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(54) Title: MULTIPLE BUFFERED CHANNEL IP MULTICAST

(57) Abstract: A method to allow a user to change multicast channels received over the Internet without reception delay. Multicast channels are monitored for their amount of usage by the user. The multicast broadcasts with the most monitored usage are buffered for quick access. A multicast broadcast is buffered according to a determined available bandwidth for a user system. Buffering of one or more multicast broadcasts is discontinued if the network is determined to be too congested.

MULTIPLE BUFFERED CHANNEL IP MULTICAST

FIELD OF THE INVENTION

The present invention relates to multiple broadcasts over a data network, and, more particularly to the user interface with multiple broadcasts.

BACKGROUND OF THE INVENTION

A multicast Internet Protocol (IP) data stream is buffered in order to account for inconsistencies in the public Internet data delivery system. When a user desires to switch from a data stream presently running on a computer to another IP multicast data stream, a delay occurs because the new data stream requires buffering. Because users are accustomed to no delay when performing channel changes in other broadcast environments, such as television or radio broadcast environments, these delays are very undesirable.

Therefore, in order for multicasts to be more widely accepted by the public, there exists a need to remove the above described delays, thereby making interaction more user friendly.

SUMMARY OF THE INVENTION

The present invention provides a computer-based method to allow a user to change multicast channels received over a network, such as the Internet, without reception delay. Multicast channels are monitored for their amount of usage. Then, the broadcasts associated with those multicast channels that were determined to have significant usage are buffered for quick access.

In accordance with further aspects of the invention, a multicast broadcast is buffered according to a determined available bandwidth for a user system.

In accordance with other aspects of the invention, buffering of one or more multicast broadcasts is discontinued according to a determination of network congestion.

As will be readily appreciated from the foregoing summary, the invention provides a new and improved method and computer product for allowing users to surf through IP multicast channels with the same speed as the traditional television interface.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same becomes better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a block diagram of an example system for implementing the present invention; and

FIGURE 2 is a flow diagram illustrating the method of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is a method for improving user interaction with multicasts as implemented over a public or private network system. As shown in FIGURE 1, an example system 10 for implementing the method of the present invention includes a multicast generating system 12 coupled to a public or private network 14, such as the Internet. A network router 16 is coupled to the network 14 and one or more user systems 20. An example of the network router 16 in the Internet environment is an Internet Service Provider (ISP). The user systems 20 are any devices capable of receiving multicasts from multicast generating system 12 through the network 14 and the router 16. Typically, the user systems 20 will comprise personal computers.

In a preferred embodiment of the present invention the multicast generating system 12 generates an Internet Protocol (IP) multicast. IP multicasts are an efficient means to move information on a network. The present invention implements any IP multicast and does not require any particular multicast protocol. In an IP multicast, data is transmitted to a group of selected users at the same time on a TCP/IP network (internal, intranet or Internet). IP multicasts are used for streaming audio and video over the network 14, but is also good for downloading a file to multiple users. IP multicasts save network bandwidth, because the files are transmitted as one data stream over the network's backbone and are split apart to target stations or user systems 20 by the router 16.

IP multicasts are addressed to a certain range of IP Address Numbers. IP multicasts are recognized by a numeric address range of an IP number. Any transmission in a multicast address range is a multicast. IP multicast transmission adds efficiency to an IP broadcast because IP routers 16 (and others within network 14 but not shown) can support these and other IP multicast protocols, such as PIM Sparce Mode and multicast Border Gateway Protocol.

FIGURE 2 illustrates the method performed by the present invention. First, at block 32, the multicast channels available by one or more user systems 20 through router 16 are monitored for requests to join. A multicast channel corresponds to a single multicast broadcast. The multicast channels' monitoring is performed by each user system 20. Next, at decision block 34, the user system determines if the monitoring of requests to join a multicast channel exceeds a threshold number of requests to join have been made for a particular multicast channel. Thereby, determining what multicast channels are most frequently accessed. For example, the threshold number of requests is the number of requests that occurred for the third most requested channel. If it is determined that the monitored multicast channel does exceed the threshold number of requests, the router 16 or one or more user systems 20 determines available bandwidth between the router 16 and one or more of the user systems 20, see block 36. Then, at block 38, the monitored multicast channel is buffered at the user systems 20 according to the determined available bandwidth. For example, if the bandwidth available to the user system is not enough to sustain buffering of additional channels, the buffering of the additional channels is not performed. If it is determined that the number of requests to join of the monitored

multicast channel does not exceed the threshold number of requests, the method skips blocks 36 and 38.

After block 38, network congestion is determined, see block 40. Network congestion is determined at the service provider (e.g. ISP) by a quality of service application (QOS) or at the user system by an application that determines available bandwidth or used bandwidth at the service provider. Then, at decision block 42, the determined network congestion is compared to a predetermined congestion threshold amount (an amount that would cause a possible disruption in data delivery across the router 16. If the network congestion is not above the congestion threshold amount, the method returns to block 32 to monitor other multicast channels. If the network congestion is above the congestion threshold amount some or all of the buffered channels are discontinued in accordance with the determined network congestion, see block 44 and then returns to block 32.

The steps of the method shown in FIGURE 2 and described above may be placed in any one of a number of different orders without compromising the present invention.

The present invention allows a user to surf through IP multicast channels with the same speed as the traditional television interface. By buffering the most frequently used channels, an end user is spared the frustrating delays of channel switching.

While the preferred embodiment of the invention has been illustrated and described, many changes can be made without departing from the spirit and scope of the invention. Accordingly, the scope of the invention is not limited by the disclosure

of the preferred embodiment. Instead, the invention should be determined entirely by reference to the claims that follow.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method for improving a user interface at a user system coupled to a plurality of multicast content providers over a network, said method comprising:

monitoring user system requests to join multicast broadcasts associated with the plurality of multicast content providers; and

buffering an associated multicast broadcast, if the associated multicast broadcast was monitored to have a number of requests to join greater than a threshold amount.

2. The method of Claim 1, wherein buffering further comprises

determining available bandwidth,

buffering the multicast broadcast according to the determined available bandwidth.

3. The method of Claim 1, further comprising:

determining network congestion; and

discontinuing buffering of one or more multicast broadcast according to the determined network congestion.

4. The method of Claim 1, wherein at least one of the content providers is a multicast broadcaster.

5. A computer program product for performing the method of Claim 1.

6. A computer program product for performing the method of Claim 2.

7. A computer program product for performing the method of Claim 3.

8. A computer program product for performing the method of Claim 4.

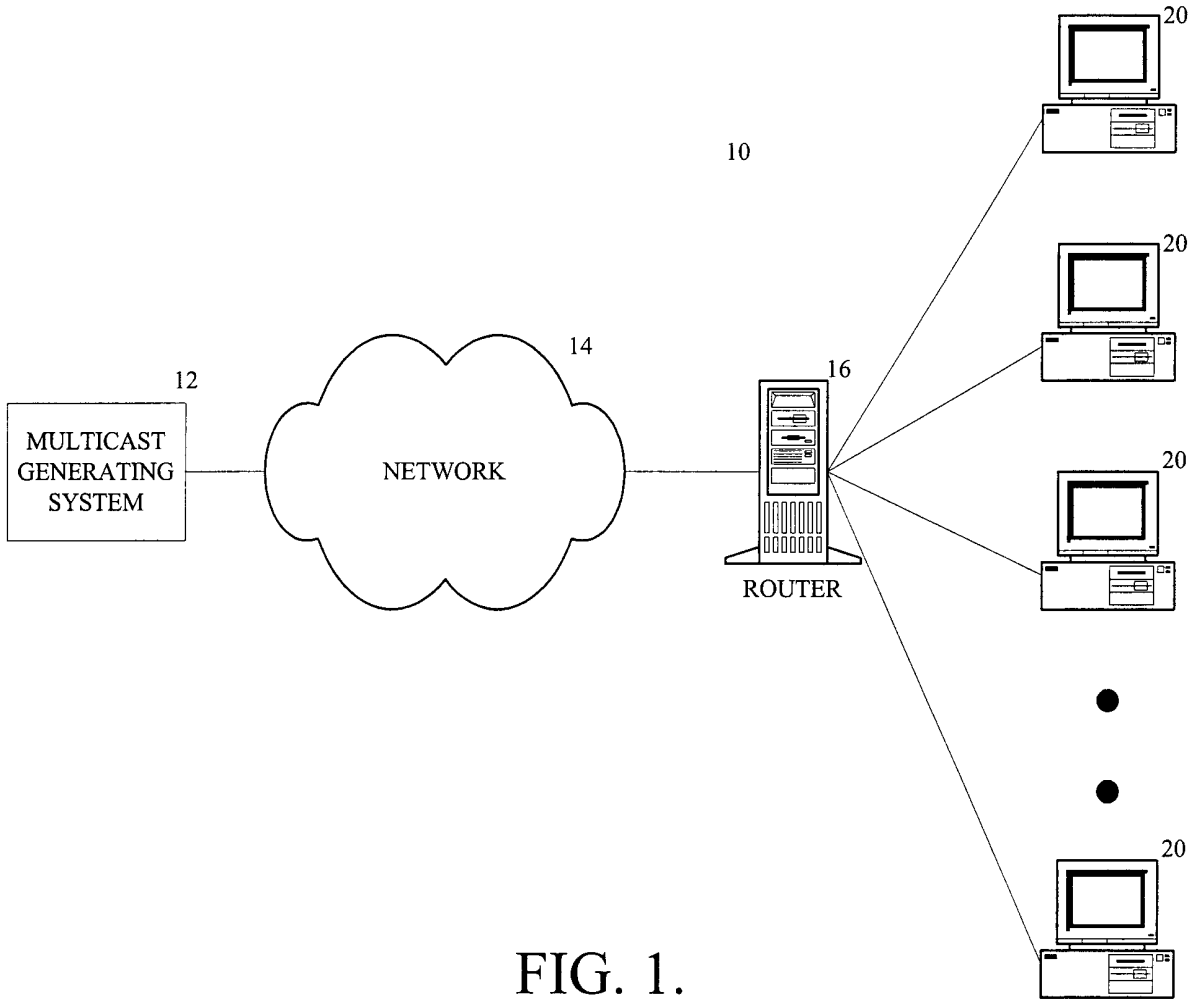
10
12
MULTICAST GENERATING SYSTEM
14
NETWORK
16
ROUTER
20
20
20
20

FIG. 1.

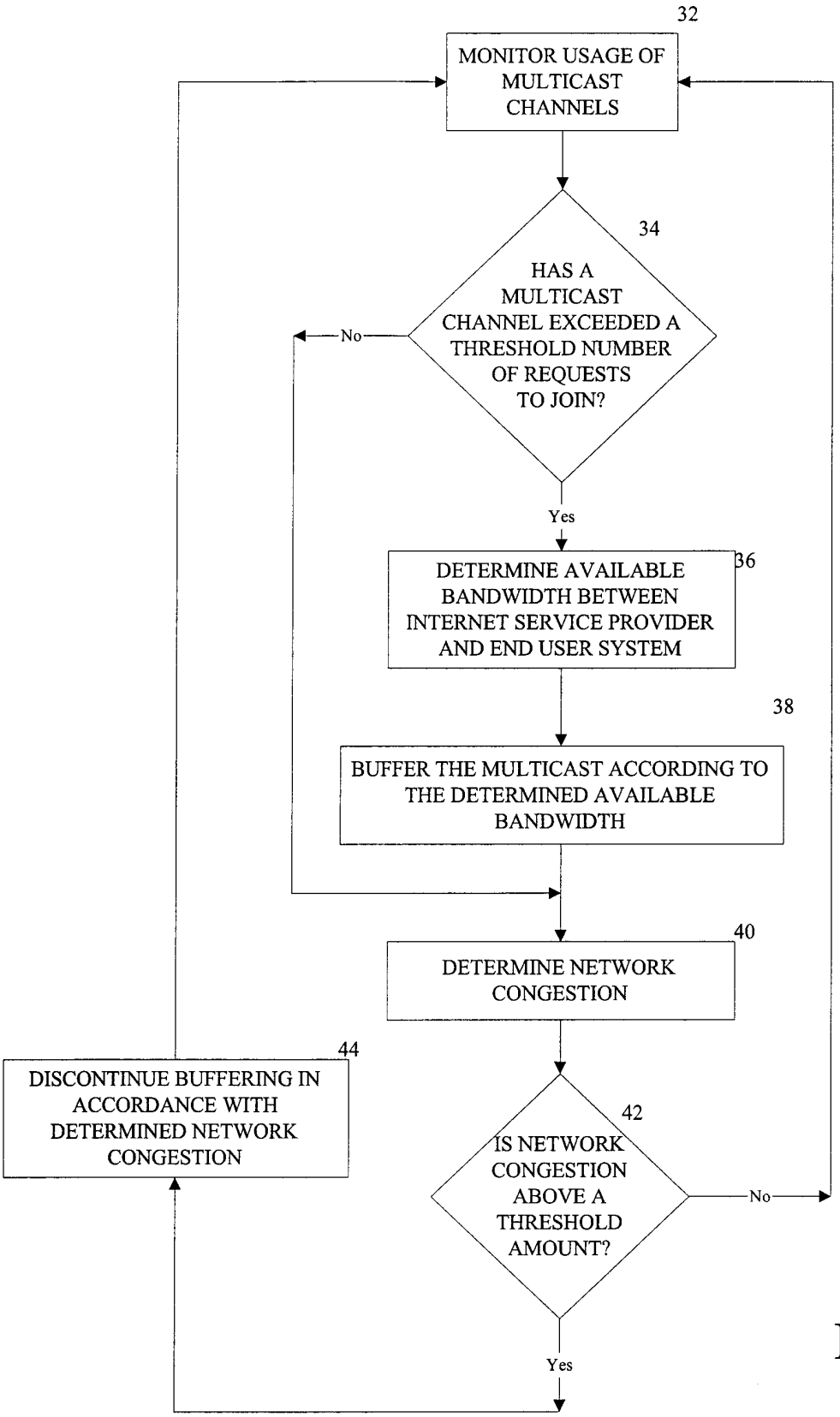
32
MONITOR USAGE OF MULTICAST CHANNELS
34
HAS A MULTICAST CHANNEL EXCEEDED A THRESHOLD NUMBER OF REQUESTS TO JOIN?
No
Yes
36
DETERMINE AVAILABLE BANDWIDTH BETWEEN INTERNET SERVICE PROVIDER AND END USER SYSTEM
38
BUFFER THE MULTICAST ACCORDING TO THE DETERMINED AVAILABLE BANDWIDTH
40
DETERMINE NETWORK CONGESTION
42
IS NETWORK CONGESTION ABOVE A THRESHOLD AMOUNT?
No
Yes
44
DISCONTINUE BUFFERING IN ACCORDANCE WITH DETERMINED NETWORK CONGESTION

FIG. 2.