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(54) ADVERTISEMENT SUBGROUPS FOR DIGITAL STREAMS

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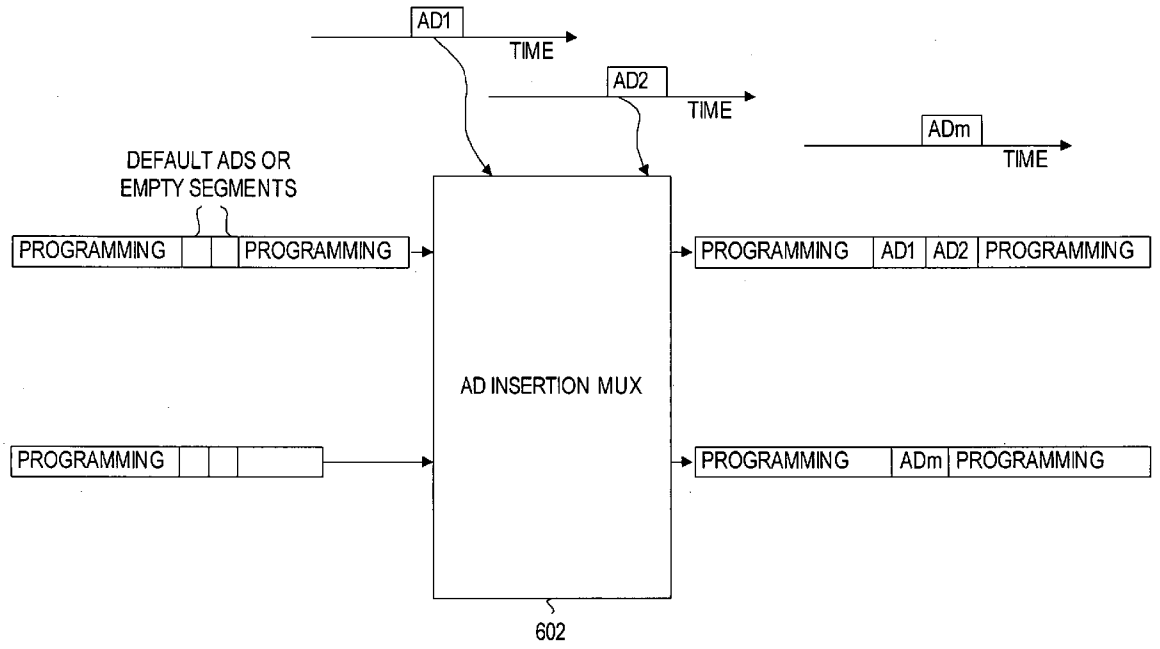
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(57) **ABSTRACT**

A targeted advertising system based on subgroups. Different subgroups are formed based on one or more subscriber characteristics, and different targeted advertisements transmitted to the different subgroups. In the Internet-environment, the subgroups are formed by utilizing multicast addresses. In cable-based and satellite-based systems, the subgroups are formed by node configurations. The targeted advertisements are inserted in the program streams at a centralized distribution point such as a router or a cable television head-end. An apparatus is presented which receives m program streams, n advertisements, and creates p presentation streams containing targeted advertisements, where p is greater than m.



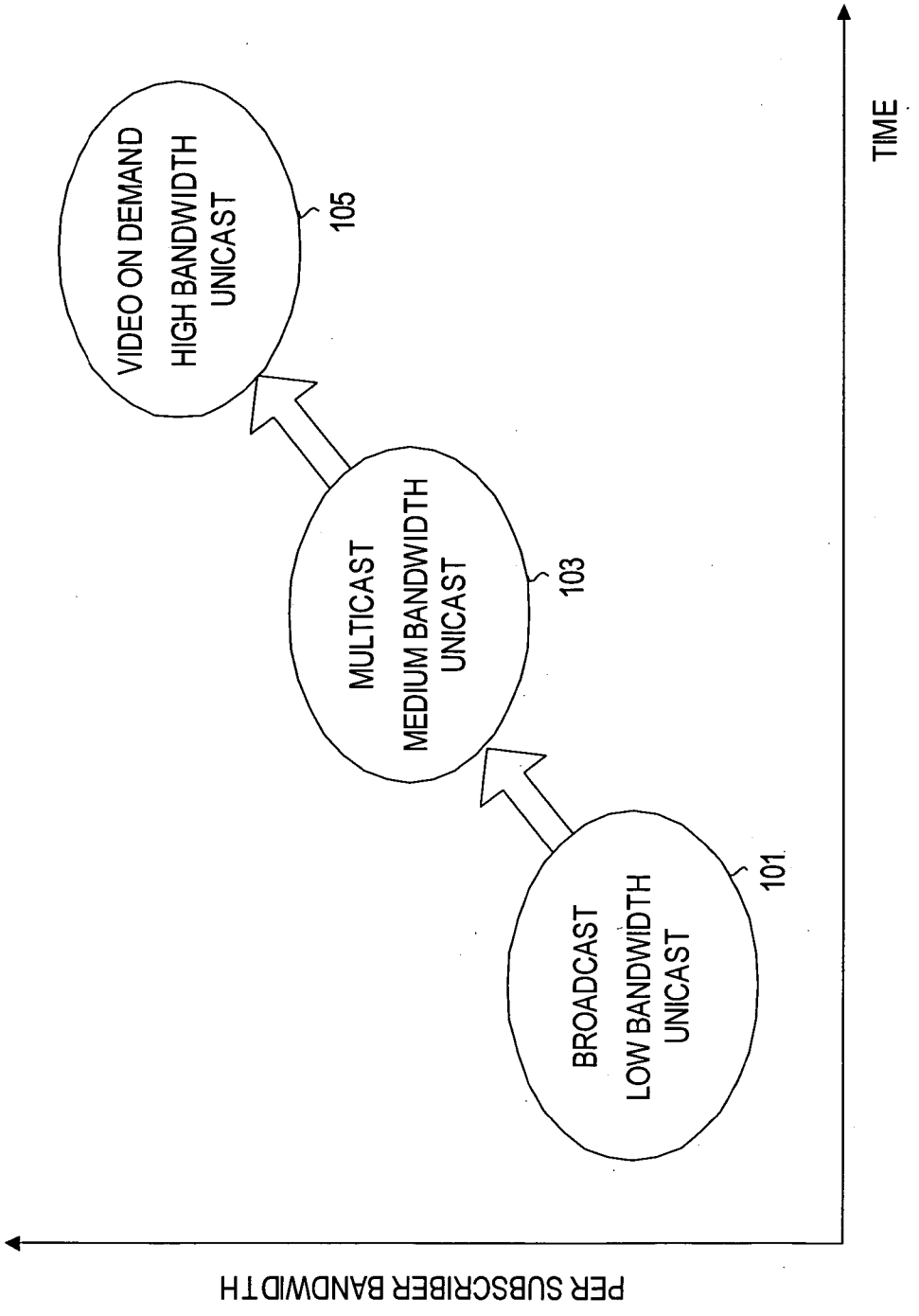

VIDEO ON DEMAND
HIGH BANDWIDTH
UNICAST
105
MULTICAST
MEDIUM BANDWIDTH
UNICAST
103
BROADCAST
LOW BANDWIDTH
UNICAST
101
TIME
PER SUBSCRIBER BANDWIDTH

FIG. 1

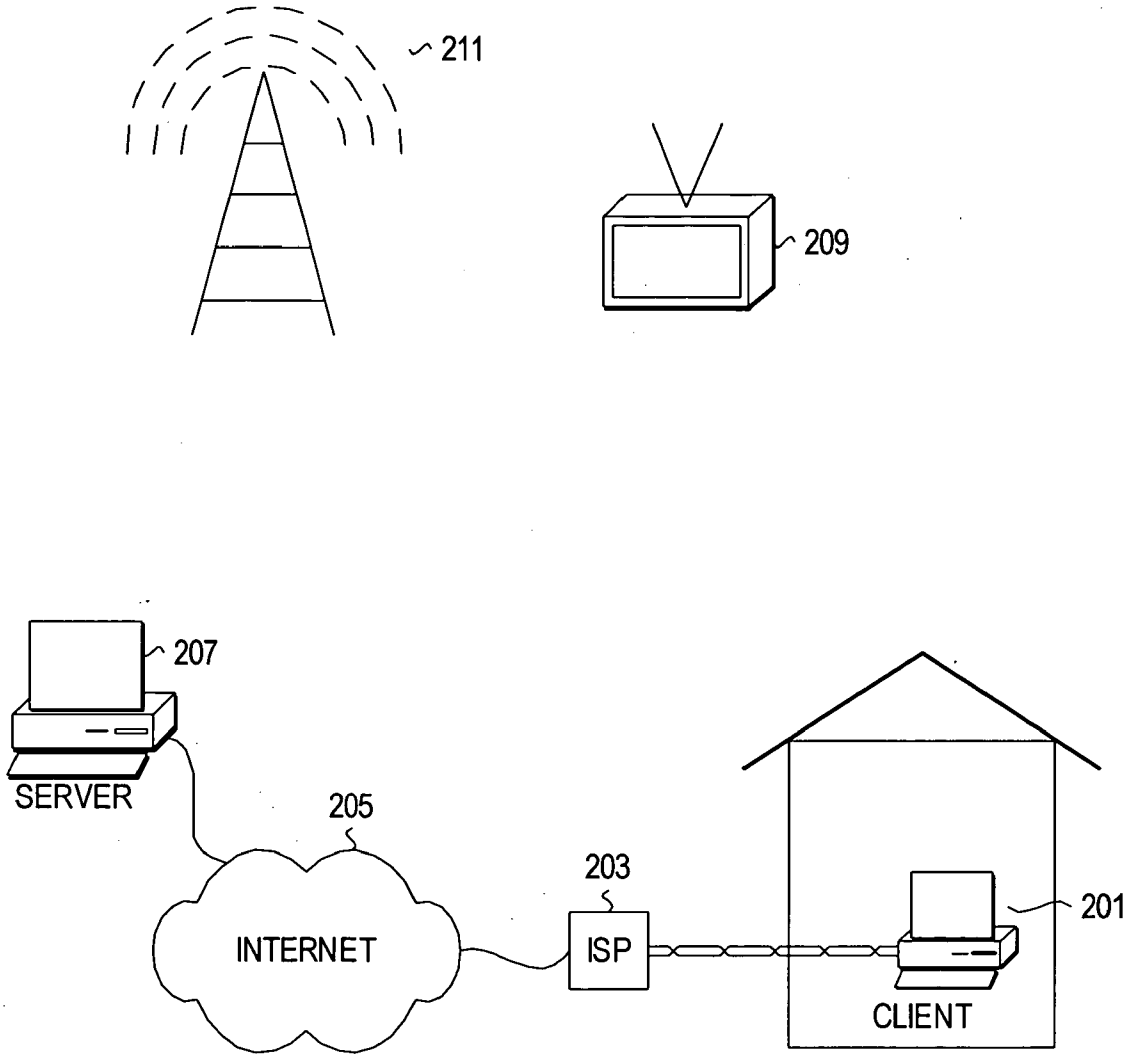


FIG. 2

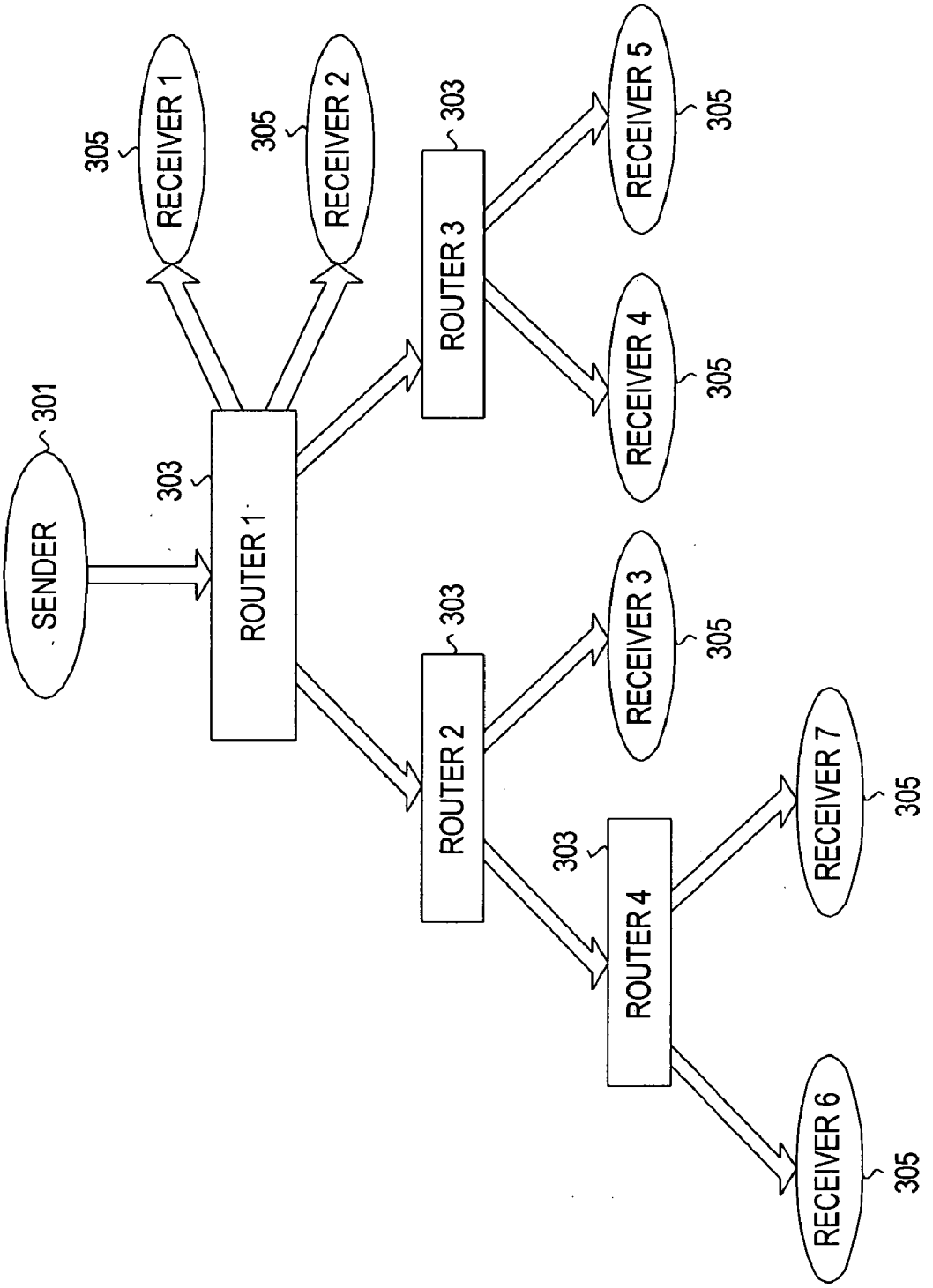

SENDER
301
ROUTER 1
303
ROUTER 2
303
ROUTER 3
303
ROUTER 4
303
RECEIVER 1
305
RECEIVER 2
305
RECEIVER 3
305
RECEIVER 4
305
RECEIVER 5
305
RECEIVER 6
305
RECEIVER 7
305

FIG. 3

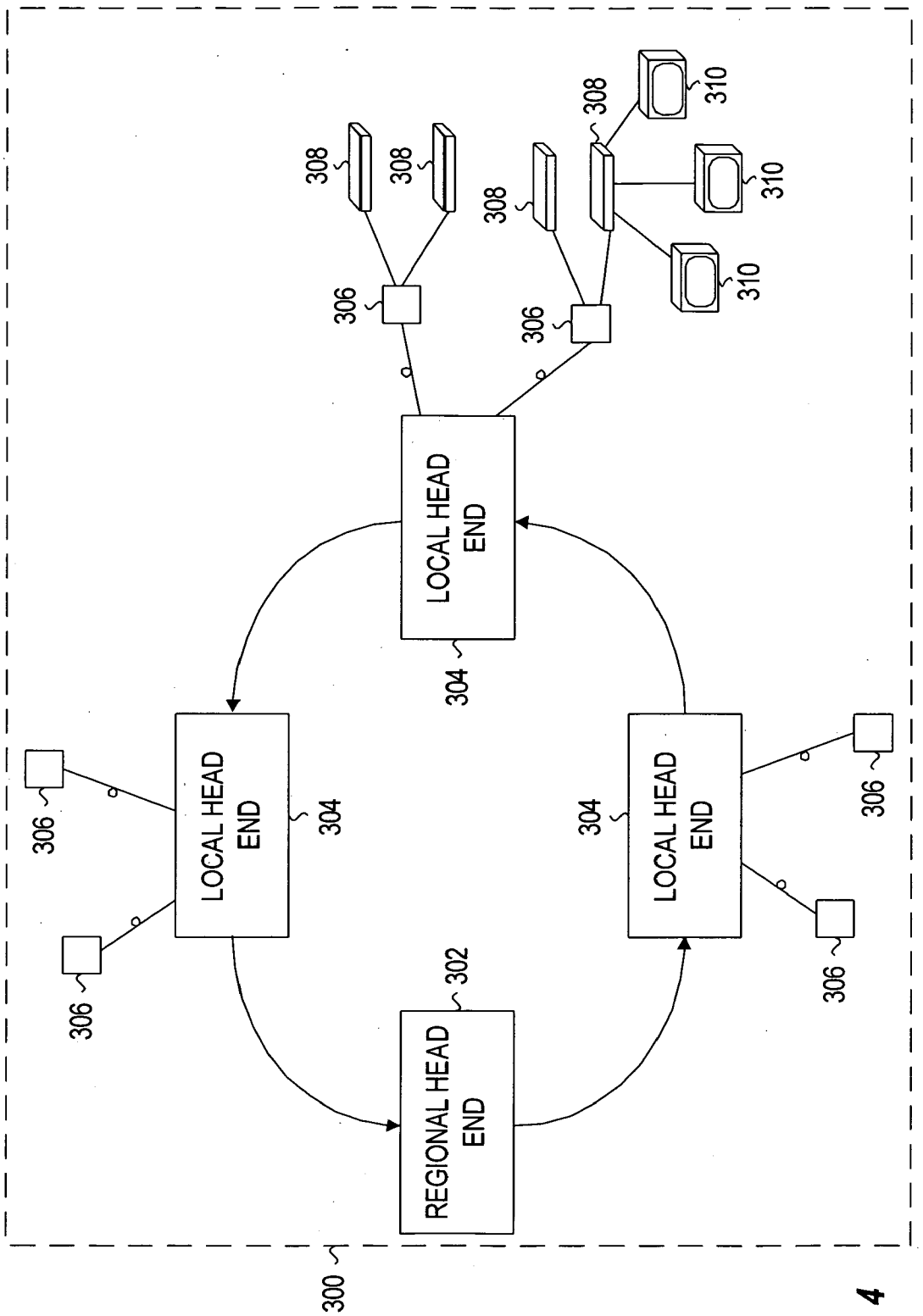

300
REGIONAL HEAD END
302
LOCAL HEAD END
304
LOCAL HEAD END
304
LOCAL HEAD END
304
306
306
306
306
306
308
308
308
308
308
310
310
310

FIG. 4

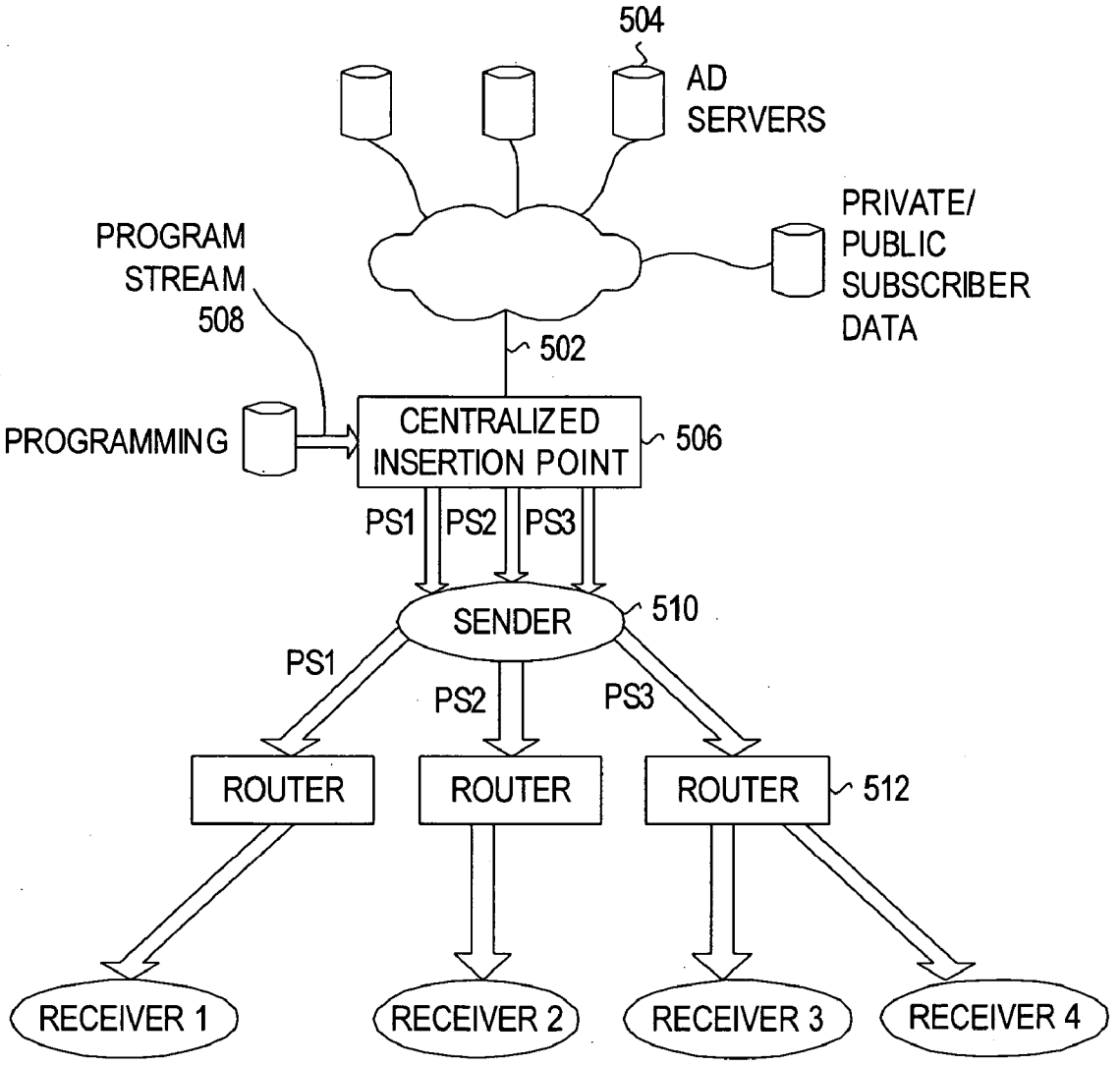

504
AD SERVERS
PRIVATE/ PUBLIC SUBSCRIBER DATA
PROGRAM STREAM 508
502
PROGRAMMING
CENTRALIZED INSERTION POINT
506
PS1
PS2
PS3
SENDER
510
PS1
PS2
PS3
ROUTER
ROUTER
ROUTER
512
RECEIVER 1
RECEIVER 2
RECEIVER 3
RECEIVER 4

FIG. 5

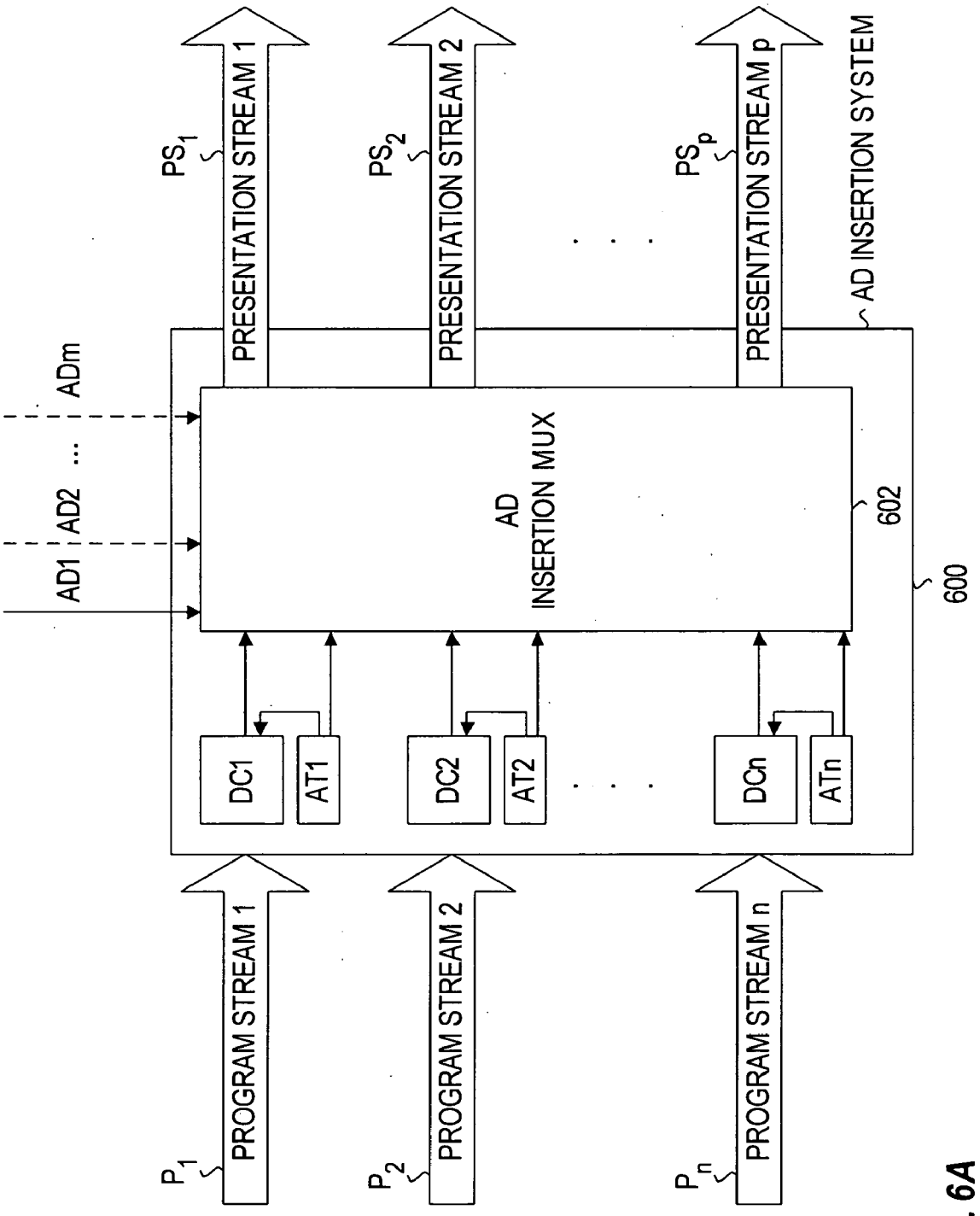

PS1
PS2
PSp
PRESENTATION STREAM 1
PRESENTATION STREAM 2
PRESENTATION STREAM p
AD INSERTION SYSTEM
ADm
AD2
AD1
AD INSERTION MUX
602
600
DC1
AT1
DC2
AT2
DCn
ATn
P1
P2
Pn
PROGRAM STREAM 1
PROGRAM STREAM 2
PROGRAM STREAM n

FIG. 6A

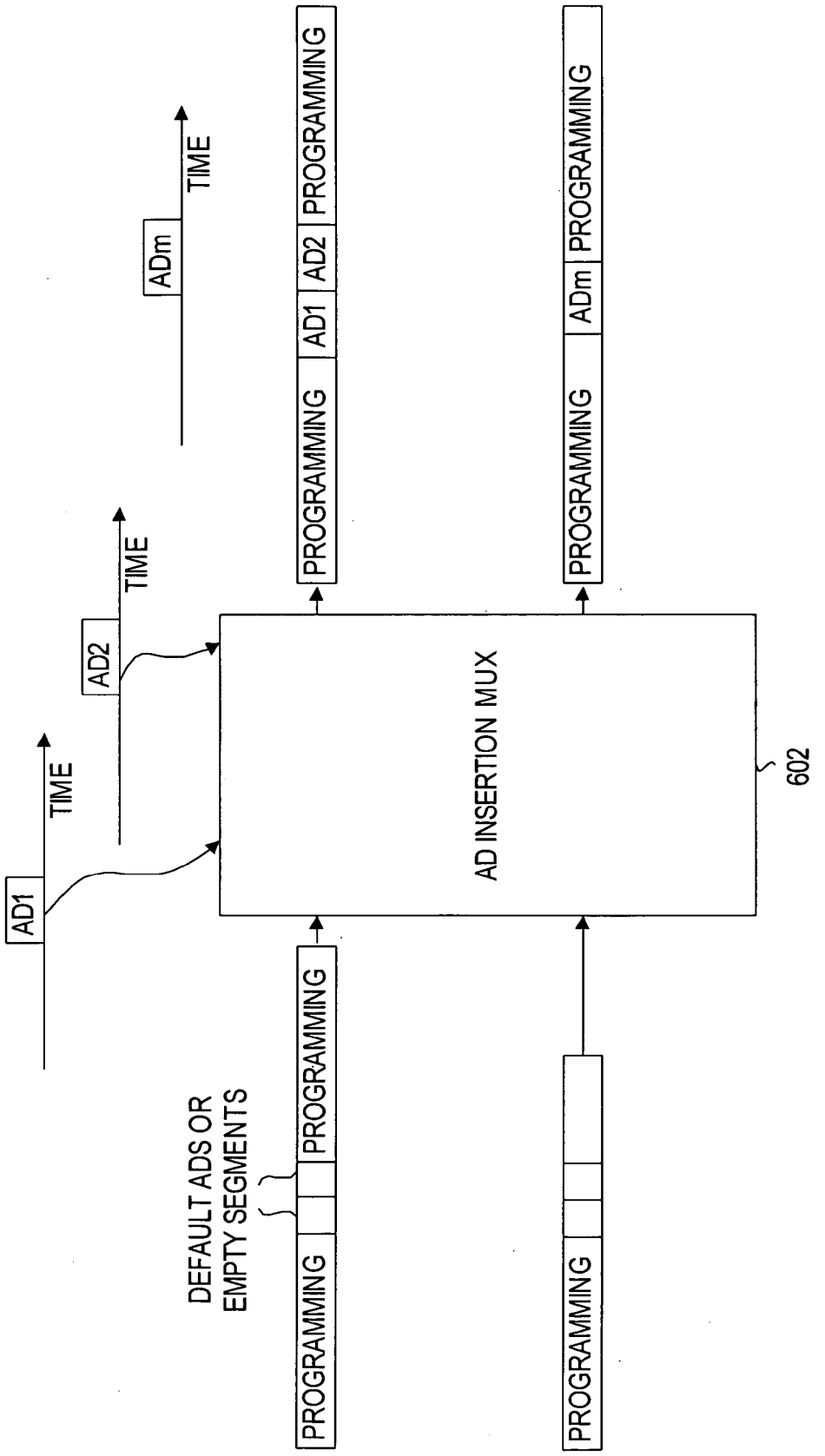

AD1
TIME
AD2
TIME
ADm
TIME
DEFAULT ADS OR EMPTY SEGMENTS
PROGRAMMING
PROGRAMMING
AD INSERTION MUX
602
PROGRAMMING
AD1
AD2
PROGRAMMING
PROGRAMMING
ADm
PROGRAMMING

FIG. 6B

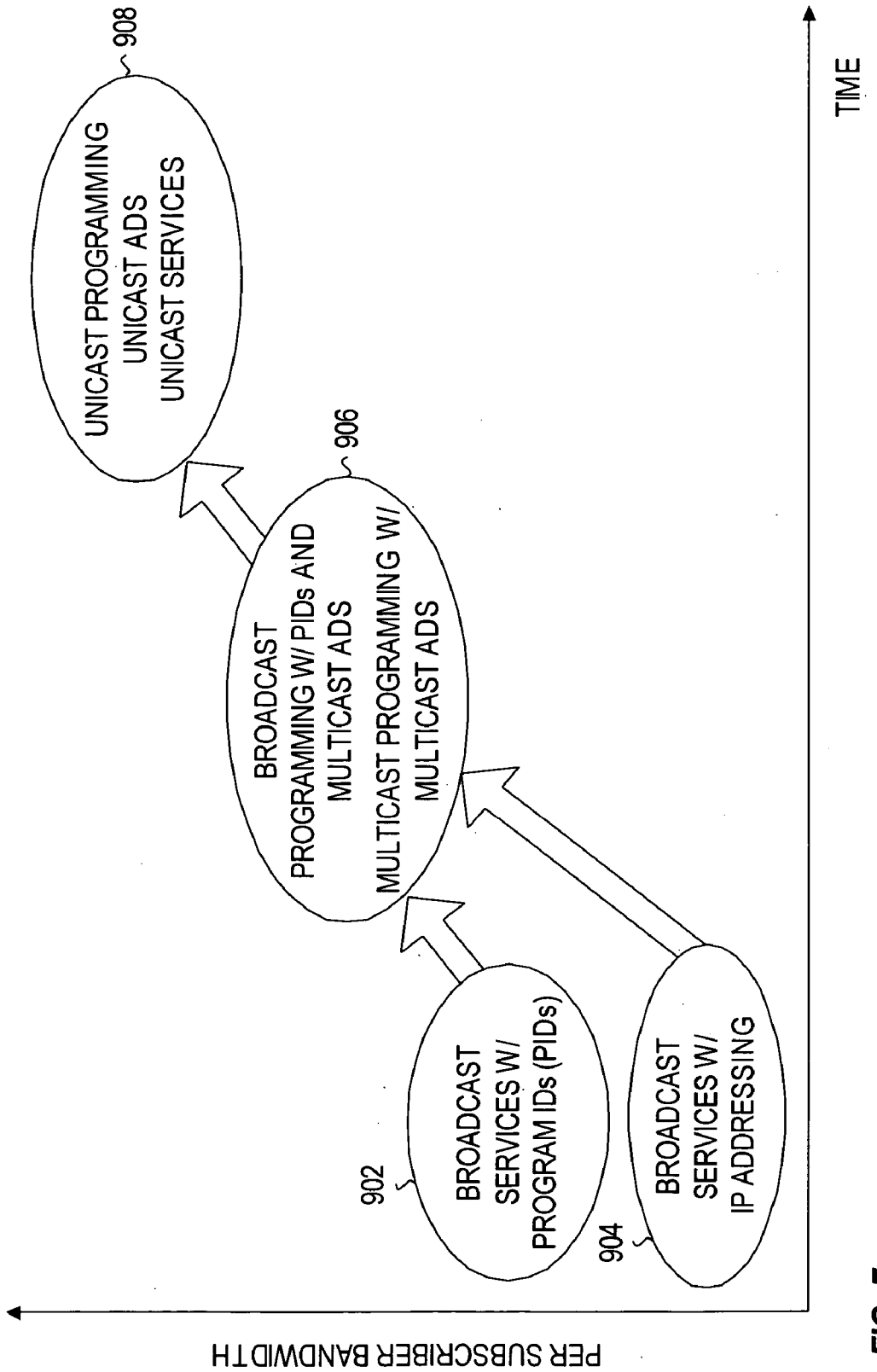

PER SUBSCRIBER BANDWIDTH
TIME
902
BROADCAST SERVICES W/ PROGRAM IDs (PIDs)
904
BROADCAST SERVICES W/ IP ADDRESSING
906
BROADCAST PROGRAMMING W/ PIDs AND MULTICAST ADS
MULTICAST PROGRAMMING W/ MULTICAST ADS
908
UNICAST PROGRAMMING
UNICAST ADS
UNICAST SERVICES

FIG. 7

ADVERTISEMENT SUBGROUPS FOR DIGITAL STREAMS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of copending U.S. patent application Ser. No. 09/568,084, filed on May 10, 2000, and entitled "Advertisement Subgroups for Digital Video Streams", which claims the benefit of U.S. Provisional Application No. 60/133,398, filed on May 10, 1999, and entitled "Advertisement Subgroup Multicasting", each of the disclosures of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] The development of compression and transmission techniques for digital video and audio signals coupled with the advent of the Internet have resulted in an ability to transmit audio and video programming to subscribers from a multitude of locations. Reception areas are no longer limited to the reception area of a radio or television transmitting tower, a cable TV head end, a telephone central office or another geographically determined location. Instead, the subscribers of programming may be distributed over a wide geographical range and in fact exist in a multitude of countries.

[0003] For example, a group of subscribers distributed across the globe having a specific interest can have simultaneous access to the programming of interest. In cable television systems, these programs are generally transmitted to groups of subscribers, each group being associated with a node. A node is traditionally associated with a receiver which receives an optical signal from the cable TV head end, converts the signal to an electrical signal, and transmits the signals to the homes. The video programming is frequently transmitted from one central location to multiple cable television head ends, and then distributed to the nodes and ultimately to the subscribers. Although the viewership for the programs transmitted in this manner may be quite large, generally, there exists characteristics that can be associated with each node due to the respective geographic location.

[0004] The nodes in certain areas may have subscribers with a particular range of household income or other demographic characteristics that are distinct from the subscribers in other nodes both nearby and distant.

[0005] Similar characteristics exist for the television systems that receive digital programming from satellites. Generally, the digital video programming is frequently transmitted from one central location to multiple cable television head ends, and then distributed to the nodes and ultimately to the subscribers.

[0006] The transmission of the programming based on specific geographic areas continues to exist, especially in cable-based systems and satellite-based systems, but is substantially affected by the advent of the Internet. In the Internet environment, the information contents may be received from any computer on the network, irrespective of where the subscriber is located. Furthermore, in the Internet environment, the information contents may be customized based on subscriber needs and preferences.

[0007] In all of the above-mentioned systems, including cable-based, satellite-based and Internet-based systems, the program contents also include one or more advertisements. These advertisements are generally inserted in the program streams by evaluating the program contents, making a rough determination of the target audience, and finding suitable advertisements. For example, beer advertisements may be inserted into the football game programming, and gardening tool advertisements may be inserted into home improvement programming. In cable-based and satellite-based systems, these advertisements are generally displayed as spot messages, and in the Internet environment, these advertisements are displayed as banner advertisements.

[0008] Internet environments also provide for multicasting where audio and video streams are simultaneously transmitted to a plurality of subscribers. The subscribers are grouped based on the type of program contents they receive, but there is no distinction for the purpose of advertising.

[0009] Thus, even though prior art advertising schemes try to match the program contents and the advertisements that are displayed within the program contents, such advertisement schemes are not fully effective. What is lacking in these advertising schemes is the idea of targeted advertising, i.e., presenting different advertisements to different subscribers based on one or more subscriber characteristics or different versions of the same advertisement to different subscribers based on one or more subscriber characteristics.

SUMMARY OF THE INVENTION

[0010] The present invention is directed at an apparatus and a method for creating subgroups based on one or more subscriber characteristics. Each subgroup corresponds to one or more subscribers and receives a particular program stream and one or more targeted advertisements directed at that set of subscribers.

[0011] The subgroups may be created in many different ways. In an Internet environment, the subgroups may be created by utilizing multicasting features. Generally, the subgroups are created within a multicast group based on one or more shared subscriber characteristics. The subgroup may comprise a group of subscribers, a group of households, an individual subscriber or a single household. In a cable environment, the subgroups may be created based on the configuration of a regional head-end and one or more local head-ends, e.g., each node configured to a local head-end may represent a subgroup.

[0012] In another embodiment, an apparatus is presented in which n digital program streams are received along with m digital advertisement streams, and p digital presentation streams containing inserted advertisements are created, where p is greater than n. Each of the digital presentation streams corresponds to a different subgroup, e.g., a first presentation is transmitted to a first subgroup, and a second presentation is transmitted to a second subgroup, etc.

[0013] In one implementation, different presentation streams are formed for different subgroups created within a multicast group. First, different advertisements or different versions of the same advertisements are selected. Then a plurality of presentation streams are created by multiplexing the program contents with one or more targeted advertisements. These presentation streams are then transmitted to different subgroups. Each of the subgroups receives a presentation stream that comprises program content and one or

more targeted advertisements. The presentation streams may be digital video streams or digital audio streams.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying drawings, which are incorporated in and form a part of the specification, illustrate the embodiments of the present invention and, together with the description serve to explain the principles of the invention.

[0015] In the drawings:

[0016] **FIG. 1** illustrates the migration from broadcast and low bandwidth unicast services to multicast and high bandwidth services;

[0017] **FIG. 2** illustrates current broadcast services and dial-up Internet access;

[0018] **FIG. 3** illustrates the formation of multicast subgroups by utilizing different routers;

[0019] **FIG. 4** illustrates an exemplary case of formation of multicast groups in a cable-based network;

[0020] **FIG. 5** illustrates the process of inserting targeted advertisements at a centralized point;

[0021] **FIG. 6A** illustrates an exemplary ad insertion multiplexer;

[0022] **FIG. 6B** illustrates time independent ad reception and insertion using an ad insertion multiplexer; and

[0023] **FIG. 7** illustrates the migration of advertising from broadcast advertisements or advertisements in unicast IP addressed streams to multicast ads and services, and to unicast ad and unicast services.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0024] In describing a preferred embodiment of the invention illustrated in the drawings, specific terminology will be used for the sake of clarity. However, the invention is not intended to be limited to the specific terms so selected, and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose.

[0025] With reference to the drawings, in general, and **FIGS. 1 through 7** in particular, the method and apparatus of the present invention is disclosed.

[0026] As illustrated in **FIG. 1**, the broadcast entertainment and telecommunications services are migrating from the classifications of broadcast programming and low bandwidth unicast **101** transmission to multicast and medium bandwidth unicast **103** systems in which the number of subscribers in the receiving group is reduced, or the bandwidth to a subscriber receiving an individualized service is increased. This migration is present in traditional television broadcasting as well as Internet access environments.

[0027] The increased availability of bandwidth to subscribers results in the formation of smaller broadcasting groups that can be referred to as multicast groups. In addition, the amount of bandwidth available to each subscriber for unicast services such as connections to Web sites, high-speed point-to-point data connections, and videoconferencing, is increased. This results in medium bandwidth unicast connections that can support new services.

[0028] The increased bandwidth also enables video on demand services that are essentially high bandwidth unicast (illustrated as **105** in **FIG. 1**) connections providing a subscriber with specific programming at a specific point in the program stream.

[0029] In accordance with the principles of the present invention, a number of new services may also be provided based on these unicast connections. One of these services is the relay of targeted advertisements.

[0030] In one embodiment of the present invention, the targeted advertisements are relayed based on subgroups, wherein each subgroup may comprise one or more subscribers, or one or more households. The method and system for creating subgroups is applicable for both the television broadcasting (video transmission) environment and the Internet environment, and may be realized in traditional networks.

[0031] **FIG. 2** illustrates exemplary illustrations for traditional television broadcasting and Internet access environments. The present broadcast audio and video entertainment services fall in the category of broadcast services that are delivered by traditional radio, cable TV and wireless broadcasting techniques wherein a client (receiver) **209** receives programming from a central unit **211**. The central unit **211** may be a base-station or a head-end or a cable distribution point. In the Internet world, a web-server **207** broadcasts the information over an Internet network **205** to an Internet Service Provider (ISP) **203** which ultimately delivers the information to a client **201**. The broadcasting is accomplished by utilizing one or more different multicasting protocols over the Internet.

[0032] The point-to-point connection for Internet access illustrated in **FIG. 2** is also representative of unicast services that can be defined as the point-to-point transmission of signals from a source or a subscriber to another subscriber. This includes telephone service and point-to-point data connections to data sources.

[0033] In accordance with the principles of the present invention, the actual formation of subgroups for advertising is performed by creating multiple lists or tables of subscribers that share one or more subscriber characteristics. The subgroups may be based on (1) geographic segmentation, (2) demographic segmentation, (3) psychological segmentation, (4) psychographic segmentation, (5) sociocultural segmentation, (6) use-related segmentation, (7) use-situation segmentation, (8) benefit segmentation, and (9) hybrid segmentation. More information may be found in a book entitled Consumer Behavior, by Leon G. Schiffman and Leslie Lazar Kanuk published by Prentice Hall, New Jersey 1999.

[0034] The analysis of different segmentations permit the advertisement to be directed to specific users or groups of users who fit certain criteria. For instance, an advertisement for a baby stroller could reach parents of children under five years old—and only those individuals in that group. Other publicly or privately available data regarding the subscribers may also be collected. This data may also be mined to form a subgroup of subscribers which has a common characteristic which matches the characteristics of the target group.

[0035] One technique for forming subgroups involves utilization of geographic location information. Each subgroup may consist of subscribers located in a particular state, city, or associated with a cable television node. Another technique for forming subgroups is based on knowledge of the viewership of the actual programming. For example, many companies collect data related to the viewing of the television programming and such information may be used to form subgroups. Once such collection of data is known as the Nielsen rating which is based on samples of information related to the viewing of television programming. Other types of similar information are also available. The subgroups may be based on the actual viewership information, or on an estimate of the current viewership, or on the statistical measurement of the viewership.

[0036] The actual formation of subgroups may be accomplished in many different ways. In an Internet environment, the subgroups may be formed by utilizing multicast addresses. Currently, the multicast addresses are utilized to form a group of subscribers that are interested in receiving the same information, e.g., listening to the same radio station, being members of some listserv, etc. In accordance with the principles of the present invention, the members of a multicast group may be further classified into subgroups (i.e., multicast subgroups). These subgroups may be formed based on geographic locations, e.g., country of residence, as can be determined from a subscriber e-mail address, IP address, or other Internet-related parameters. These subgroups may also be formed based on a subscriber's operating system, data transmission rate, or other transmission related parameters. In this implementation, each subgroup may comprise a country, e.g., subscribers from the USA may be grouped in the first subgroup, and subscribers from Mexico may be grouped in the second subgroup. The formation of subgroups based on geographic information assists in selecting target advertisements that are suitable for each group.

[0037] As shown in **FIG. 3**, in one embodiment, the multicast subgroups may be formed by utilizing different routers. In **FIG. 3**, a transmitter/provider of information (sender) **301** is directly connected to Router **1303**. The sender **301** may be a web-based server or a network-based server or other comparable means configured to distribute information to a plurality of receivers **305** via one or more routers **303**. As shown in **FIG. 3**, Router **1** is directly coupled to the sender **301** and thereby forms a multicast group. Different receivers **305** belonging to the multicast group of Router **1** are further distributed in subgroups. Receiver **1** and Receiver **2** belong to a first subgroup served directly by Router **1**. Receiver **3** is in a second subgroup served by Router **2**. Receiver **4** and **5** are in a third subgroup and are served by Router **3**. Receiver **6** and **7** are in a fourth subgroup and are served by Router **4**.

[0038] Standard Internet multicasting protocols may be used to create these subgroups. Internet-based multicast protocols are well known to those skilled in the art and include Internet Group Management Protocol (IGMP) protocols and other Transmission Control Protocol/Internet Protocol (TCP/IP) related protocols. Some of these multicast protocols are described in the book entitled Routing in the Internet authored by Christian Huitema, and published by Prentice-Hall in 1995, and in the volumes 1 and 2 of the books entitled Internetworking with TCP/IP, authored by Douglas E. Corner and Douglas E. Corner and David L. Stevens respectively, published by Prentice-Hall in 1995 and 1999. The aforementioned books are incorporated herein by reference.

[0039] The Internet Engineering Task Force RFCs 1112, 1458, 1301 and 966 specify protocols for multicasting and are incorporated herein by reference.

[0040] Other multicasting techniques may also be used to create lists of subscribers that form part of one or more multicast groups. These groups may be subscribers in diverse locations receiving a program stream, or may be a group of subscribers belonging to the listserv.

[0041] In the cable systems and satellite-based systems, the subgroups may be created by utilizing the existing configuration of cable networks. As an example, in a cable television system, the subscribers associated with a node may be considered to form a subgroup. As illustrated in **FIG. 4**, in a traditional cable-based network **300**, a regional head end **302** is coupled to one or more local ends **304**. Each local end **304** serves one or more nodes **306**. Each node **306** serves one or more set-tops **308**, and each set-top **308** in turn may serve one or more television sets **310**. In general, the viewers of the information transmitted to the television sets are the subscribers.

[0042] The subgroups may be formed utilizing the configuration of a local head end **304**, or a node **306**. The nodes are preferred because traditionally a local head end serves a large number of viewers/households, wherein a node serves only few households and thus may be used appropriately to form subgroups.

[0043] In a traditional cable-based system, a node **306** is configured to a plurality of set-tops **308** whereby the set-tops **308** receive transmission signals from the nodes **306**. These transmission signals include programming contents as well as advertisements. Generally, the information is delivered via transmission signal to one or more set-tops **308** located within the household, and for tracking purposes, a set-top **308** represents a subscriber. However, in actual practice, a single set-top **308** may serve one or more television sets **310**.

[0044] As described before, depending on the application and the desired size of the subgroups, the subgroups may be based on the local head end **304** or may be based on the nodes **306**. Alternatively, the subgroups may be narrowed and may be based upon the different set-tops **308**, whereby a household represents a subgroup.

[0045] In the future, the subgroups will be further narrowed to the level of a television set **310** served from a single set-top **308**. Thus, a single set-top **308** may represent a plurality of subscribers. In this case, different members of a household are different subscribers and the individual members of the household may be grouped in different subgroups for receiving different targeted advertisements. For example, the parents may receive a first target advertisement in their bedroom television, and the television in the children's bedroom may receive a second target advertisement (even though the parents and the children may be watching the same program).

[0046] The cable-based systems and satellite-based systems may further utilize cable modems or other devices configured to communicate with the Internet. For example,

set-top boxes can include Data Over Cable Service Interface Specification (DOCSIS) cable modems and be assigned, and thus identified, by an IP address. The DOCSIS cable modem can receive multiple channels via this IP address.

[0047] In one embodiment, the advertisement streams (also referred as ad streams) are sent via a DOCSIS channel setup to the DOCSIS cable modem within the set-top from a Cable Modem Termination System (CMTS). The CMTS relays all ad streams transmitted by the sender. The sender obtains, from the CMTS, the IP address of the set-top box which integrates a DOCSIS cable modem and transmits the advertisements to that IP address through the CMTS. The IP address can be part of a multicast group or it can be a unicast address. The ad streams may be transmitted using Internet technologies such as streaming media or other real time protocols.

[0048] The subscriber information relating to the nodes may be further customized/modified. For example, the addresses of the homes served by the node may be used along with public records to determine the average price that was paid for the home. The public records that sufficiently provide this information include tax records and other real estate information, e.g., the real estate information that associates zip codes with the median house prices may be used to determine the median house price of households served by a node. Other demographic information that may be of interest includes the predominant language which is spoken by the subscribers in the node, the average household size for households served by the node, and the average disposable income of households served by the node.

[0049] The present node sizes in cable television systems range from 300 to 1,500 subscribers, but the node sizes are likely to decrease as more bandwidth is required per home. This will result in smaller nodes, each node being fed by a fiber-optic cable which transmits and receives signals from the head end. As node size is reduced the subgroup for advertising will also be reduced, thus permitting more directed advertisements.

[0050] In cable-based systems, and in Internet-based systems, once the target advertisements have been identified, the actual insertion of the advertisements in the program streams may occur at a centralized point (e.g., a server) or at a local point (e.g., at a client end).

[0051] **FIG. 5** illustrates an exemplary process of inserting target advertisements at a centralized point. **FIG. 5** is particularly applicable in an Internet environment. As shown in **FIG. 5**, there exists a plurality of target advertisements **502** that may have been received from many different advertisement servers **504**. At a centralized point **506**, these target advertisements are inserted into one or more actual program streams **508** to form a plurality of presentation streams (PS1-PS3). Each presentation stream contains a different target advertisement. For exemplary purposes, it is shown that a sender **510** routes a first presentation stream (PS1) via one or more routers **512** to a first receiver, labeled Receiver **1**. The second presentation stream (PS2) is being routed via another router to Receiver **2**. The third presentation stream **3** (PS3) is routed via the use of yet another router to Receivers **3** and **4**. Additional routers may be used to form different subgroups and for the transmission of the advertisements to these subgroups.

[0052] The process of centralized insertion is also applicable for the cable-based or for the satellite-based systems. In a cable television environment, the routing function may be accomplished in the head end, instead of being accomplished in the routers. Similarly, the receivers shown in **FIG. 5** may correspond to one or more geographic nodes within the cable television system.

[0053] **FIGS. 6A and 6B** illustrate another exemplary process of inserting advertisements at a centralized point. This process may be used for cable-based systems. **FIG. 6A** illustrates an exemplary advertisement insertion system (also referred as ad insertion system) **600**. The ad insertion system **600** comprises an advertisement insertion multiplexer (also referred as ad insertion mux) **602**, where a number of program streams (P1-Pn) are received and initially decoded by demux units DC1, DC2, through DCn. The advertisements are labeled as AD1-ADm and are received separately. The timing modules AT1, AT2 through ATm are used to determine the appropriate insertion point for a new advertisement. The ad insertion mux **602** is responsible for multiplexing the program streams with the appropriate advertisements and creating a plurality of presentation streams PS1-PSp.

[0054] The program streams P1-Pn may comprise empty segments and the ad insertion mux **602** may insert target-advertisements in these segments to create various presentation streams **1** through p. Alternatively, the program streams may contain original advertisements within the program contents and the ad insertion mux **602** may substitute the original advertisement with one of the selected advertisements and create presentation streams **1** through p.

[0055] Thus, one feature of the system is the ability to take n program streams and m advertisements and create p presentation streams with p being larger than n. This represents the fact that the initial program streams have been used in conjunction with the multicast subgroups to create presentation streams with advertisements that are specifically directed at subgroups.

[0056] **FIG. 6B** illustrates the time independent feature of the advertisement insertion mux **602**. This feature allows advertisements to be received at times not corresponding to the presentation times. The advertisements may be received shortly in advance of or well in advance of the insertion time, and may be stored in a temporary storage unit for insertion at a later time. As previously described, the advertisements may be received over a low bandwidth channel such that a 30 second advertisement is received in a period of minutes or even longer. The local digital storage unit such as a magnetic storage unit, a magneto-optic storage unit, or an optical storage unit allows insertion any time subsequent to the reception.

[0057] In an exemplary case, the programming may be received at digital data rates in the 27-155 Mb/s range. Thus, a fiber optic transmission system based on OC-3 transport rates or greater is used for the transport of digital video programming. The advertisements may be received over a lower data rate line, such as a T1 line operating at 1.5 Mb/s. In this example, the transmission of the digital video programming must occur over the fiber optic transmission system (special facility), while the current cable television system can be used for the transmission of the advertisements.

[0058] Generally, the insertion of advertisements in program streams is handled by a combination of cue-tone

detectors, switching equipment and tape players which hold the advertising material. Upon receipt of the cue tone, an insertion controller automatically turns on a tape player containing the advertisement. Switching equipment then switches the system output from the video and audio signals received from the programming source to the output of the tape player. The tape player remains on for the duration of the advertising, after which the insertion controller causes the switching equipment to switch back to the video and audio channels of the programming source. When switched, these successive program and advertising segments usually feed to a radio-frequency (RF) modulator for delivery to the subscribers.

[0059] Many subscriber television systems, such as cable television systems are currently being converted to digital equipment. These new digital systems compress the data being transmitted to subscribers using compression standards such as Motion Picture Experts Group 2 (MPEG-2) standard. The compressed advertisement data is stored as a digital file on a large disk drive or several drives. Upon receipt of the cue tone, the digital system spools ("plays") the file off of the drive to a decompressor. The video and accompanying audio data are decompressed back to a standard video and audio, and switched into the video/audio feed of the RF modulator for delivery to the subscriber.

[0060] A compressed program stream, generally, is a collection of video, audio, and data streams which usually share a common time base.

[0061] To enable the inserting of different advertisements in compressed program streams, different advertising breaks or splice points are identified. Splice points in a compressed program stream provide opportunities to switch from one program to another. They indicate a safe place to switch, a place in the bit stream, where a switch can be made, and result in good visual and audio quality. They are analogous to the vertical (blanking) interval used to switch uncompressed video. Unlike uncompressed video, frame boundaries in an MPEG-2 bit stream are not evenly spaced. Therefore, the syntax of the transport packet itself is used to convey where these splice points may occur.

[0062] There exists a plurality of standards in the current technologies that provides a description of splice points and other constraints for encoding and inserting in program streams, e.g., MPEG-2 transport streams. In systems utilizing MPEG-2, the transport streams may be spliced without modifying the Packetized Elementary Stream (PES) packet payload. The systems are in compliance with existing Society of Motion Picture and Television Engineers (SMPTE) standards, e.g., SMPTE 312M-1999, and the constraints specified in the standard are applied individually to program streams within transport streams.

[0063] Splicing of MPEG bit streams also requires managing buffer fullness of the decoder's buffers. When MPEG bit streams are encoded, there is an inherent buffer occupancy at every point in time. The buffer fullness corresponds to a delay, the amount of time that a byte spends in the buffer. When splicing two separately encoded bit streams, the delay at the splice point will not usually match. This mismatch in delay can cause the buffer to overflow or underflow at some time in the future.

[0064] To avoid unpredictable underflows and overflows, the splicing method requires that the MPEG encoder match the delay at splicing points to a given value. Alternatively, the syntax of the transport packet itself may be used to convey where these splicing points may occur.

[0065] Two different types of splice points may be defined: Out Points and In Points. In Points are places in the bit streams where it is safe to enter and start decoding that bit stream. Out points are places where it is safe to exit the bit stream. Out Points and In Points are imaginary points in the bit stream located between two transport stream packets. An Out Point and an In Point may be co-located, that is, a single packet boundary may serve as both a safe place to leave a bit stream and a safe place to enter it.

[0066] The SMPTE standard describes requirements for grouping In Points of a set of program identifier (PID) streams into program In Points, and for grouping Out Points of a set of PID streams into program Out points which correspond in presentation time to the underlying data. Furthermore, because MPEG video and audio frames have different durations and their presentation times do not necessarily align, this standard defines exactly what it means for PID stream splice points to correspond in time. More information on this standard may be found in a document entitled "SMPTE Standard for Television, Splice Points for MPEG-2 Transport Schemes", published by the Society of Motion Picture and Television Engineers, 595 W. Hartsdale Avenue, White Plains, N.Y. 10607.

[0067] Thus, one object of the invention is to provide for efficient real-time distribution of one or more variable bit-rate (VBR) programs to one or more receivers. In cases where a plurality of programs are multiplexed together and distributed simultaneously, it is possible, in the context of the present invention, for one or more of these programs to be encoded at a constant bit rate (CBR). Typically, each VBR or CBR program consists of a video stream component, one or more audio stream components, and possibly one or more data stream components. Each of these real-time distributed programs is hereinafter referred to as a primary program.

[0068] It is another object of the invention to selectively distribute advertisements in the form of auxiliary data to one or more receivers. The auxiliary data is distributed in non-real time using any available channel capacity, and is stored locally at the selected receivers for real-time presentation at a later time. In accordance with the foregoing, one aspect of the invention comprises a method and apparatus for efficient CBR distribution of program streams, along with advertisements (auxiliary data) to one or more receivers. A primary data stream, comprising at least one VBR program, and possibly one or more CBR programs, is converted to a CBR data stream by inserting advertisements where fill packets would have otherwise been used to create a CBR data stream. The distribution of the program streams and advertisements is based on subgroups.

[0069] Furthermore, the advertisements in the form of the auxiliary data may be differentiated from the primary programs in that the auxiliary data need not be distributed in real time. By doing away with the requirement for real-time or near real-time distribution of at least a portion of the program multiplex, it becomes easier to efficiently utilize the available channel bandwidth.

[0070] In an exemplary embodiment of this aspect of the invention, the program streams and the advertisements (aux-

iliary data) are each assumed to be divided into segments or packets. The packets of auxiliary data are inserted in between the packets of the primary programs whenever the distribution channel is idle for a time interval that is at least as long as the time interval needed to transmit the next packet of auxiliary data. In addition, MPEG-compliant program map data illustrating the location of each of the primary program or auxiliary data stream components in the multiplexed data stream are inserted into the data stream for use at the receivers. Such program maps are described in .sctn.2.4.4 of the MPEG system layer documentation, ISO/IEC 13818-1.

[0071] In connection with the foregoing, another aspect of the invention comprises a method and apparatus for receiving the CBR distribution data stream at a particular receiver, and combining selected program streams with selected advertisements to create a customized augmented program for that particular receiver. The receiver is configured with sufficient local storage to buffer the selected advertisements until they are needed, for insertion into the selected primary program or for other presentations, at a later time.

[0072] In an exemplary embodiment of this aspect of the invention, a receiver program selector receives the distribution data stream and uses a program map embedded therein to direct program and auxiliary data multiplexers (MUXes) to extract a selected primary program and selected portions of the auxiliary data stream, respectively. A video augmentation unit then inserts the selected auxiliary data into the primary program stream to create an augmented primary program which is supplied for decoding and viewing. In the typical case, the auxiliary data comprises short program segments including both video and audio data.

[0073] In this way, individual receivers which include some form of local storage could be programmed to receive certain program segments or certain types of program segments at any time of the day. For example, all new car advertisements could be classified together and assigned a unique group identification number. If such advertisements are periodically extracted from an auxiliary data library and combined with the multiplexed primary programs prior to distribution, then the program map embedded in the distribution data stream would be updated to reflect such additions. A receiver that has been programmed to receive all advertisements pertaining to new automobiles, and which is monitoring the received bit stream could detect such an advertisement by matching the relevant group classification number in the embedded program table with an internal list representative of the types of programs which it has been programmed to receive. The PIDs corresponding to any associated audio, video, or data streams comprising the advertisement, could then be extracted from the distribution data stream and copied to local storage for viewing at a later time.

[0074] **FIG. 7** illustrates the migration of services from the present suite of services that are transmitted as broadcast services with program IDs (PIDs) **902** and broadcast services with IP addressing **904**, to medium bandwidth services **906** which can include broadcast programming labeled by program identifiers and combined with multicast advertisements, as well as multicast programming with multicast advertisements. Also illustrated in **FIG. 7** is the migration from medium bandwidth services **906** to unicast services **908** including unicast programming and unicast advertisements. In unicast services, the individual advertisements are delivered directly to the subscriber along with the individually selected programming.

[0075] The advertisements may be inserted into program streams to create a plurality of presentation streams that are directly transmitted to a group of subscribers. An example of this embodiment is the substitution of generic advertisements in a cable television system at the cable TV head end and transmission of the new program presentation stream directly to the subscriber. In another embodiment, an Internet sender inserts advertisements destined for a subgroup multicast and multicasts the new presentation stream to the subscribers in that multicast subgroup. Alternatively, the program streams may contain one or more empty segments where one or more targeted advertisements may be inserted.

[0076] Generally, the programming or entertainment program streams include digital video or audio streams that contain programming of interest to the subscriber. This programming may be entertainment programming in the form of shows, news, theatre, and movies, or may be data programming including but not limited to stock quotes, travel information, or other types of information that may be broadcasted to a plurality of subscribers.

[0077] Generally, the program streams are digitized and compressed in order to be transmitted over a limited bandwidth channel. A variety of compression schemes may be used. For video, these techniques include the motion pictures expert group (MPEG) compression standard, as well as any of the video streaming standards used for the transmission of video over the Internet. For audio systems, a variety of audio compression and transmission techniques may be used including the compression and transmission system developed by Real Networks and sold under the trademark REALAUDIO, as well as other audio compression and transmission systems available for use on the Internet. These video and audio compression and transmission systems allow for the incorporation of generic/default advertisements when initially placed in the audio or video stream. Once placed in the stream, a variety of techniques may be used to detect their presence, and these generic advertisements may be substituted with target advertisements. The compressed audio or video streams may also contain one or more empty segments where one or more target advertisements may be inserted.

[0078] One technique that may be used to detect an advertisement break in the compressed digital stream is the placement of an audible or inaudible tone within the digital stream. This tone may be used to mark the beginning or end of the advertisement. An alternate technique is to place a known digital code in the audio or video stream that permits recognition of the advertisement. This code may indicate the duration of the advertisement. Using this technique, digital circuitry may be used to recognize the beginning of the advertisement. Other techniques are also envisioned.

[0079] Once the advertisement is located and removed from the audio or video stream, it may be necessary to "heal" the stream such that there is no disruption in the compression algorithms which may rely on information which is interspersed in the advertisement. The interspersing of information may be such that programming information is included in a digitized advertisement which will be replaced. A

healing technique may be used to replace the original audio or video information and inserted advertisement, and consists of locating the information in the stream which is related to the programming and insuring that it is contained within the new advertisement that is inserted into the programming.

[0080] Although this invention has been illustrated by reference to specific embodiments, it will be apparent to those skilled in the art that various changes and modifications may be made which clearly fall within the scope of the invention. The invention is intended to be protected broadly within the spirit and scope of the appended claims.

What is claimed is:

1. A method of presenting targeted advertisements to subscribers in a packetized video environment, the method comprising:

(a) retrieving, from a plurality of subscriber locations, data characterizing subscribers associated with the subscriber locations;

(b) forming, based on at least one subscriber characteristic obtained from data, a set of addressable subgroups, each addressable subgroup being characterized by one or more of the subscriber characteristics and including one or more of the subscribers;

(c) receiving, at a centralized location, a program stream containing at least one advertising opportunity;

(d) retrieving, at the centralized location, a plurality of targeted advertisements;

(e) creating, at the centralized location, a set of targeted advertisement streams from the plurality of targeted advertisements, the set of targeted advertisement streams corresponding to set of addressable subgroups;

(f) transmitting the set of targeted advertisement streams from the centralized location to the addressable subgroups;

(g) storing, at the subscriber locations, at least one targeted advertisement from the targeted advertisement stream transmitted to the associated subgroup;

(h) transmitting the program stream from the centralized location to the addressable subgroups;

(i) receiving the program stream at the subscriber locations; and

(j) creating a set of presentation streams containing different targeted advertisements by inserting, at the subscriber locations, at least one stored targeted advertisement into the at least one advertising opportunity of the received program stream.

2. The method of claim 1 wherein the subgroups are formed based on geographic location.

3. The method of claim 1 wherein the data includes at least one demographic parameter.

4. The method of claim 1 wherein the subscribers of the addressable subgroups are served by different delivery networks.

5. The method of claim 1 wherein the subscriber locations are geographically dispersed.

6. The method of claim 1 wherein the set of presentation streams are continuous presentable streams containing content and at least one targeted advertisement.

7. The method of claim 1 wherein each presentation stream in the set of presentation streams includes a different targeted advertisement.

8. The method of claim 1 wherein the at least one advertising opportunity includes at least one default advertisement.

9. The method of claim 1 wherein the at least one targeted advertisement stored at the subscriber location corresponds to the one or more subscriber characteristics of the associated subgroup.

10. The method of claim 1 wherein the targeted advertisements are not synchronized with the at least one advertising opportunity.

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