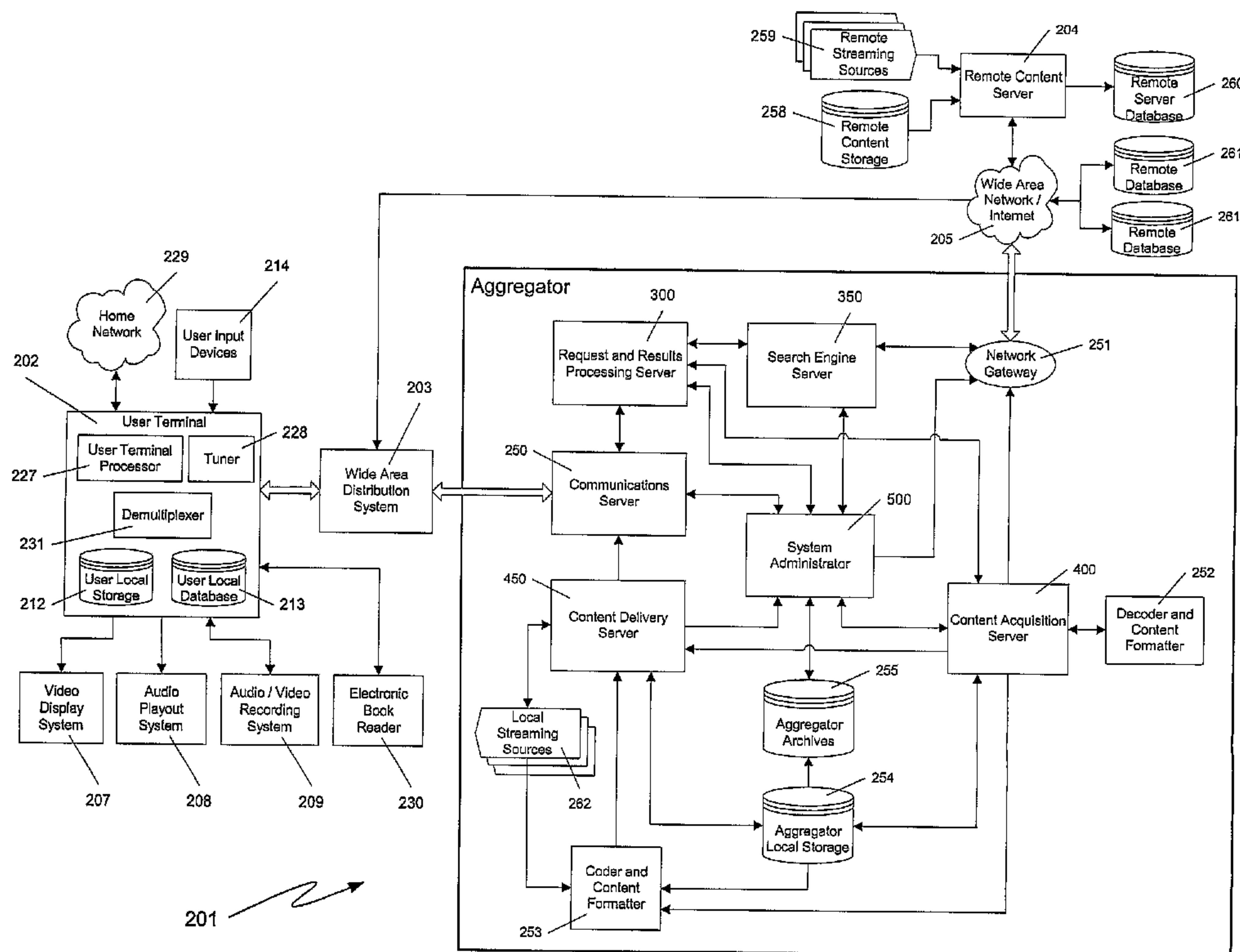




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(57) Abrégé/Abstract:

A video and digital multimedia aggregator (201) includes a content decoder, coder (codec) and formatter (252). The codec formatter (253) receives coding and formatting requests that characterize input source content and desired output target content. Data conveyed about the source and target content may include parameters such as physical and/or logical addresses, coding and compression parameters, for descriptions content size, description of auxiliary services, and other metadata elements that may be required for coding and formatting.

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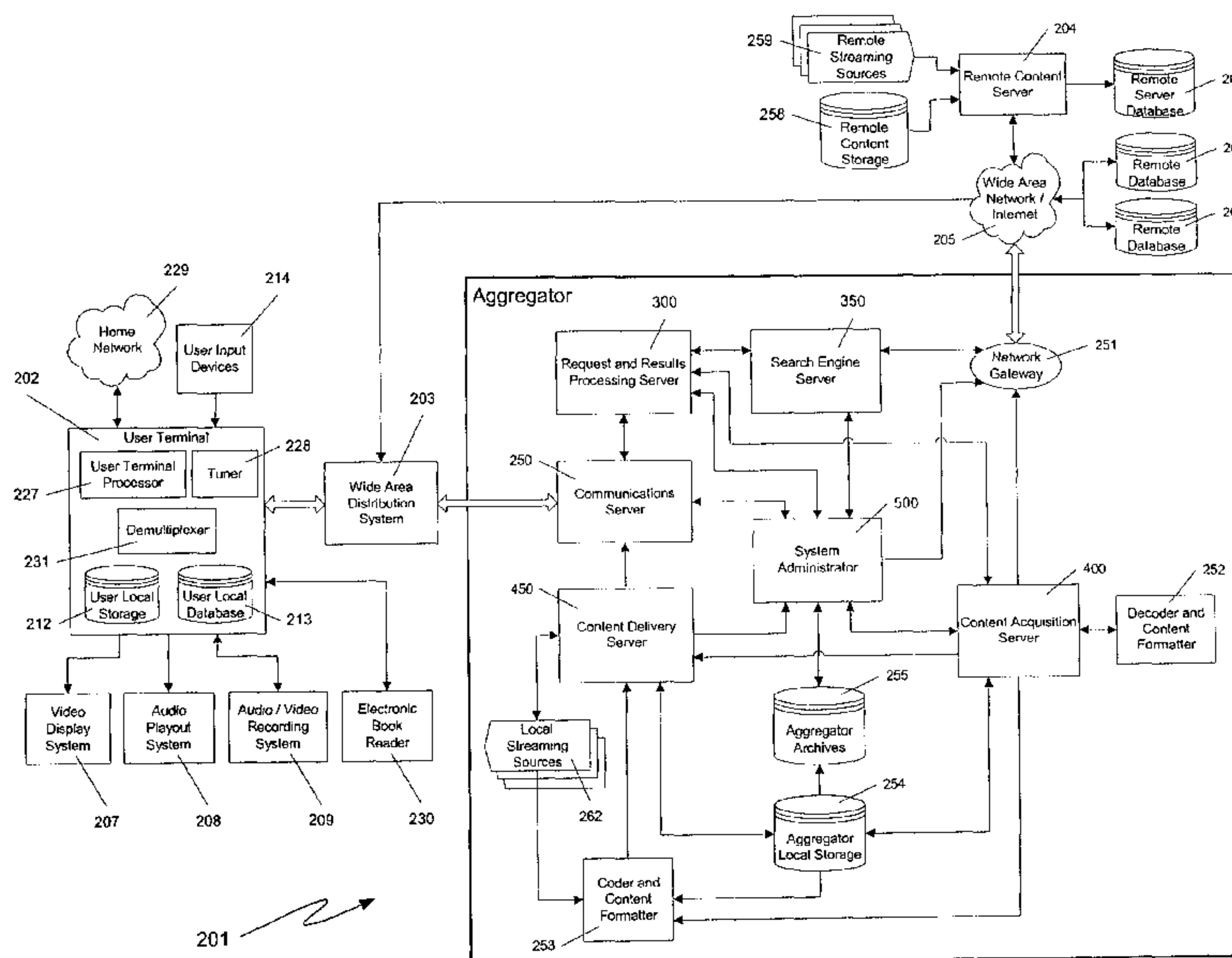
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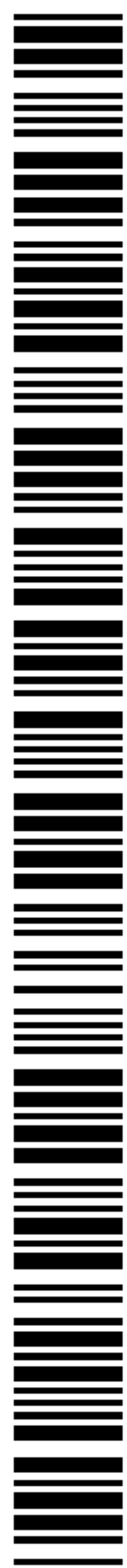
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(54) Title: VIDEO AND DIGITAL MULTIMEDIA AGGREGATOR CONTENT CODING AND FORMATTING



(57) Abstract: A video and digital multimedia aggregator (201) includes a content decoder, coder (codec) and formatter (252). The codec formatter (253) receives coding and formatting requests that characterize input source content and desired output target content. Data conveyed about the source and target content may include parameters such as physical and/or logical addresses, coding and compression parameters, for descriptions content size, description of auxiliary services, and other metadata elements that may be required for coding and formatting.



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VIDEO AND DIGITAL MULTIMEDIA AGGREGATOR CONTENT CODING AND FORMATTING

1 **Technical Field**

2 The technical field is television program and digital multimedia delivery systems
3 that incorporate intelligent and flexible program search and delivery mechanisms.

4 **Background**

5 Cable television delivery systems greatly expanded the array of programs
6 available to television viewers over that provided by over-the-air broadcast systems.
7 Subsequently, satellite television delivery systems, and in particular, digital satellite
8 broadcast systems further expanded the viewing choices for consumers. In the near
9 future, digital broadcast television systems will provide many more programming choices
10 for consumers.

11 In addition to television programming delivered through television program
12 delivery systems, other programs and events may be sent to consumers. These other
13 programs and events include streaming video sent over wired and unwired, narrowband to
14 broadband services, digital audio programs, and other multimedia data.

15 Unfortunately, customers are still limited in their television viewing choices by
16 the local and regional nature of television delivery systems. For example, a broadcaster
17 in Boston may provide programming of local interests to people in Massachusetts while a
18 broadcaster in Seattle may provide different programming to people in the Seattle area. A
19 person in Boston generally cannot access Seattle programming, other than programming
20 that is provided at a national level.

21 In addition to this local/regional market segregation, many other sources of
22 programming and events may not be available in a specific viewing area. These other
23 sources may include audio programming, streaming video, local or closed circuit
24 television programming (e.g., education television programming provided by a state
25 education department) and other programming.

26 Even if certain programming is available in a local viewing area, a viewer may not
27 be aware of its existence. This situation may be the result of a large array of available
28 programming coupled with a limited program menu or guide. The program guide may be
29 limited in that not all available programming can be listed, some programming changes
30 occur that are not reflected in the program guide, and errors may exist in the program
31 guide. In addition, the more comprehensive the program guide, the harder it is for the
32 viewer to search and navigate the program guide to find a desired program.

1 Summary

2 The problems noted above are solved by the video and digital multimedia
3 aggregator system and method described herein. Program content can be packaged and
4 delivered by the system, including video, television, radio, audio, multimedia, computer
5 software, and electronic books, or any content that can be delivered in digital format.

6 The aggregator comprises a request and results processing server, a search engine
7 server coupled to the request and results processing server and a content acquisition
8 server coupled to the request and results processing server. The request and results
9 processing server receives a request for a program, the search engine server searches for
10 the program and the content acquisition server acquires a program for delivery to the user.
11 The request and results processing server includes a search request processor that receives
12 information related to the user's search request and provides the information to a search
13 results form builder that creates an electronic search request. The search request may be
14 augmented by using a content search suggestion engine to add additional search terms
15 and descriptions to the search request. The aggregator may also include a decoder that
16 decodes program content and program metadata from remote sources for storage at the
17 aggregator, and an encoder that encodes content metadata and programs for delivery to
18 the user. The aggregator may also comprise one or more crawlers, such as a content
19 crawler, to look for program content in the digital communications network.

20 The search engine server searches at least a local content database. The local
21 database comprises at least two file types. A content file includes a complete program
22 content file. For example, the 1997 movie Titanic may exist in the local content database
23 as a complete program content file. The complete program content file may also include
24 a reference content or metadata that contains additional information related to the content.
25 Such additional information in the reference content may include: a program description,
26 including program rating, program description, video clips, program length, format (e.g.,
27 4x3 television or 16x9 movies), and other information; billing information and digital
28 rights management information; viewing statistics, including number of times viewed,
29 dates/times viewed, identity of users viewing the program; advertisement information to
30 allow ads to be inserted during viewing of the program; and other information.

31 The additional information in the reference file may be provided in whole or in
32 part to the system users. For example, the aggregator may provide a program description
33 and accompanying video clips to selected systems users. The reference file may also be
34 used by the aggregator for system administration purposes. For example, billing and

1 digital rights management information may be used to collect appropriate fees from
2 system users and to provide such collected fees to the entities owning rights in the
3 content.

4 A remote content crawler continually crawls the digital communication network
5 looking for content to provide to the aggregator. The content provided to the aggregator
6 may be stored in a form of an entire content file. For example, the content may include
7 an entire movie, television program or electronic book. Alternatively, the content
8 provided to the aggregator may be a reference to a content file that is stored at, or that
9 will be available at one of the remote locations. For example, the content may be a
10 reference to a future, scheduled live sports event that will be made available to system
11 users. The sports event may be provided for a one time fee, as part of a sports package,
12 for which a fee is collected, or as a free event. In the examples discussed above, the
13 content may be stored at the aggregator, and may subsequently be provided to system
14 users. For the example of the live sports event, the aggregator may store the live sports
15 event and may then provide the sports event as a replay, in addition to facilitating live
16 viewing of the sports event.

17 To ensure the content is delivered to the correct addressee, in a format that is
18 compatible with the addressee's equipment (i.e., hardware and software), the aggregator
19 may include one or more content coders, decoders and formatters. In an embodiment, the
20 coding, decoding and formatting functions may be executed by separate components,
21 which may be embodied as hardware or software, or a combination of hardware and
22 software. In another embodiment, two or more of the functions may be executed by a
23 single device, comprising hardware and/or software.

24 In an embodiment, the formatting, decoding and coding functions are executed by
25 a coder-decoder (codec) formatter. The codec formatter may comprise means for
26 receiving a coding and formatting request, means for analyzing parameters contained in
27 the coding and formatting request, means for decoding, formatting and coding target
28 content, means for configuring the decoding, formatting and coding means, and means for
29 routing coded target output content to one or more target addresses.

30 In another embodiment, the codec formatter may include means for processing
31 auxiliary service requests. Such auxiliary service requests may be included in the coding
32 and formatting request, or may be separately supplied. The auxiliary services may
33 include closed captioning, descriptive video narration, alternative language audio, content
34 rating, critical review information, device control and commands, future content

1 schedules, advertising, targeted advertising, text and data services, interactive services,
2 and content metadata. The means for processing auxiliary services includes means for
3 analyzing the auxiliary service requests, means for configuring one or more auxiliary
4 services processing means to supply the requested auxiliary services, and means for
5 outputting the requested auxiliary services. The outputted auxiliary services may be
6 combined with the coded target output content.

7 **Description of the Drawings**

8 The detailed description will refer to the following drawings in which like
9 numerals refer to like elements, and in which:

10 Figure 1 is a block diagram of primary components of a content search,
11 packaging, and delivery system;

12 Figure 2 is a block diagram of the components of the content search, packaging,
13 and delivery system configured to deliver content to a set top terminal;

14 Figure 3 is a block diagram of the components of the content search, packaging,
15 and delivery system configured to deliver content to a personal computer terminal;

16 Figure 4 is a schematic of the components of the content search, packaging, and
17 delivery system showing subsystems of an aggregator, a user terminal, and a remote
18 content server;

19 Figure 5 is a schematic of subsystems of a content acquisition server and
20 components with which the content acquisition server interacts as part of a content search,
21 packaging, and delivery system;

22 Figure 6 is a schematic of subsystems of a content delivery server and components
23 with which the content delivery server interacts as part of the content search, packaging,
24 and delivery system;

25 Figure 7 is a schematic of subsystems of a codec and content formatter and
26 components with which the codec and content formatter interacts as part of the content
27 search, packaging, and delivery system;

28 Figure 8 is a diagram of components of a formatting codec used with the codec
29 and content formatter of Figure 7;

30 Figure 9 shows a flowchart describing a process of decoding, formatting, and
31 coding source content and outputting target content; and

32 Figure 10 shows a flowchart describing a method of processing auxiliary services
33 that may accompany source and/or target content.

1 DETAILED DESCRIPTION

2 Figure 1 is a block diagram of a content search, packaging, and delivery system
3 200. The content to be packaged and delivered by the system 200 includes video,
4 television, radio, audio, multimedia, computer software and electronic books.
5 Components of the system 200 include an aggregator 201 and a user terminal 202, which
6 are connected using a wide area distribution system 203. Other components are remote
7 content servers 204 that exchange data with the aggregator 201 using a wide area
8 network/Internet 205 connection. The user terminal 202 may incorporate a video display
9 system 207, an audio playout system 208, an audio/video recording system 209, user
10 input devices 214, an electronic book reader 230, and a connection to a home network
11 229 to interact with other devices in the user's home environment. Alternatively, one or
12 more or all of the video display system 207, the audio playout system 208, the
13 audio/video recording system 209, and the electronic book reader 230 may be separate
14 components that are coupled to the user terminal 202.

15 The system 200 allows a user to enter search parameters, such as keywords and
16 category headings, and have the aggregator 201 use these parameters to locate, package,
17 and deliver content to the user terminal 202 from numerous sources. The requests and
18 content deliveries can be sent over communications links including, but not limited to,
19 telephone lines, coaxial cable, fiber-optic cable, wireless connections, wide area
20 networks, the Internet, and other communication media collectively represented by the
21 wide area distribution system 203. The numerous sources of content are shown in Figure
22 4 and include, but are not limited to, an aggregator local storage 254, local streaming
23 sources 262, remote content storage 258, and remote streaming sources 259. In an
24 embodiment, the local streaming sources 262 are comprised of the audio and video
25 channels being delivered using a cable headend system that may house the aggregator
26 201.

27 The system 200 will take a user's search request and may perform a search of
28 virtually every active and scheduled radio and television channel in the world, as well as
29 archived sources of video and audio programming such as movies and recorded audio
30 sources and sources of other multimedia, software, and electronic book content. In an
31 embodiment, the system 200 will also search Internet Web sites and other online
32 databases. The user will then be able to select programming or other content for
33 download based on the search results. In an embodiment, the download, or delivery,
34 process can be fulfilled by making the content available on a specific channel of a cable

1 television system, or by transmitting the content using a digital communications protocol,
2 such as the Internet standard TCP/IP, for example. In addition, the content search,
3 packaging, and delivery system 200 is capable of formulating and presenting a list of
4 suggested content based on an analysis of the user's current search parameters, stored
5 information about previous searches and previously selected content downloads and other
6 user-specific or related information. The system 200 is also capable of notifying a user
7 prior to the start time of selected programming and availability of other content using
8 such notification as an electronic mail message and/or an on-screen message indicating
9 that the scheduled program will be broadcast at a specified time. The system 200 may
10 support one or more digital rights management (DRM) systems to track the usage and
11 copyrights rights associated with downloaded content and bill the user's account as
12 appropriate and provide any license and usage fees to the content provider. The system
13 200 may implement a users' privacy protection scheme allowing users to control what
14 information is gathered, limit what is done with that information, and review and delete
15 the user's profile if desired.

16 An overview of an embodiment of the system 200 is shown in Figure 2 where the
17 user terminal 202 is a set top terminal 206 that communicates with the aggregator 201
18 through a cable television system headend 210, thereby making use of the cable television
19 system headend 210 high bandwidth concatenated cable system 216. Further, the set top
20 terminal 206 system may include a tuner 228, a demultiplexer 231, the video display
21 system 207, the audio playout system 208, the audio/video recording system 209, user
22 input devices 214, an electronic book reader 230, and a connection to the user's home
23 network 229. These components are used to tune, select, view, listen to, and store audio
24 and video programming and other content delivered by the search, packaging, and
25 delivery system 200. Figure 2 also shows a communications path from one or more
26 remote content servers 204 through the wide area network/Internet 205 directly to the set
27 top terminal 206, which bypasses the aggregator 201 and cable television system headend
28 210. This path may be used in the case where the requested content is available in the
29 required format from the remote content server 204 and is authorized for direct delivery
30 to the user. In an alternative embodiment, the aggregator 201 is collocated with the cable
31 television system headend 210 that is acting as the wide area distribution system 203 as is
32 the case when a cable television system is also serving as the user's Internet service
33 provider.

1 An overview of another embodiment of the system 200 is shown in Figure 3,
2 where the user terminal 202 is a personal computer terminal 211 that communicates with
3 the aggregator 201 through an Internet service provider/cable television system headend
4 215. In this case, the content may be delivered by a cable headend that is operating as an
5 Internet service provider (ISP). The personal computer terminal 211 also may include the
6 video display system 207, the audio playout system 208, the audio/video recording
7 system 209, user input devices 214, the electronic book reader 230, and the connection to
8 the home network 229. A communications path also exists from one or more remote
9 content servers 204 through the wide area network/Internet 205 directly to the personal
10 computer terminal 211, which bypasses the aggregator 201 and the Internet service
11 provider/cable television system headend 215 in the case where requested content is in
12 the required format and is authorized for direct delivery to the user.

13 The user can receive video and audio programs (i.e., the content) in a number of
14 different ways. First, the tuner 228 in the user terminal 202, shown in Figure 2, can
15 simply tune to the desired program, or the demultiplexer 231 can select a program from a
16 digital multiplex, thereby displaying the program at the appropriate time. However, the
17 desired program may not be broadcast by the user's cable television system headend 210,
18 or the user would like to watch a program supplied by the local headend, but not
19 subscribed to by the user, e.g., a boxing match broadcast by a premium channel that the
20 user does not ordinarily receive. In these examples, the program can be delivered to the
21 user by the aggregator 201 using the telephone lines, fiber-optic transmission lines, or
22 other communication media, or using the cable television system headend 210. In an
23 embodiment, the aggregator 201 can supply the desired program to the user by pulling
24 programs from program delivery systems in the United States and abroad and delivering
25 the program to system users. Therefore, a user can have access to programs outside the
26 user's immediate viewing area.

27 Figure 4 shows the system 200 and system components in more detail. At a user's
28 location, the user terminal 202 includes the tuner 228, the demultiplexer 231, a user
29 terminal processor 227, user local storage 212 and user local database 213. Coupled to
30 the user terminal 202 may be user input devices 214, the video display system 207, the
31 audio playout system 208, the audio/video recording system 209, an electronic book
32 reader 230, and a connection to the home network 229.

33 The user terminal 202 is coupled through the wide area distribution system 203 to
34 the aggregator 201 and further through the wide area network/Internet 205 to remote

1 program sources. The remote program sources include remote streaming sources 259 and
2 remote central storage 258. The remote program sources also include remote databases
3 261 and, through the remote content server 204, a remote server database 260.

4 The aggregator 201 may include a communications server 250 that communicates
5 with the user terminal 202 through the wide area distribution system 203. The
6 communications server 250 receives inputs from a request and results processing server
7 300, a content delivery server 450 and a system administrator 500. The content delivery
8 server 450 receives inputs from a coder and content formatter 253 and a content
9 acquisition server 400. The content delivery server 450 also accesses an aggregator local
10 storage 254 and local streaming sources 262. Finally, the content delivery server 450
11 provides an output to the system administrator 500.

12 The coder and coder formatter 253 receives inputs from the content acquisition
13 server 400, the aggregator local storage 254 and local streaming sources 262. The system
14 administrator 500 receives inputs from the content and delivery server 450, and
15 communicates with the content acquisition server 400, the request and results processing
16 server 300, a search engine server 350 and aggregator archives 255. A decoder and
17 content formatter 252 is coupled to the content acquisition server 400. Finally, a network
18 gateway 251 couples components of the aggregator 201 with the remote content server
19 204 through the wide area network/Internet 205.

20 Programs received at the aggregator 201 may be input to the formatter 253. The
21 formatter 253 reformats all input content into a format that is readily received by all user
22 terminals 202 operably connected to the delivery system 200 (not shown in Figure 4). In
23 addition, the formatter 253 can store full or partial copies of content in compressed form
24 in the aggregator local storage 254. Furthermore, the aggregator 201 can provide real-
25 time delivery of certain content, such as a boxing match. In an embodiment, if a large
26 number of users want a particular live program, then the cable television system headend
27 210 can broadcast the program on a particular channel available to all the requestors
28 instead of broadcasting the program to each individual user over the wide area
29 distribution system 203. See U.S. Patent Application serial number 09/191,520, entitled
30 Digital Broadcast Program Ordering, hereby incorporated by reference, for additional
31 details of broadcast program delivery.

32 The aggregator 201 can also implement a screening process for limiting the
33 number of programs captured to those programs with a viewing audience above a
34 predetermined threshold. In effect, the aggregator 201 contains a filter that will pass only

1 programs meeting the predetermined selection criteria. The filter may include
2 programming that screens the content to reject specific items, such as adult content, for
3 example.

4 The system administrator 500 records what fees should be paid and to whom. For
5 example, the aggregator 201 will determine to whom any copyright or other fees should
6 be paid when a program is broadcast.

7 The user terminal 202 may be a television, a set top terminal 206, a personal
8 computer terminal 211 (not shown), or any device capable of receiving digital or analog
9 data, or some combination thereof. The user terminal 202 is equipped with the user input
10 devices 214 that communicate search criteria to the system 200 as well as navigate
11 through the user terminal menu system and control the user terminal's other various
12 functions. The user local storage 212 is used to store and archive content onto one or
13 more removable and/or non-removable storage devices or media for later access.
14 Removable storage media may include, but is not limited to, magnetic tape, magnetic
15 disks, optical disks and modules, and electronic memory cartridges. The user local
16 database 213 is the repository of all relevant information about a user's profile and
17 account. This information includes, but is not limited to, user name, password, personal
18 information that the user has authorized for storage, billing information, other users
19 allowed access to the account, past search criteria, past content download information,
20 and library information about stored content. As a consumer protection, the user terminal
21 202 may enable the account user to view the information stored in the user local database
22 213 and modify certain data fields and select which data fields may be reported to a main
23 system database within the aggregator 201. Certain fields including, but not limited to,
24 account numbers and billing information may not be allowed this level of user access.

25 The user terminal processor 227 may include a central processing unit and all
26 associated hardware, software, and firmware modules to perform all operations within the
27 user terminal 202. These operations include, but are not limited to, managing
28 communications with the aggregator 201 and other networked devices, processing search
29 and download requests, displaying search and download results, managing and
30 controlling communications with the user local storage 212 and the user local database
31 213, responding to user interaction with presentation of graphical user interface (GUI)
32 menus, playing out selected programming content using various audio and video output
33 devices, implementing the user's part of the digital rights management schema, and
34 administering the user's account and billing. The tuner 228 and the demultiplexer 231 are

1 used to select an audio/video channel for playout from the channels available on the cable
2 television system 216.

3 In an embodiment, the user terminal 202 may incorporate selected features of the
4 aggregator 201. For example, the user terminal 202 may include a small metadata
5 crawler, an aggregator, and program content and program metadata storage.

6 The user terminal 202 communicates with the aggregator 201 using the wide area
7 distribution system 203. Within the aggregator 201, the communications server 250 acts
8 as the interface point to the wide area distribution system 203 for the purpose of
9 managing primary communications to system users. The communications server 250
10 routes incoming user requests and associated user information to the request and results
11 processing server 300, routes search results and content downloads through the wide area
12 distribution system 203 to end users, and may route billing information from a customer
13 billing server to the end users. The request and results processing server 300 performs the
14 basic processing and routing related to user search requests, content download requests,
15 administrative information requests, search results, related content suggestions, and
16 programming notification.

17 The content acquisition server 400, as shown in detail in Figure 5 receives content
18 download requests from the request and results processing server 300. The content
19 acquisition server 400 includes a content request processor and router 401 and a remote
20 content download processor 402. A download request is made by the user for content
21 selections from sources including, but not limited to, earlier programming searches,
22 recurring scheduled events, an electronic program guide, lists of electronic books and
23 computer software, advertisements, promotions, and affiliated Internet websites. In
24 general, a download request will be accompanied by data indicating the source of the
25 content and whether the content is local or remote. Requests for content that is available
26 only from a remote site may be routed to the network gateway 251 and then to the
27 appropriate remote source. Remote sources include, but are not limited to, the remote
28 content storage 258 and the remote streaming sources 259 shown in Figure 4. The remote
29 content server 204 verifies the request and returns the content through the wide area
30 network/Internet 205. If the programming content is in the appropriate format and is
31 authorized for direct delivery to the user, the content may be routed through the wide area
32 network/Internet 205 and the wide area distribution system 203 directly to the user
33 terminal 202. During this transfer, administrative data pertaining to billing and
34 verification of delivery may be sent back to the aggregator 201.

1 Programming that is not formatted and authorized for direct delivery from a
2 remote source may be transmitted through the network gateway 251 to the remote content
3 download processor 402 contained within the content acquisition server 400. The remote
4 content download processor 402 buffers or caches the programming content while
5 managing the download connection to the remote source. The programming content is
6 then routed to the decoder and content formatter 252, which may be capable of decoding
7 various industry formats and compression schemes and may reformat and encode the
8 decoded data and associated metadata into one or more preferred content formats for
9 delivery and for local storage. The processed programming content, along with user
10 identification and routing data, is then routed to the content delivery server 450, which
11 then manages the delivery of the content through the communications server 250 and
12 wide area distribution system 203 to the user terminal 202. The content delivery server
13 450 is shown in detail in Figure 6. The content acquisition server 400 is described in
14 more detail in co-pending patent application entitled "Video and Digital Multimedia
15 Aggregator," filed on August 3, 2001, which is incorporated by reference.

16 Requests for programming available from a local source are routed directly to a
17 local content request processor 451 within the content delivery server 450. The local
18 content request processor 451 initiates delivery of content from local sources including,
19 but not limited to, the aggregator local storage 254 and aggregator local streaming sources
20 262, and routes the content to the coder and file formatter 253. In an embodiment, the
21 local streaming sources 262 can include any of the cable television channels available at
22 the cable television system headend 210 housing the aggregator 201. If the programming
23 content is not already in the user-requested format and coding scheme, the coder and
24 content formatter 253 (see Figure 4) performs content formatting and coding of the
25 programming for delivery to the user. The content is then forwarded to a content delivery
26 processor 453, which manages the delivery of the content through the communications
27 server 250 and wide area distribution system 203 to the user terminal 202.

28 If the programming being delivered from a remote content server 204 will be
29 stored to the aggregator local storage 254, the programming metadata is analyzed to
30 determine if the content is in an acceptable format for local storage. The aggregator 201
31 may be configured to store content in one or more specific formats that will balance the
32 highest quality of programming content to be delivered to the users versus available
33 storage space. In an embodiment, one or more of the selected storage formats will make
34 the most efficient use of the aggregator local storage 254 resources as well as support

1 high-speed delivery to system users. If the content acquisition server 400 determines that
2 the content does not meet the format requirements for local storage, the content stream
3 and/or contents are routed to the decoder and content formatter 252 (see Figure 4). The
4 decoder and content formatter 252 decodes the incoming data and may extract digital
5 and/or analog data representing the content and any metadata associated with the content.
6 The decoder and content formatter 252 then reformats the content into the required
7 formats and coding schemes for local storage. The properly formatted programming
8 content may then be stored to the aggregator local storage 254.

9 Returning to Figure 5, the remote content download processor 402 analyzes the
10 programming content's metadata and determines if the content is in the appropriate
11 format and coding scheme for delivery to the user. The format and coding scheme for
12 delivery may be different from that used for local storage in order to accommodate
13 particular parameters of a user's download request. The user may request specific
14 formats and coding schemes due to considerations including, but not limited to, the
15 method of playback, the type of programming, whether the user intends to store the
16 content, or the type and bandwidth of the connection the user terminal 202 has to the
17 aggregator 201 or the remote content server 204. If the content does not meet the format
18 criteria, the content stream and/or contents are routed to the decoder and content formatter
19 252 along with the required formatting and coding parameters. The decoder and content
20 formatter 252 decodes the incoming data and may extract digital and/or analog data
21 representing the content and its metadata. The decoder and content formatter 252 then
22 reformats the content into the required formats and coding schemes for delivery to the
23 user.

24 If the programming download request is to be fulfilled by the local aggregator
25 201, the local content request processor 451 of the content delivery server 450 (see Figure
26 6) analyzes the programming content's metadata and determines if the content is in the
27 appropriate format and coding scheme for delivery to the user. If the format and coding
28 scheme is not correct, the local content request processor 451 retrieves the programming
29 content from the aggregator local storage 254 or the appropriate local streaming sources
30 262 and routes the programming to the coder and content formatter 253 along with the
31 required formatting and coding parameters. The coder and content formatter 253 then
32 decodes the incoming data and may extract digital and/or analog data representing the
33 content and its metadata. The coder and content formatter 253 then reformats the content
34 into the required formats and coding schemes for delivery to the user. The correctly

1 coded and formatted programming content file(s) and/or streams, whether directly from
2 local sources or from the coder and content formatter 253, and routes this content to the
3 content delivery server 450.

4 The coder and content formatter 253 may employ digital compression techniques
5 to increase existing transmission capacity. A number of digital compression algorithms
6 currently exist or may be developed in the future that can achieve the resultant increase in
7 capacity and improved signal quality desired for the system 200. For television and video
8 content, algorithms generally use one or more of three basic digital compression
9 techniques: (1) within-frame (intraframe) compression, (2) frame-to-frame (interframe)
10 compression, and (3) within carrier compression or a combination of two or more
11 techniques. The coder and content formatter 253 of the content search, packaging, and
12 delivery system 200 will be able to use any one or combination of two or more of these
13 techniques in addition to being able to have its capabilities modularly expanded to include
14 any emerging and future techniques that are determined to be desirable. In an
15 embodiment, although a single digital compression standard may be used for the delivery
16 system 200, different levels of compression and/or digital coding can be utilized when
17 delivering programs to a user requesting a particular program. For example, if the
18 program is sent out using an HDTV format, then less compression is used as opposed to
19 sending out the program using a standard video format. The reason is that the HDTV
20 format requires more digital data per portion of content. Since the HDTV format requires
21 more digital data, the HDTV format will also require more bandwidth to transmit,
22 possibly increasing the cost of delivery. Therefore, the quality of the video delivered may
23 be a variable in the fees charged to users of the system 200.

24 The decoder and content formatter 252 and the coder and content formatter 253
25 may be similar or identical in functionality, software configuration, and/or hardware
26 configuration. In an embodiment, the decoder and content formatter 252 and the coder
27 and content formatter 253 may be embodied by a single subsystem represented by a codec
28 and content formatter 270, which is shown in detail in Figure 7. In an alternate
29 embodiment, the decoder and content formatter 252 and the coder and content formatter
30 253 may each comprise one or more separate codec and content formatters 270. The
31 codec and content formatter 270 includes a codec and content formatter processor 271
32 that may communicate with and control other components of the codec and content
33 formatter 270. In particular, the formatter processor 271 communicates with one or more
34 content routers 272, one or more formatting codecs 274, and one or more auxiliary

1 services processors 276. The formatter processor 271 communicates with one or more
2 content routers 272 in order to transmit routing connection parameters and paths for the
3 transfer of content data between various source and target subsystems. The formatter
4 processor 271 communicates with one or more formatting codecs 274 to identify and
5 manage available codec processing resources, configure codec hardware and/or software
6 parameters for decoding, formatting, and coding operations, and to transmit routing
7 information and coding and formatting parameters necessary for the formatting codecs
8 274 to decode, format, and code content from various sources. The formatter processor
9 271 also communicates with one or more auxiliary services processors 276 to allocate
10 resources and transmit parameters associated with requests for auxiliary services
11 processing. Auxiliary services may include closed captioning, descriptive video services,
12 advertising, interactive services, and other data services. The formatter processor 271
13 may also communicate with other components of the content search, packaging, and
14 delivery system 200 including the content delivery server 450, the content acquisition
15 server 400, the aggregator local storage 254, and the local streaming sources 262 (see
16 Figure 4). Communications with these other systems includes receiving coding and
17 formatting requests, transmitting content routing data, and managing content flow
18 between various content sources and one or more components of the codec and content
19 formatter 270.

20 When the remote content download processor 402 within the content acquisition
21 server 400 and/or the content delivery processor 453 within the content delivery server
22 450 determine that a particular content entity needs to be decoded, formatted,
23 reformatted, and/or coded, the respective processors (402, 453) transmit a coding and
24 formatting request to the codec and content formatter 270. Coding and formatting
25 requests convey data to the codec and content formatter 270 characterizing the input
26 source content and the desired output target content. Data conveyed about the source and
27 target content may include parameters such as physical and/or logical addresses, coding
28 and compression parameters, format descriptions, content sizes and/or lengths,
29 description or location of auxiliary services combined with the source content, description
30 or location of auxiliary services to be combined with the target content, and other
31 metadata elements that may be required for coding, formatting, and routing. The codec
32 and content formatter 270 may then use these parameters to identify available resources,
33 establish content routing paths, configure formatting codecs 274, configure auxiliary
34 services processors 276, and perform the required coding and formatting operations to

1 fulfill the coding and formatting request. In an embodiment, a coding and formatting
2 request may identify one or more target content coding and formatting schemes, as in the
3 case where one type of formatting may be applied to the target content for storage and
4 another type of formatting may be applied to the target content for delivery to system
5 users, which may require the codec and content formatter 270 to configure and control
6 one or more of the formatting codecs 274 and auxiliary services processors 276.

7 The codec and content formatter 270 may use one or more of the content routers
8 272 to dynamically establish logical and/or physical circuit connections for transmission
9 of content data between the various subsystems shown in Figure 7. A content router 272
10 may comprise one or more hardware systems and one or more software modules that may
11 operate under the direction of the formatter processor 271 to establish and manage the
12 interconnections between subsystems required to transfer content in support of one or
13 more coding and formatting operations. In Figure 7, several of the interconnections
14 between subsystems are shown as two connection lines and a series of dots between the
15 two lines. This convention is used to indicate that at any time there may exist one or
16 more connections or circuits between one or more of the connected subsystems and that
17 between two connected subsystems the number of connections may vary. Each collection
18 of connections or circuits may comprise one or more logical and/or one or more physical
19 connections between software and/or hardware modules. Physical routing configurations,
20 such as may be required for the transfer of analog content, may be achieved using one or
21 more industry standard and/or custom components such as circuit switching devices,
22 matrix switches, distribution amplifiers, signal splitters, input and output ports, and patch
23 bays. Logical routing, such as may be required for the transfer of digital content, may be
24 achieved using one or more digital packet transport protocols that may operate on one or
25 more local area networks supported by the system administrator 500 as part of the content
26 search, packaging, and delivery system 200. In an embodiment, the functionality of the
27 content routers 272 may be implemented by one or more subsystems and may be
28 functionally and/or physically external to the codec and content formatter 270 and may be
29 a subsystem (not shown in Figure 4) of the aggregator 201. In another embodiment, the
30 functionality of the content routers 272 may be implemented by one or more subsystems
31 and may be functionally and/or physically external to the aggregator 201 so that the
32 aggregator 201 and its subsystems may connect to the content routers 272, or equivalent
33 systems, through external interfaces (not shown in Figure 4). The number of connections
34 and the logical and physical routing paths of such connections both within the codec and

1 file formatter 270 and external to the codec and file formatter 270 may be changed as
2 required to accommodate a smaller or larger number of content pathways and to
3 accommodate various source and destination combinations required at any given time.
4 These pathways may be created or modified on a demand basis by the formatter processor
5 271 and may be modified prior to a coding and formatting operation and/or during a
6 coding and formatting operation as may be required.

7 Content that is stored locally by the system 200 and/or acquired remotely may
8 exist in one or more of numerous standardized and/or proprietary formats with various
9 coding and compression schemes applied and may need to be decoded, reformatted,
10 and/or recoded to satisfy local storage requirements and requirements of delivery to one
11 or more system users. The content decoding, formatting, and/or coding functions may be
12 performed by one or more of the formatting codecs 274 as shown in Figure 7. Decoding
13 of a content file or stream may comprise several processing operations that may include
14 performing a packet or frame alignment, reading and caching content metadata, reading
15 embedded time code information, reading and caching auxiliary services data, and
16 recovering and caching content payload data in digital form and/or analog baseband form.
17 Formatting or reformatting of content payload data may comprise several processing
18 operations that may include analog-to-digital conversion, digital-to-analog conversion,
19 packetizing or framing digital data representing content into one or more standard and/or
20 proprietary formats, translating digital data representing content from one or more
21 standard and/or proprietary formats into one or more other standard and/or proprietary
22 formats, modifications to existing auxiliary services that may be packaged with the
23 content, addition of auxiliary services such as closed captioning and/or advertising, frame
24 rate translation of video content, video aspect ratio format conversion (e.g., 4x3 television
25 or 16x9 movies), and any required audio and/or video processing. Coding of a content
26 file or stream may comprise several processing operations that may include applying
27 varying levels of compression and various schemes of error correction coding to one or
28 more content files and/or signals.

29 The codec and content formatter 270 may contain one or more banks of one or
30 more formatting codecs 274 that may comprise one or more separate software and/or
31 hardware modules. The hardware and/or software modules may exist as a flexible group
32 of resources that may be accessed on a demand basis and may be dynamically assigned
33 and configured to accommodate virtually any content decoding, formatting, and coding
34 operation. When the formatter processor 271 receives a coding and formatting task

1 request from the content acquisition server 400 or the content delivery server 450, the
2 formatter processor 271 may poll the group of formatting codec 274 resources, identify
3 available resources required for the requested task, configure those resources to perform
4 the requested task thereby configuring a formatting codec 274, and transmit the required
5 decoding, formatting, and coding parameters as well as routing information to the newly
6 configured formatting codec 274. In an embodiment, the formatter processor 271 may
7 configure and activate one or more available hardware and/or software modules by
8 downloading appropriate software modules to perform particular decoding, formatting,
9 and coding tasks as required by a user content download request or other content
10 acquisition task. The ability of the formatting codecs 274 to be software configurable
11 may allow a high degree of configuration flexibility as well as the ability to accommodate
12 coding and formatting schemes yet to be developed.

13 An example of a formatting codec 274 configuration is shown in detail in Figure
14 8. The formatting codec 274 includes a master codec processing module 315 that is
15 coupled to one or more other processing modules and that may manage the configuration
16 and operation of one or more other processing modules within the formatting codec 274.
17 In an embodiment, the processing modules within the formatting codec 274 may be
18 interconnected using a bus topology that may allow dynamic interconnectivity between
19 up to all of the processing modules and may support logical addressing of modules for
20 communications routing. The master codec processing module 315 may be coupled to a
21 memory management module 319 and a codec memory module 320. The memory
22 management module 319 may dynamically assign and manage resources within the codec
23 memory 320 for use by one or more other processing modules within the formatting
24 codec 274.

25 The master codec processing module 315 is coupled to a content decoding module
26 316 that may manage the configuration and operation of one or more processing modules
27 in order to perform content decoding operations. Coupled to the content decoding
28 module 316 is a frame alignment module 321 that may use decoding parameters received
29 from the formatter processor 271 to synchronize and align the formatting codec 274 with
30 the incoming content data packets and/or frames. Also coupled to the content decoding
31 module 316 is a metadata collection module 322 that may read any metadata information
32 contained in one or more content files and content transport streams and may temporarily
33 store this data in the codec memory 320. A time code processing module 323 is also
34 coupled to the content decoding module 316 and may extract any time code data that may

1 be embedded in one or more content files and/or content transport streams and may store
2 and/or process the time code as required to support coding and formatting operations.
3 The content decoding module 316 is further coupled to a format translation module 324,
4 which may perform the actual translation of the incoming source content data to the
5 desired output target content format. An example of format translation may involve
6 reading a source video file in a proprietary digital format and translating the content data
7 into a standardized format. The content decoding module 316 is also coupled to an
8 auxiliary services divider module 328 and an auxiliary services routing module 329. The
9 auxiliary services divider module 328 may read any auxiliary services that may be a part
10 of the source content files and/or transport stream and may separate, or parse, these data
11 services from the content data and metadata. The auxiliary services routing module 329
12 may then route the auxiliary services data to one or more of the codec memory 320 and/or
13 auxiliary services processors 276.

14 The master codec processing module 315 is coupled to a content formatting
15 module 317 that may perform content formatting operations and/or manage the
16 configuration and operation of one or more processing modules in order to perform
17 content formatting operations. Coupled to the content formatting module 317 is a format
18 translation module 324 that may perform translation of incoming source content data into
19 desired output target content format. Processing steps to accomplish content formatting
20 and format translation may be optimized to minimize degradation of the content data
21 and/or signal. The content formatting module 317 is also coupled to a digital-to-analog
22 and analog-to-digital conversion module 325 that may perform any required conversion
23 of audio and video content between analog and digital formats to support source content
24 that may exist in various digital and/or analog formats and may be delivered to system
25 users in various digital and/or analog formats. The content formatting module 317 is also
26 coupled to an auxiliary services combiner module 330, which may combine and/or
27 recombine any previously existing and/or newly established auxiliary services with the
28 target content files and/or transport stream. The auxiliary services combiner 330 is in
29 turn coupled to the auxiliary services routing module 329 in order to receive appropriate
30 auxiliary services data. The content formatting module 317 is further coupled to an
31 audio/video processing module 331 that may perform various processing functions on the
32 audio and video signals of the source content to meet target content requirements. The
33 audio/video processing functions may include adjusting audio levels, combining and/or
34 splitting audio signals, and adjusting video luminance and chrominance.

1 The master codec processing module 315 may also be coupled to a content coding
2 module 318 that may perform content coding operations and/or manage the configuration
3 and operation of one or more processing modules in order to perform content coding
4 operations. Coupled to the content coding module 318 is a digital compression module
5 326 that, as required, may apply various digital compression schemes to the target content
6 that was not previously digitally compressed during content formatting and or translation.
7 Different levels of digital compression may be applied to one or more target content files
8 and/or transport streams. The different compression levels may be based on requirements
9 such as those regarding content delivery quality and available content delivery bandwidth
10 and/or storage capacities. An error correction coding module 327 is also coupled to the
11 content coding module 318 and may apply one or more of various digital forward error
12 correction coding schemes to one or more of the target content files and/or transport
13 streams to reduce digital errors during content delivery and allow correction of data
14 containing a certain level of errors.

15 The codec and content formatter 270 may contain one or more banks of auxiliary
16 services processors 276. The auxiliary services processors may comprise one or more
17 separate software and/or hardware modules. The auxiliary services processors 276 may
18 process and/or generate auxiliary services to be included with target content. Such
19 auxiliary services may include closed captioning services, descriptive video services,
20 advertising, interactive services, and other data services. The hardware and/or software
21 modules may exist as a flexible group of resources that may be accessed on a demand
22 basis and that may be dynamically assigned and configured to accommodate various
23 auxiliary services processing operations. When the codec and content formatter processor
24 271 receives a coding and formatting request that includes auxiliary services processing
25 requests from the content acquisition server 400 or the content delivery server 450, the
26 formatter processor 271 may analyze the auxiliary processing parameters contained in the
27 coding and formatting request. The analyzed parameters are then used to determine the
28 required configuration of one or more auxiliary services processors 276 necessary to
29 perform the requested operations. The formatter processor 271 may then poll the group
30 of auxiliary services processing resources, identify the available resources required for the
31 requested task, configure those resources to perform the requested task, and transmit the
32 required auxiliary services parameters as well as routing information to the auxiliary
33 services processor 276. In an embodiment, the formatter processor 271 may configure
34 and activate one or more available hardware and/or software modules by downloading

1 appropriate software modules to perform particular auxiliary services processing tasks as
2 required by a user content download request or other content acquisition task. The ability
3 of the formatting codecs 274 to be software configurable allows a high degree of
4 configuration flexibility as well as the ability to accommodate auxiliary services yet to be
5 developed.

6 Auxiliary services may accompany both analog and digital content deliveries and
7 may be embedded in one or more content files and/or transport streams. Auxiliary
8 services accompanying video programming content may include closed captioning
9 services for users with hearing impairments, descriptive video services for system users
10 with visual impairments, alternative language audio service, v-chip program rating
11 information, critical review information, device control parameters and commands, future
12 programming schedules, advertising, advertising insert tags, other text and data services,
13 and interactive services data such as browser pages, menus, icons, and links. Auxiliary
14 services accompanying audio programming content may include extended metadata such
15 as graphics files, in-depth data about the producers of the content, critical reviews, future
16 programming schedules, device control parameters and commands, advertising,
17 advertising insert tags, other text and data services, and interactive services data such as
18 browser pages, menus, icons, and links. Auxiliary services processed by the formatter
19 270 may be pre-existing services recovered from source content and routed from one or
20 more formatting codecs 274 to one or more auxiliary services processors 276 and/or
21 newly established services transferred from one or more other content search, packaging,
22 and delivery system 200 resources through the codec and content formatter processor 271
23 to one or more auxiliary services processors 276. In an embodiment, one or more
24 auxiliary services processors 276 may comprise an audio closed captioning processor that
25 may receive audio and time code data for a particular video content entity from a
26 formatting codec 274, perform speech-recognition and other processing on the audio data,
27 and output one or more files and/or transport streams that contain time-code-synchronized
28 closed captioning text and data to be combined with the target content as an auxiliary
29 service.

30 Figure 9 shows an overview of the content formatting and coding process 360
31 performed by the codec and content formatter 270. The codec and content formatter
32 processor 271 (see Figure 8) first receives a coding and formatting request from the
33 content acquisition server 400 and/or the content delivery server 450, routine 361. The
34 formatter processor 271 then uses routine 363 to analyze the coding and formatting

1 request parameters contained in the coding and formatting request in order to determine
2 the required configuration of one or more formatting codecs 274 necessary to perform the
3 requested operations. The formatter processor 271 may then poll formatting and coding
4 resources, routine 365, and identify available formatting codec hardware and/or software
5 modules necessary to realize the required configuration. Routine 367 may then configure
6 one or more formatting codecs 274 using the coding and formatting request parameters
7 and required configuration data to access and configure one or more formatting codec 274
8 hardware and/or software modules. The formatter processor 271 may then use source
9 content and target content routing address information from a decoding and formatting
10 request to configure one or more content routers 272, routine 369. Routine 371 may then
11 initiate and manage the transfer of source content through one or more content routers
12 272 from one or more source locations to one or more formatting codecs 274. Source
13 locations may include the content acquisition server 400, the content delivery server 450,
14 aggregator local storage 254, and local streaming sources 262. One or more formatting
15 codecs 274 may then execute routine 373, which may make use of the hardware and/or
16 software modules shown in detail in Figure 8 to perform the requested decoding,
17 formatting, and coding operations to produce the target output content. Routine 374 may
18 then perform processing of auxiliary services as outlined in the content coding and
19 formatting request. Auxiliary services processing starts at the formatting codec 274,
20 which parses existing auxiliary services from the source content and routes those services
21 to one or more auxiliary services processors 276, which perform appropriate processing
22 on existing auxiliary services as well as establish new auxiliary services as required. The
23 auxiliary services processors 276 may then route the appropriate auxiliary services to one
24 or more formatting codecs 274 for combination with one or more target output content
25 files and/or data transport streams.

26 Once the one or more target content files and/or transports streams have been
27 assembled, routine 375 within the formatter processor 271 transfers the formatted target
28 content through one or more content routers 272 to one or more target addresses residing
29 in one or more components external to the codec and content formatter 270 which may
30 include the content acquisition server 400, the content delivery server 450, aggregator
31 local storage 254, and/or local streaming sources 262. The formatter processor 271 may
32 then clear content routing connections using routine 377. Content routing connections to
33 be cleared may include one or more physical routing connections and/or one or more
34 logical routing connections. Physical routing connections may be cleared by returning

1 routing circuitry to an idle or standby state and logical routing connections may be
2 cleared by removing logical address information from appropriate memory registers
3 within one or more content routers 272. The formatter processor 271 may then return one
4 or more configured formatting codecs 274 and/or auxiliary services processors 276 to a
5 standby and/or default state, routine 379, and return the one or more formatting codec 274
6 and or auxiliary services processor 276 hardware and/or software modules to the available
7 pools of formatting resources and/or auxiliary services processing resources, respectively.
8 Routine 381 within the formatter processor 271 may then log appropriate administrative
9 data with the content acquisition server 400 and/or the content delivery server 450.
10 Routine 383 may then stop processing.

11 Figure 10 shows the auxiliary services processing of routine 374 in more detail. If
12 existing auxiliary services and/or newly established auxiliary services are to be combined
13 with target output content, then routine 385 within one or more of the formatter processor
14 271 and/or formatting codecs 274 analyzes any auxiliary services processing request
15 parameters that may be part of the coding and formatting request and determines the
16 necessary configuration of one or more auxiliary services processors 276. Routine 387
17 within the formatter processor 271 may then poll available auxiliary processing resources
18 and configure one or more auxiliary services processors 276 required to perform the
19 requested processing operations. One or more formatting codecs 274 may parse, or
20 separate, existing auxiliary services and time code data that may be combined with one or
21 more source content files and/or transport streams, routine 389. Routine 391 may then
22 transfer these auxiliary services as well as the source content time code data to one or
23 more auxiliary services processors 276. Routine 391 may also transfer data from sources
24 external to the codec and content formatter 270 that may be required to establish new
25 auxiliary services to be combined with the target output content. These external sources
26 may include the content acquisition server 400, the content delivery server 450, and the
27 aggregator local storage 254. One or more auxiliary services processors 276 may then
28 perform one or more processing and formatting operations on one or more sources of
29 auxiliary services data in accordance with processing request parameters in order to
30 output one or more target auxiliary services to be combined with target output content,
31 routine 393. Routine 395, which may reside within the formatter processor 271 and/or
32 one or more auxiliary services processors 276, may then transmit these output auxiliary
33 services to one or more formatting codecs 274. Routine 397 may then be executed by one
34 or more formatting codecs 274 to combine the auxiliary services with one or more target

- 1 output content files and/or data streams. Processing is then continued with routine 375 as
- 2 shown in Figure 9 and as described above.

1 In The Claims:

2 1. A method for formatting and coding content for storage and delivery, comprising:
3 receiving a coding and formatting request;
4 analyzing parameters contained in the coding and formatting request;
5 configuring a formatting codec using the analyzed parameters;
6 decoding, formatting, and coding target content using the configured formatting
7 codec, whereby coded target output content is produced; and
8 routing the coded target output content to one or more target addresses.

9 2. The method of claim 1, further comprising:

10 processing auxiliary services, comprising:

11 analyzing auxiliary services processing requests in the coding and
12 formatting request,

13 configuring one or more auxiliary services processes to generate requested
14 auxiliary services, and

15 outputting the requested auxiliary services, wherein the outputted auxiliary
16 services are combined with the coded target output content.

17 3. The method of claim 2, further comprising parsing the requested auxiliary services
18 and time code data.

19 4. The method of claim 3, further comprising synchronizing auxiliary service time
20 code data and content time code data.

21 5. The method of claim 2, wherein the auxiliary services comprise one or more of
22 closed captioning, descriptive video narration, alternative language audio, content rating,
23 critical review information, device control and commands, future content schedules,
24 advertising, targeted advertising, text and data services, interactive services, and content
25 metadata.

26 6. The method of claim 2, wherein auxiliary services are combined with requested
27 source content, further comprising:

28 separating the auxiliary services from the requested source content;

29 processing the separated auxiliary services; and

30 combining selected separated auxiliary services with the coded target output
31 content.

32 7. The method of claim 2, wherein the requested auxiliary services are separate from
33 the requested content.

- 1 8. The method of claim 1, further comprising polling formatting and coding
2 resources, wherein available formatting and coding resources are identified.
- 3 9. The method of claim 1, further comprising:
4 reading target content routing address information; and
5 configuring one or more target content routers based on the address information.
- 6 10. An apparatus that decodes, formats, and codes content for storage and delivery,
7 comprising:
8 means for receiving a coding and formatting request;
9 means for analyzing parameters contained in the coding and formatting request;
10 means for decoding, formatting and coding target content;
11 means for configuring the means for decoding, formatting and coding target
12 content; and
13 means for routing coded target output content to one or more target addresses.
- 14 11. The apparatus of claim 10, further comprising means for processing auxiliary
15 services, comprising:
16 means for analyzing auxiliary service requests in the coding and formatting
17 request;
18 means for configuring one or more auxiliary services processing means to supply
19 the requested auxiliary services; and
20 means for outputting the requested auxiliary services, whereby the outputted
21 auxiliary services are combined with the coded target output content.
- 22 12. The apparatus of claim 11, further comprising means for parsing auxiliary services
23 and auxiliary service time code data.
- 24 13. The apparatus of claim 12, further comprising means for synchronizing the
25 auxiliary service time code data and content time code data.
- 26 14. The apparatus of claim 11, whereby auxiliary services are combined with
27 requested source content, further comprising:
28 means for separating the auxiliary services from the requested source content;
29 means for processing the separated auxiliary service; and
30 means for combining selected separated auxiliary services with the coded target
31 output content.
- 32 15. The apparatus of claim 11, wherein the requested auxiliary services are separate
33 from the requested content, further comprising:
34 means for formatting and coding the requested auxiliary services; and

1 means for combining the requested formatted and coded auxiliary services and the
2 coded target output content.

3 16. The apparatus of claim 11, wherein the auxiliary services comprise one or more of
4 closed captioning, descriptive video narration, alternative language audio, content rating,
5 critical review information, device control and commands, future content schedules,
6 advertising, targeted advertising, text and data services, interactive services, and content
7 metadata.

8 17. The apparatus of claim 10, further comprising means for polling formatting and
9 coding means, wherein available formatting and coding means are identified.

10 18. The apparatus of claim 10, further comprising means for ready target content
11 routing address information.

12 19. The apparatus of claim 18, further comprising means for configuring one or more
13 means for routing target content based on the address information.

14 20. The apparatus of claim 10, wherein the parameter contained in the coding and
15 formatting request comprise one or more of a physical address, a logical address, coding
16 parameters, compression parameters, format description, content size, description of
17 auxiliary services, and metadata elements.

18 21. The apparatus of claim 10, further comprising means for applying forward error
19 correction coding to target output content.

20 22. The apparatus of claim 10, wherein the target addresses include one or more of an
21 aggregator local storage and a user terminal.

Figure 1

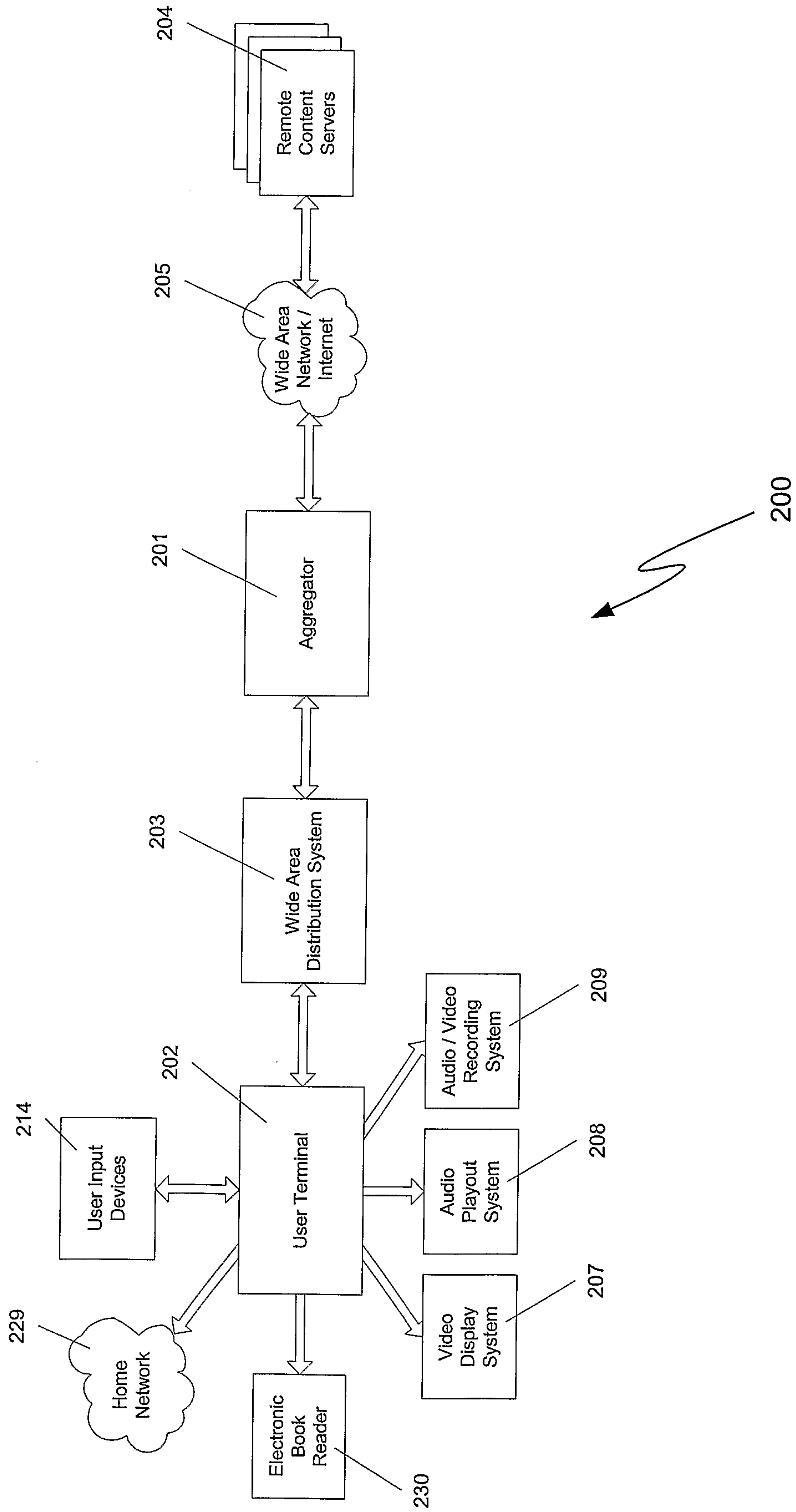


Figure 2

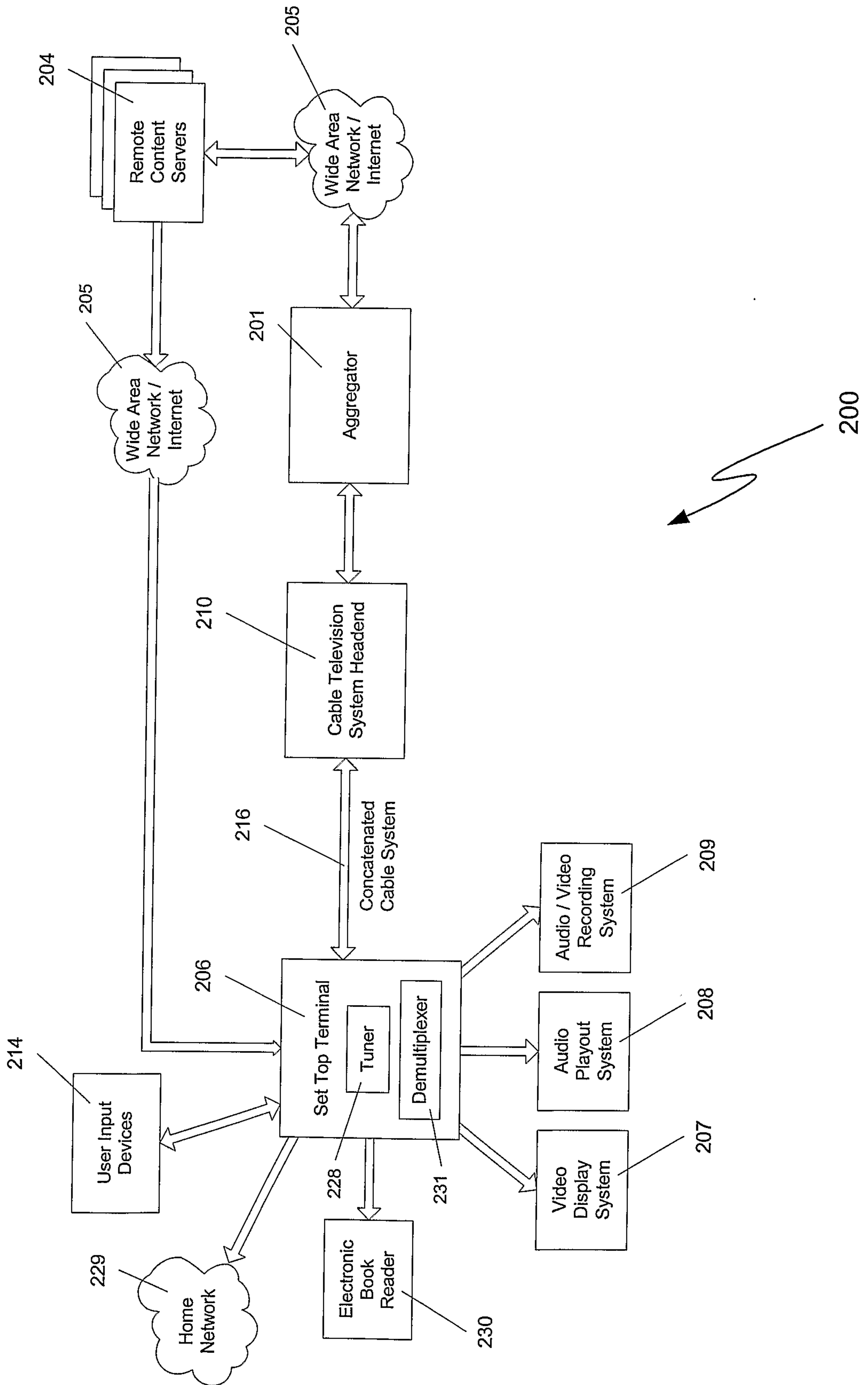
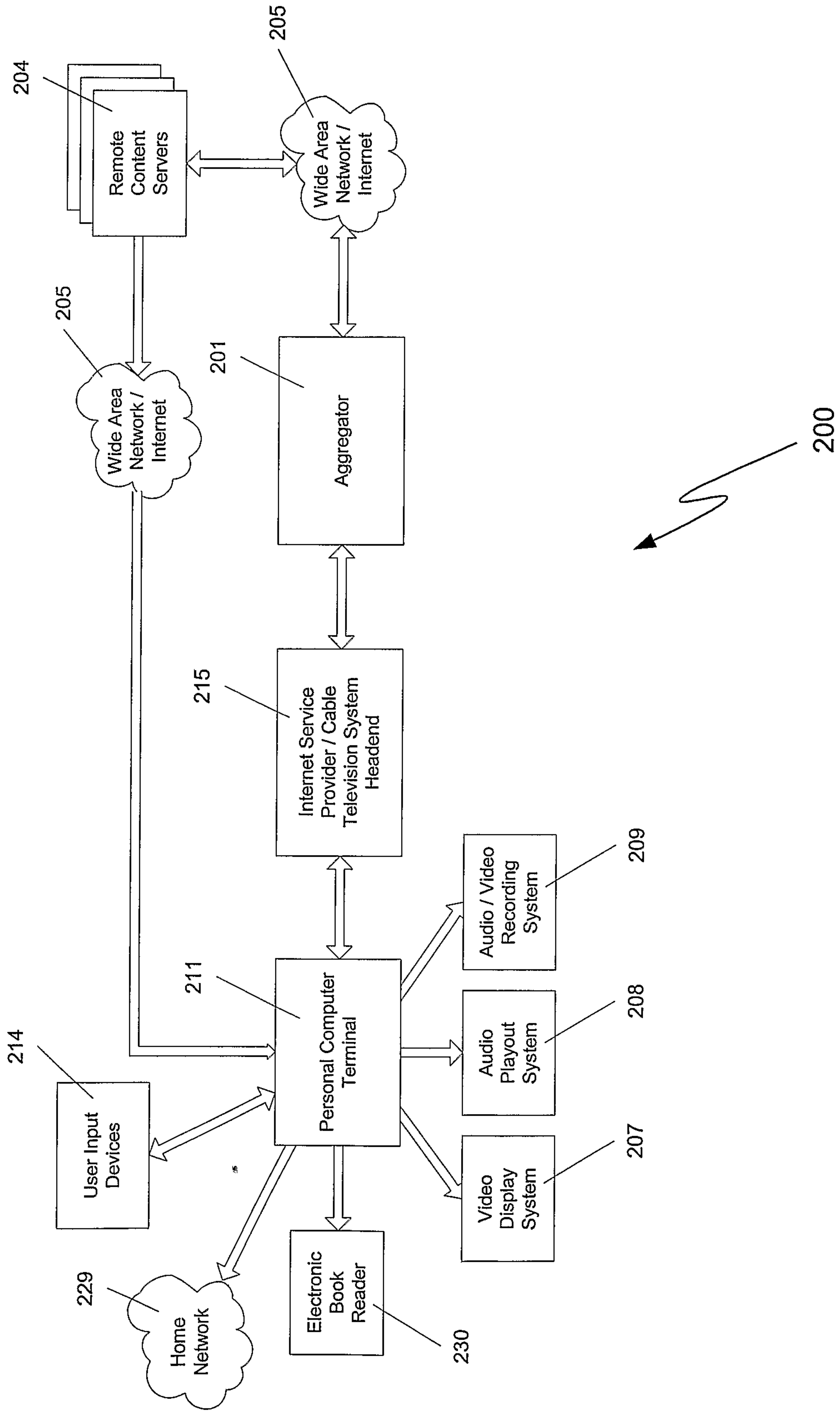


Figure 3



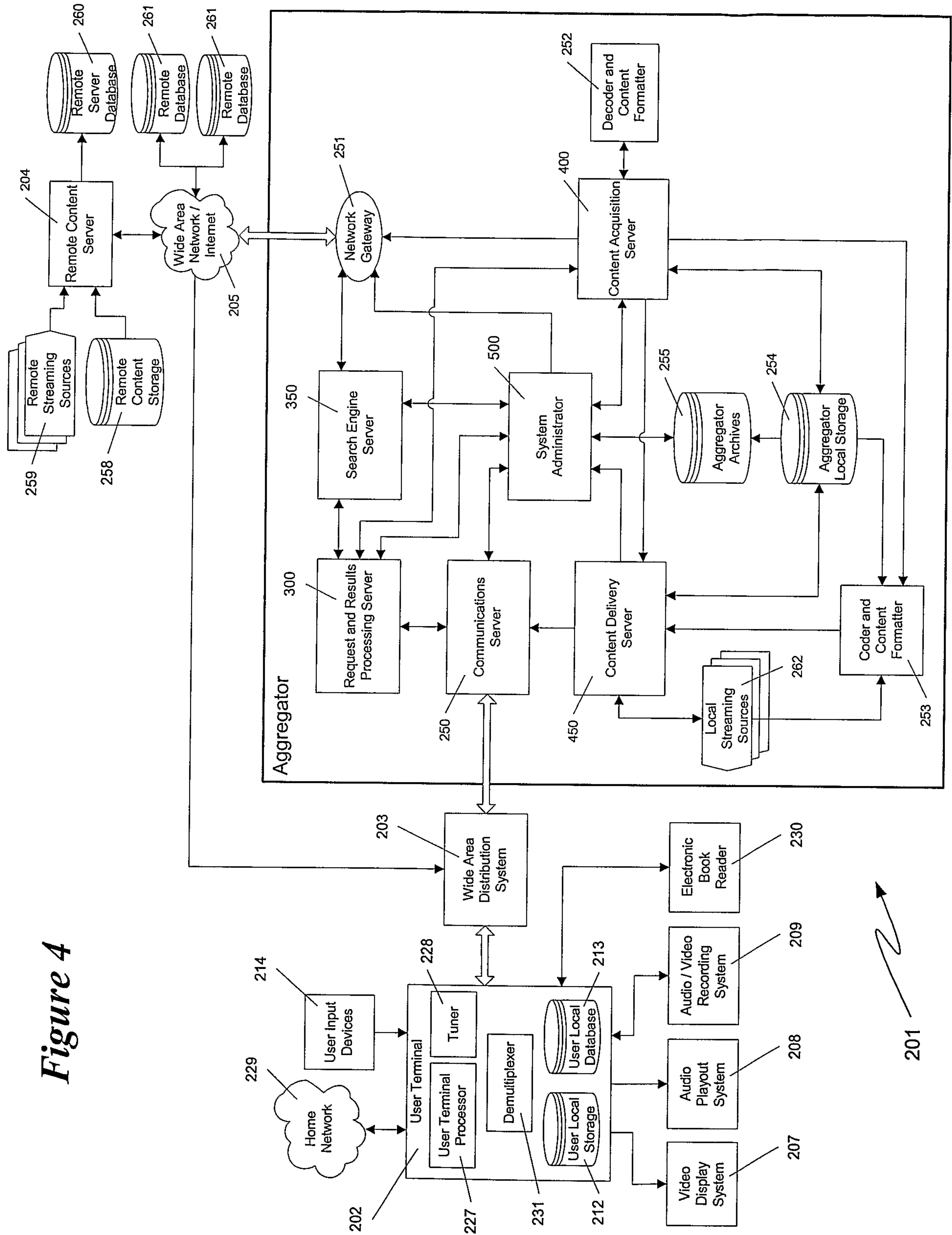


Figure 4



Figure 5

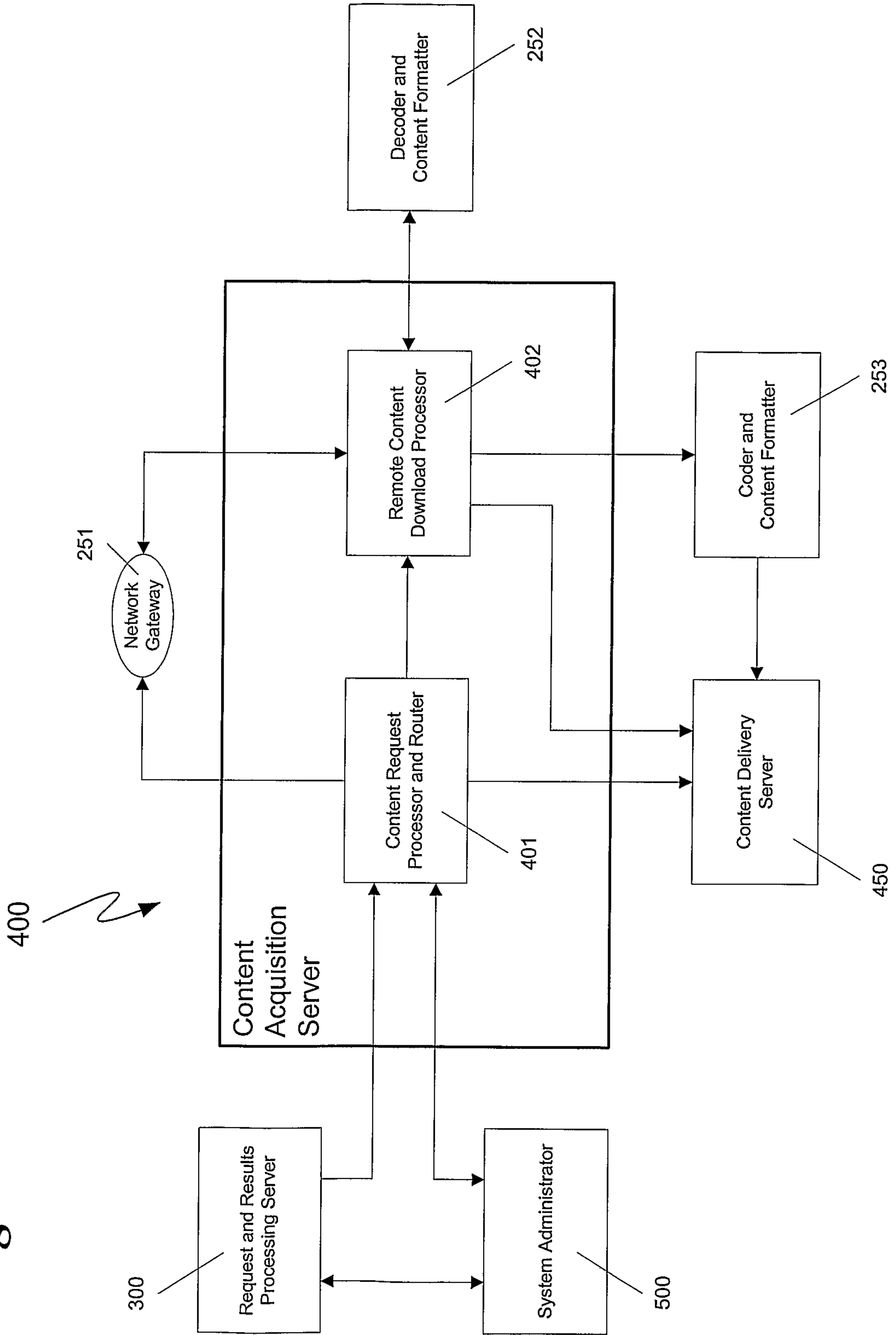


Figure 6

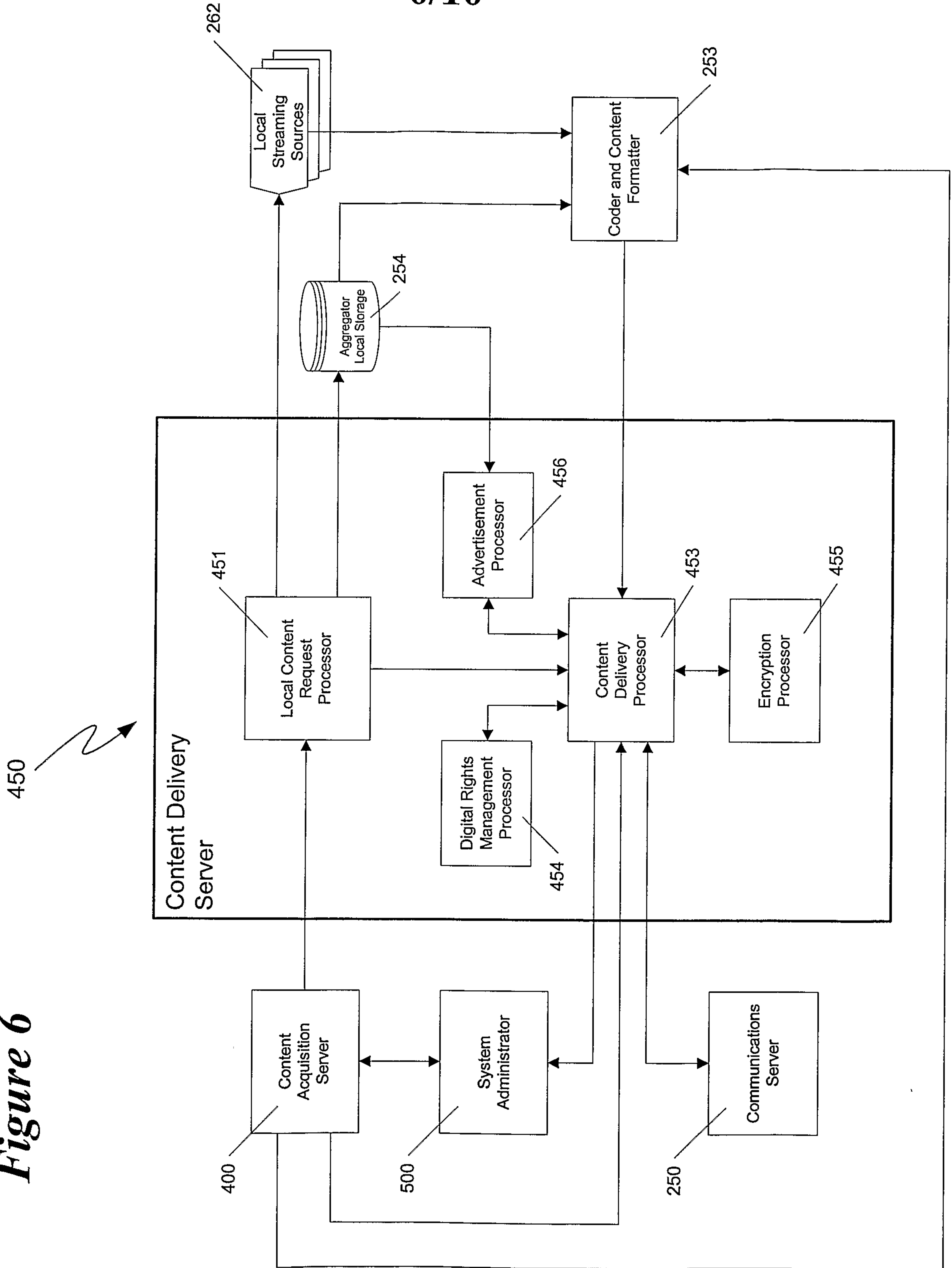


Figure 7

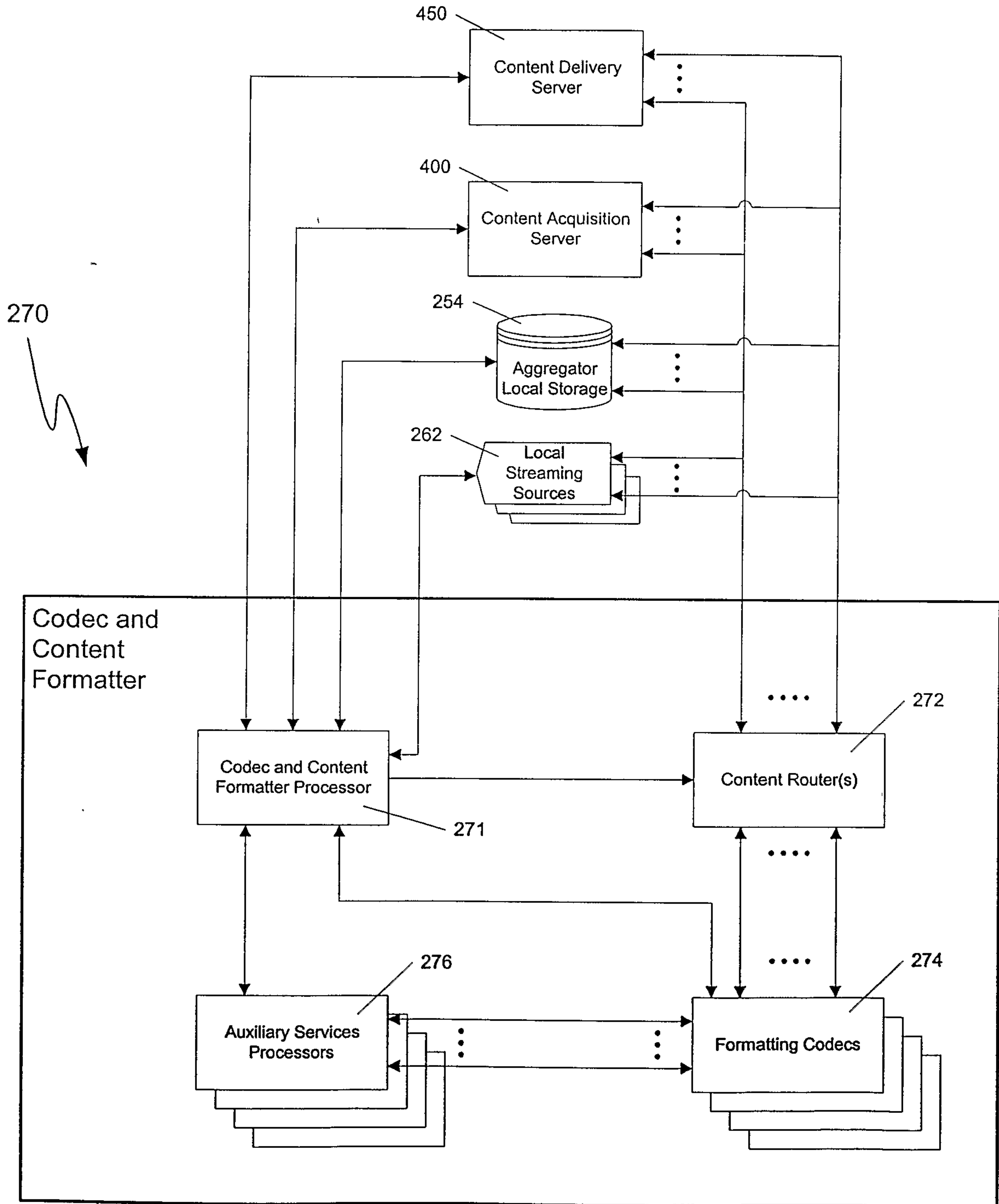


Figure 8

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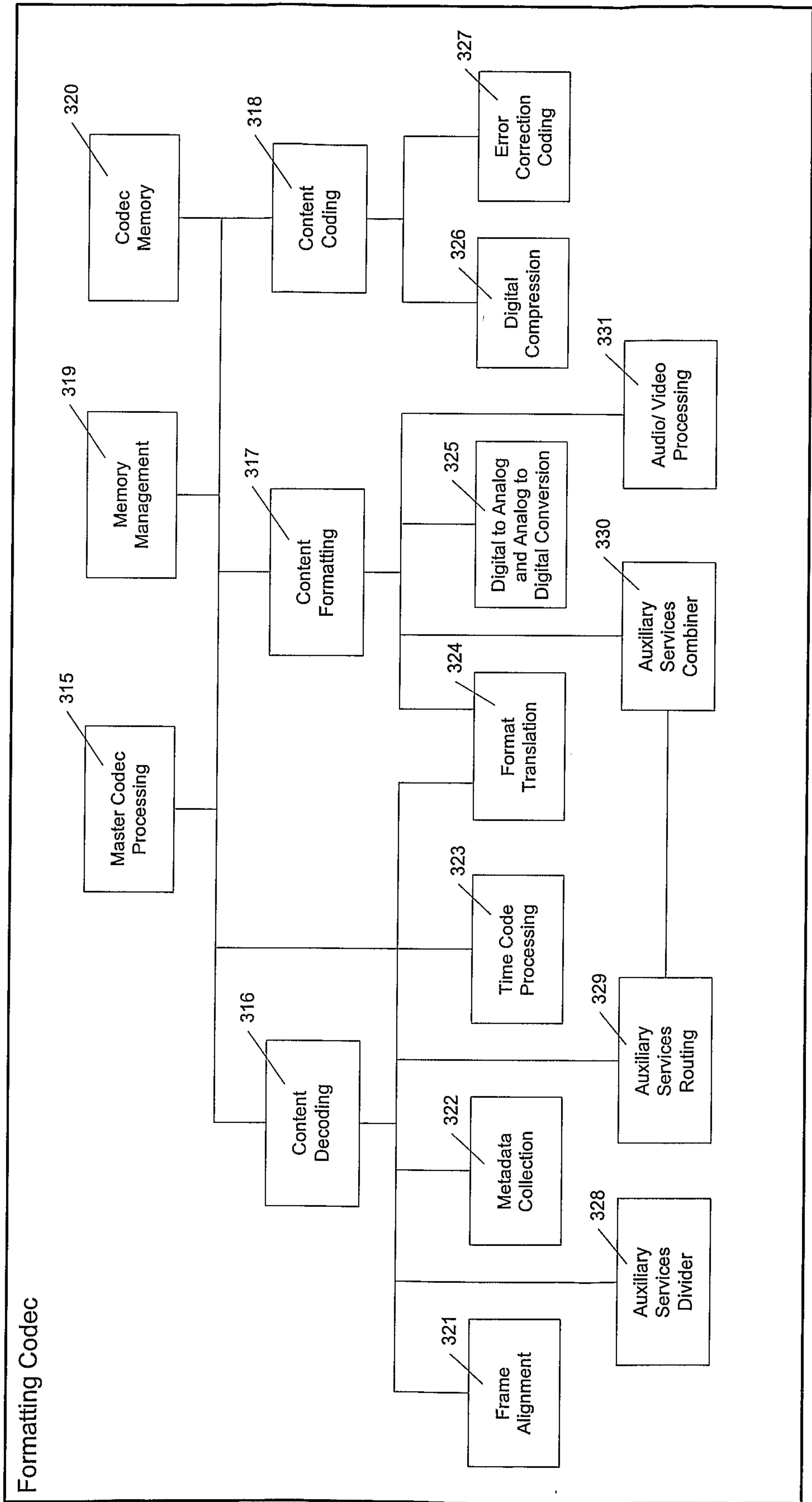


Figure 9

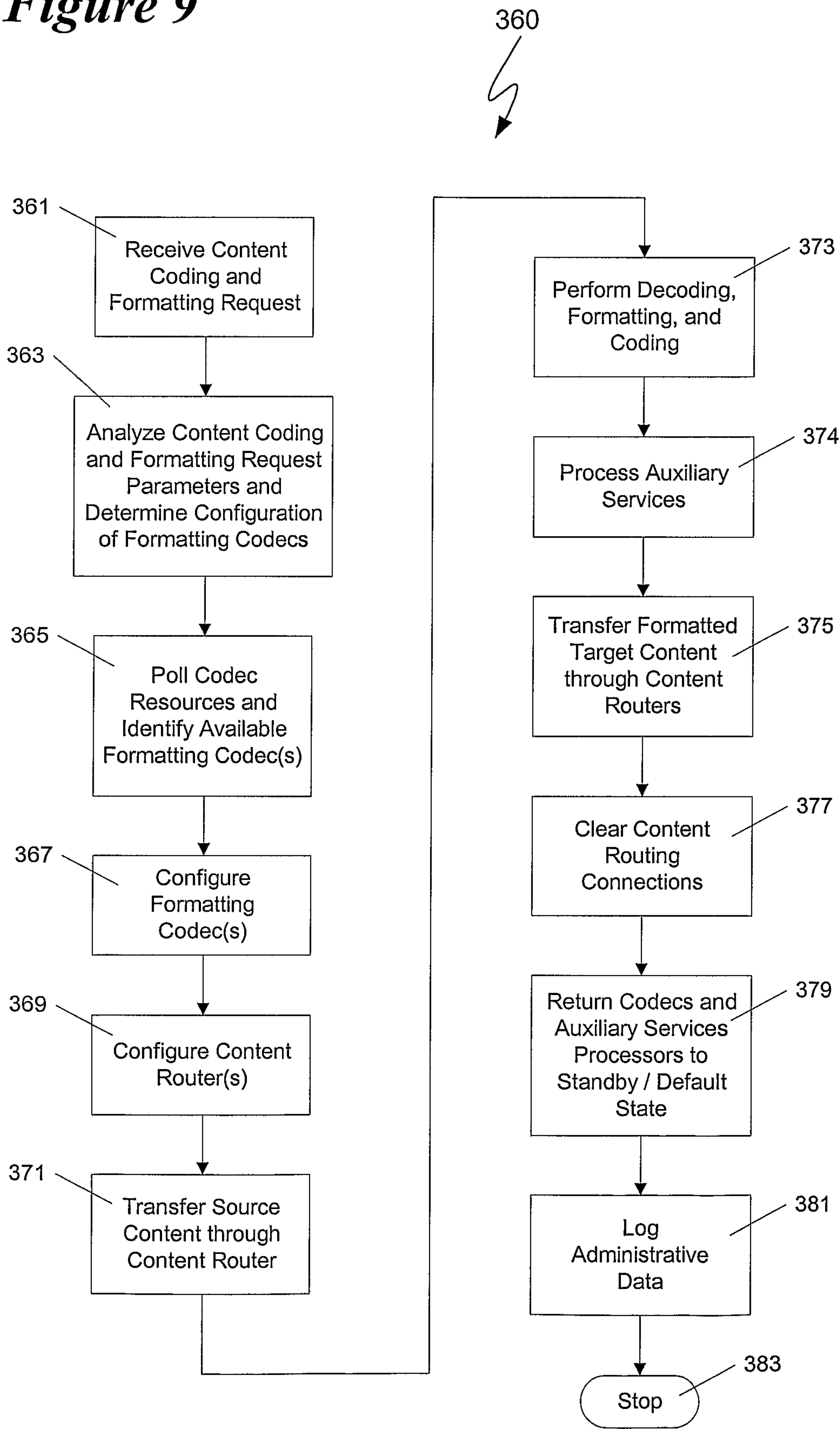


Figure 10

