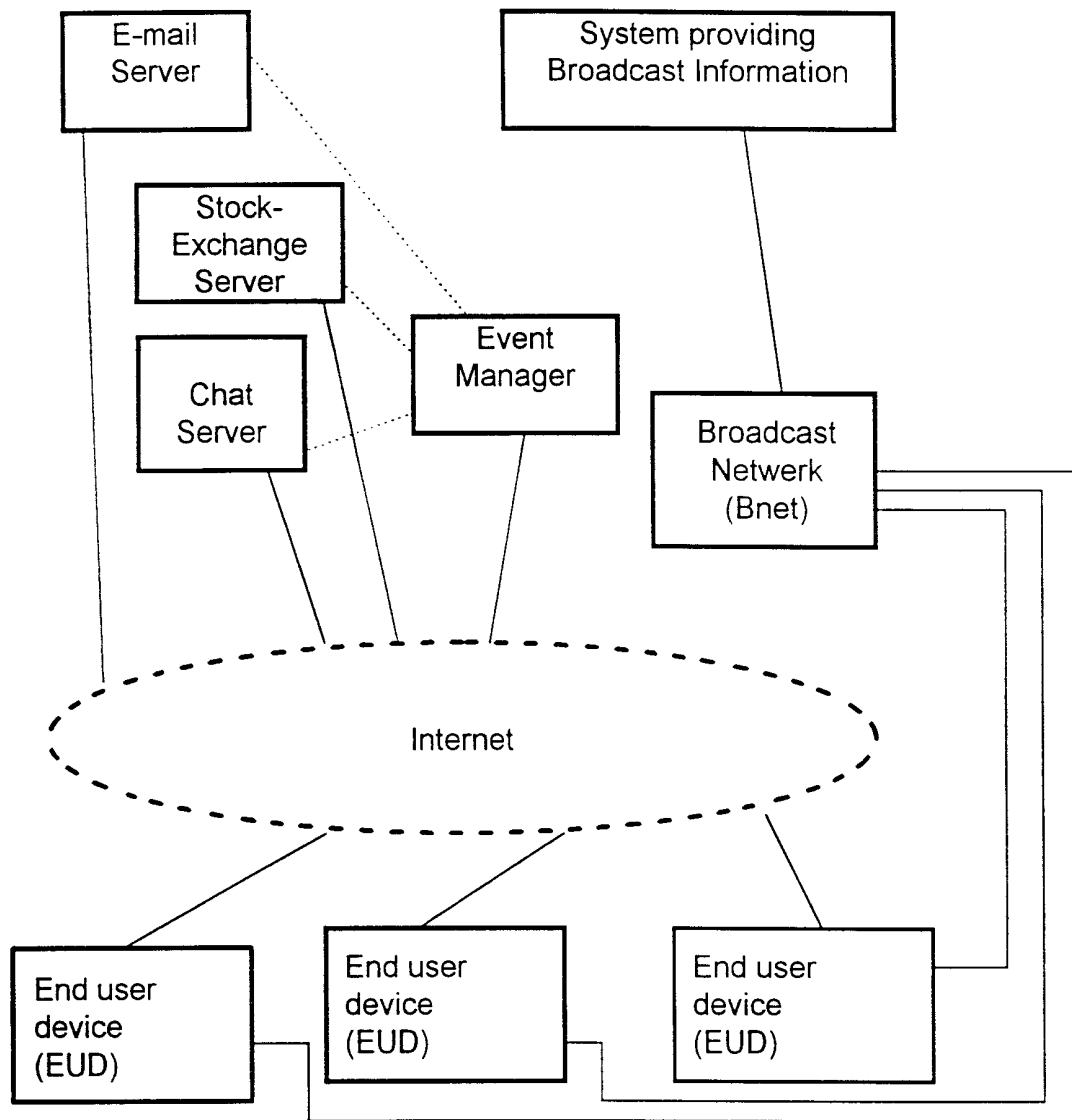


Fig. 1

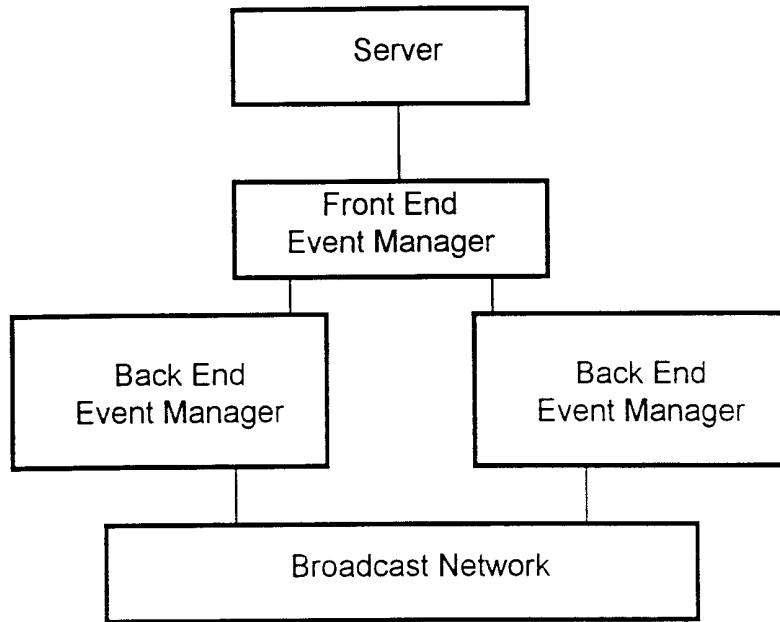


Fig. 2

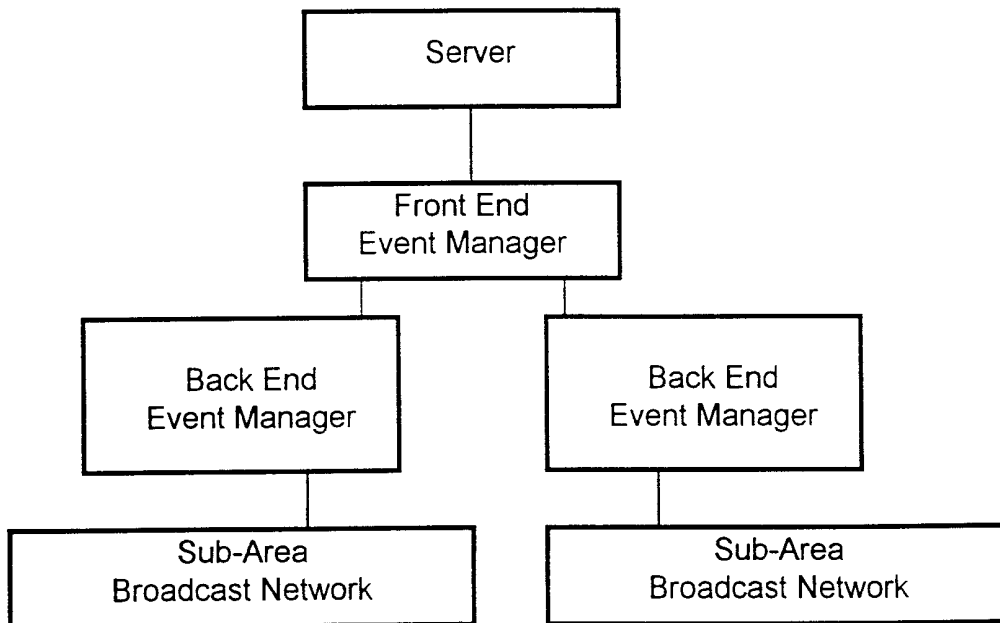


Fig. 3

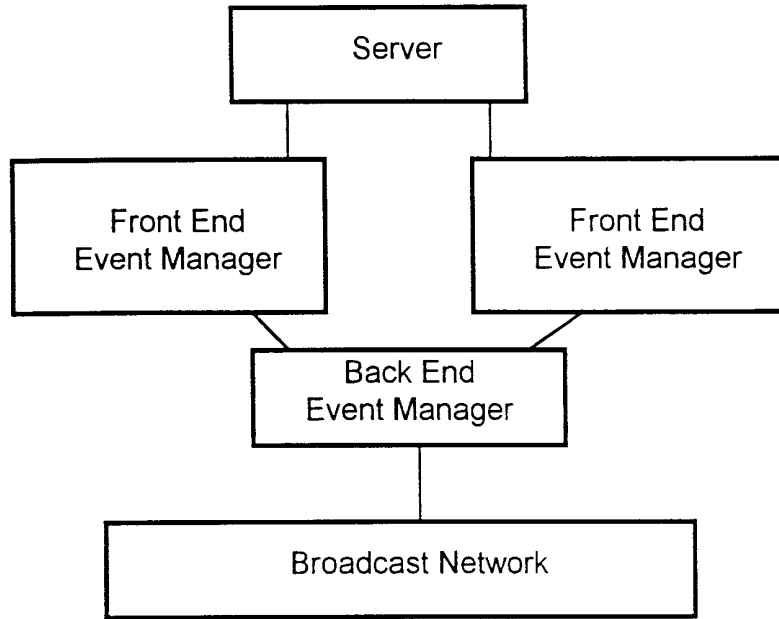


Fig. 4

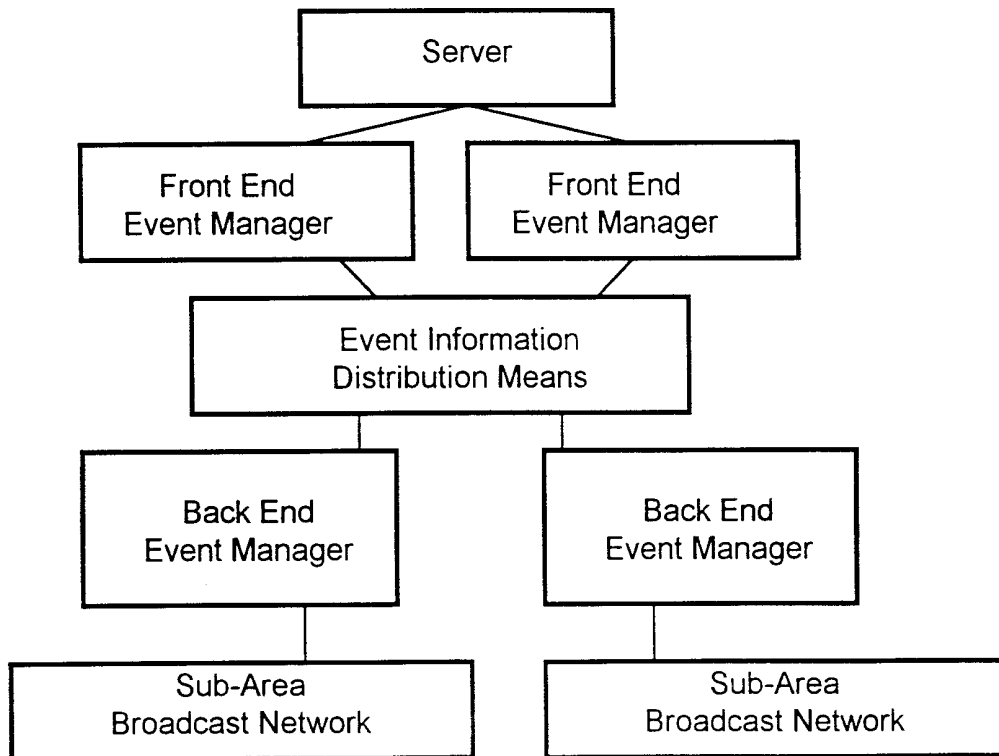


Fig. 5

Fig. 6

Event message = [0]
[1]

Fig. 7

Event message = [0]
[event description]

Fig. 8

[event message 1; ... ; event message n]

Event information =

[0; 1; 1; ... ; 1; 1; 0; ... ; 1; 0; 0]

Position 12



Fig. 9

Event Message = [End User Device ID; event description]
 [End User Device ID]

Fig. 10

Event Information = {[EUD-ID 1; event description 1];...
 ...;[EUD-ID n; event description n]}

Event Information = [EUD-ID 1; ... ; EUD-ID n]

Fig. 11

Event Information = {[EUD-ID 1;...; EUD-ID 99];[EUD-ID 100;...; EUD-ID 199]; ...}

$0 < EUD-ID < 99$

$100 < EUD-ID < 199$

....

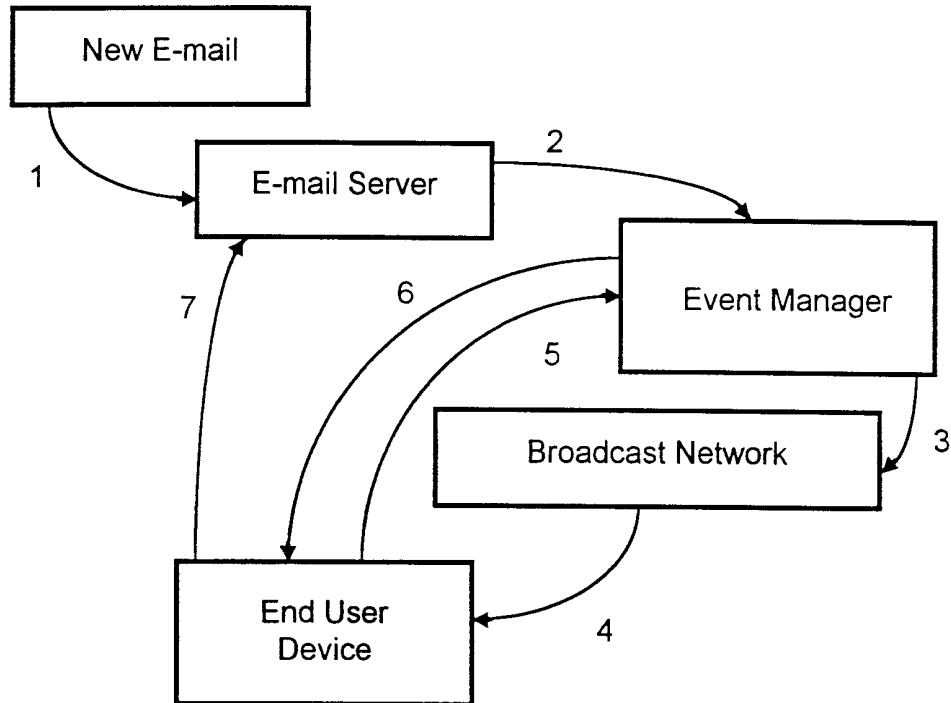


Fig. 12

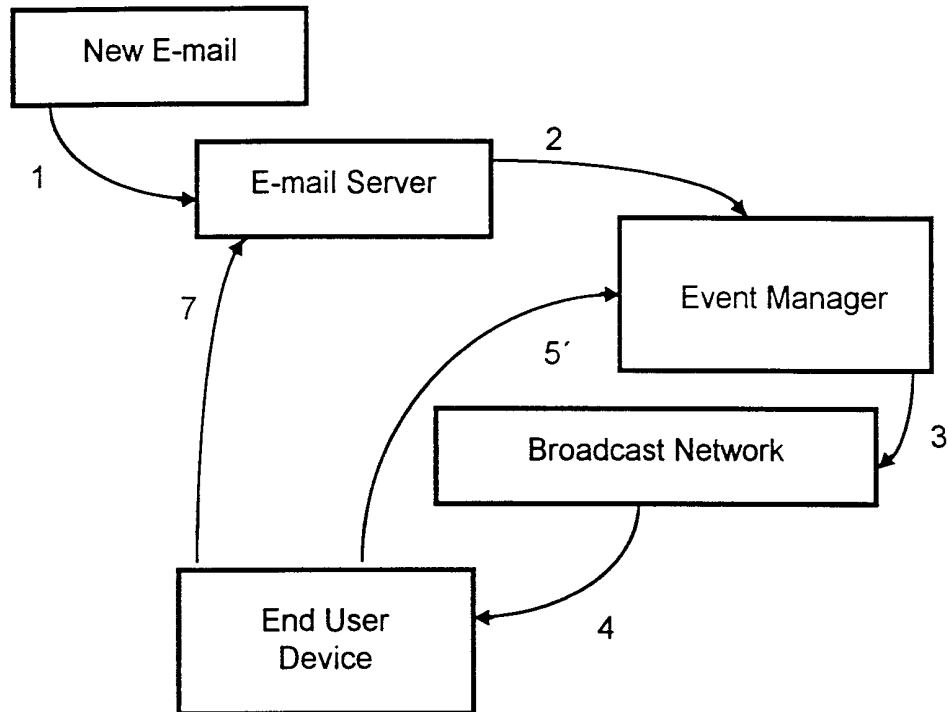


Fig. 13

INTERNATIONAL SEARCH REPORT

Inte. l. onal Application No
PCT/GB 99/02542

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/18 H04L12/58

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)
IPC 7 H04L

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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 339 392 A (RISBERG JEFFREY S ET AL) 16 August 1994 (1994-08-16) abstract column 2, line 26 - line 55 figure 8	1,2,7-9, 11,12, 17-19
Y	—	3-6,10, 13-16,20
Y	EP 0 739 115 A (AT & T CORP) 23 October 1996 (1996-10-23) abstract column 2, line 45 -column 3, line 15 column 4, line 5 - line 28 figure 3	3-6, 13-16
	—	-/--

Further documents are listed in the continuation of box C.

Patent family members are listed in 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 document but published on or after the international filing date
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- *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

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- *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

Date of mailing of the international search report

10 April 2000

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Fax: (+31-70) 340-3016

Authorized officer

Poggio, F

INTERNATIONAL SEARCH REPORT

Int. l. onal Application No

PCT/GB 99/02542

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	EP 0 779 716 A (LUCENT TECHNOLOGIES INC) 18 June 1997 (1997-06-18) abstract column 16, line 40 -column 17, line 10 figure 20	10,20
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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