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(54) **FAST-ADVANCE WHILE RECORDING ON-DEMAND CONTENT**

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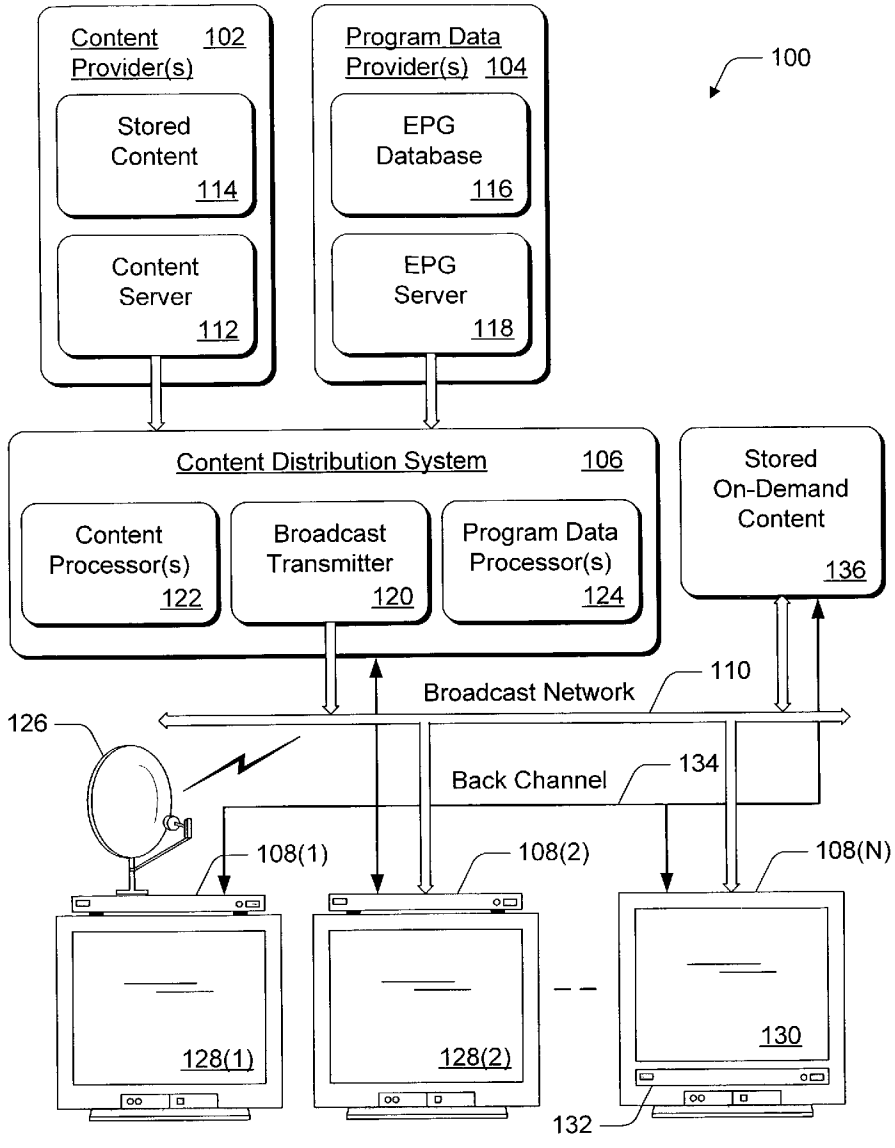
(57) **ABSTRACT**

A digital video recording system receives a first stream of on-demand video content and can both record the video content and route the video content for viewing on a display device. In response to a viewer request to fast-advance the video content display, the digital video recording system can request a second stream of the on-demand video content and route the second video content for fast-advance display on the display device while continuing to record the first video content without interruption and without a change in the speed at which the video content is recorded.



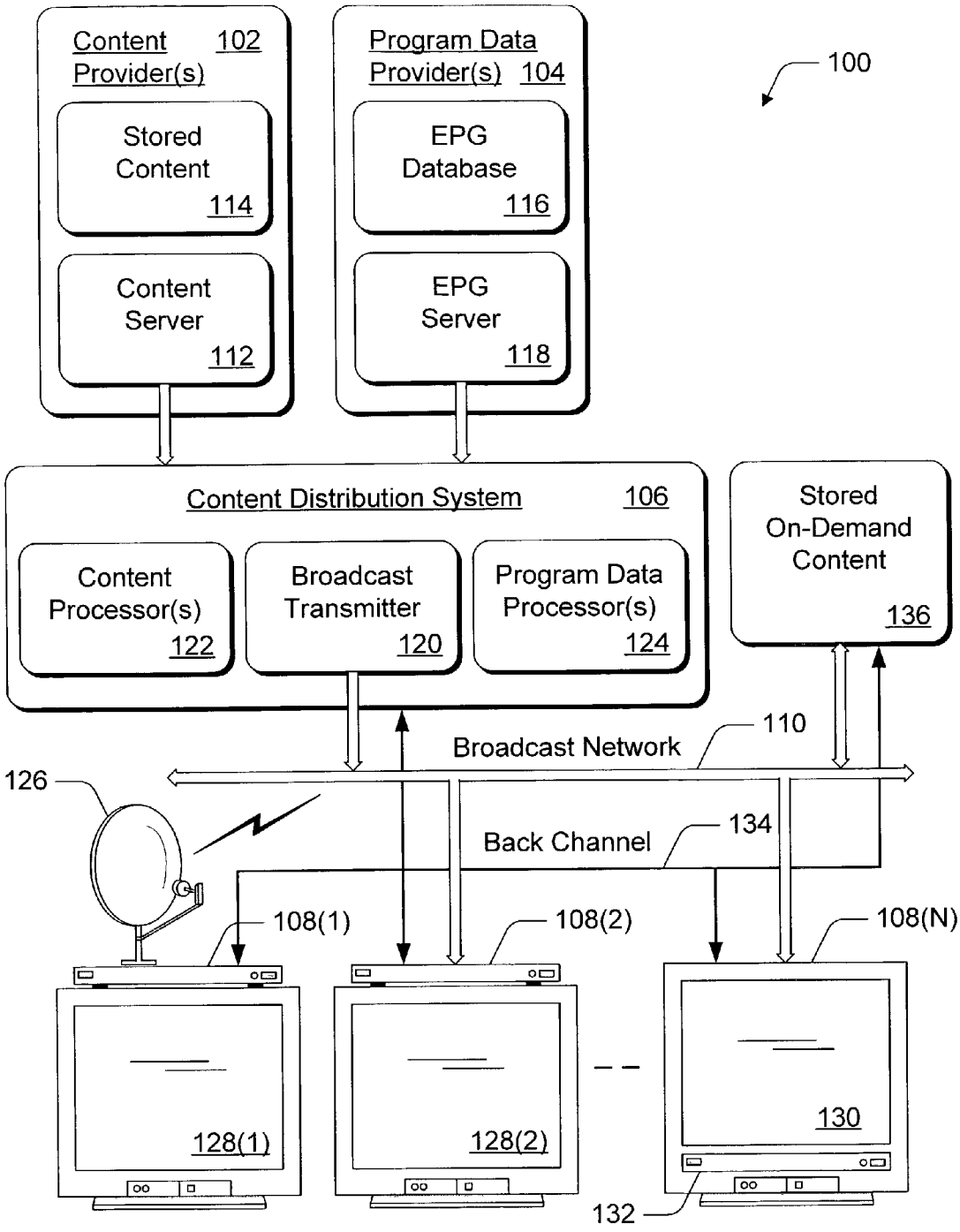

Content Provider(s) 102
Stored Content 114
Content Server 112
Program Data Provider(s) 104
EPG Database 116
EPG Server 118
100
Content Distribution System 106
Content Processor(s) 122
Broadcast Transmitter 120
Program Data Processor(s) 124
Stored On-Demand Content 136
Broadcast Network 110
126
Back Channel 134
108(1)
108(2)
108(N)
128(1)
128(2)
130
132

Fig. 1

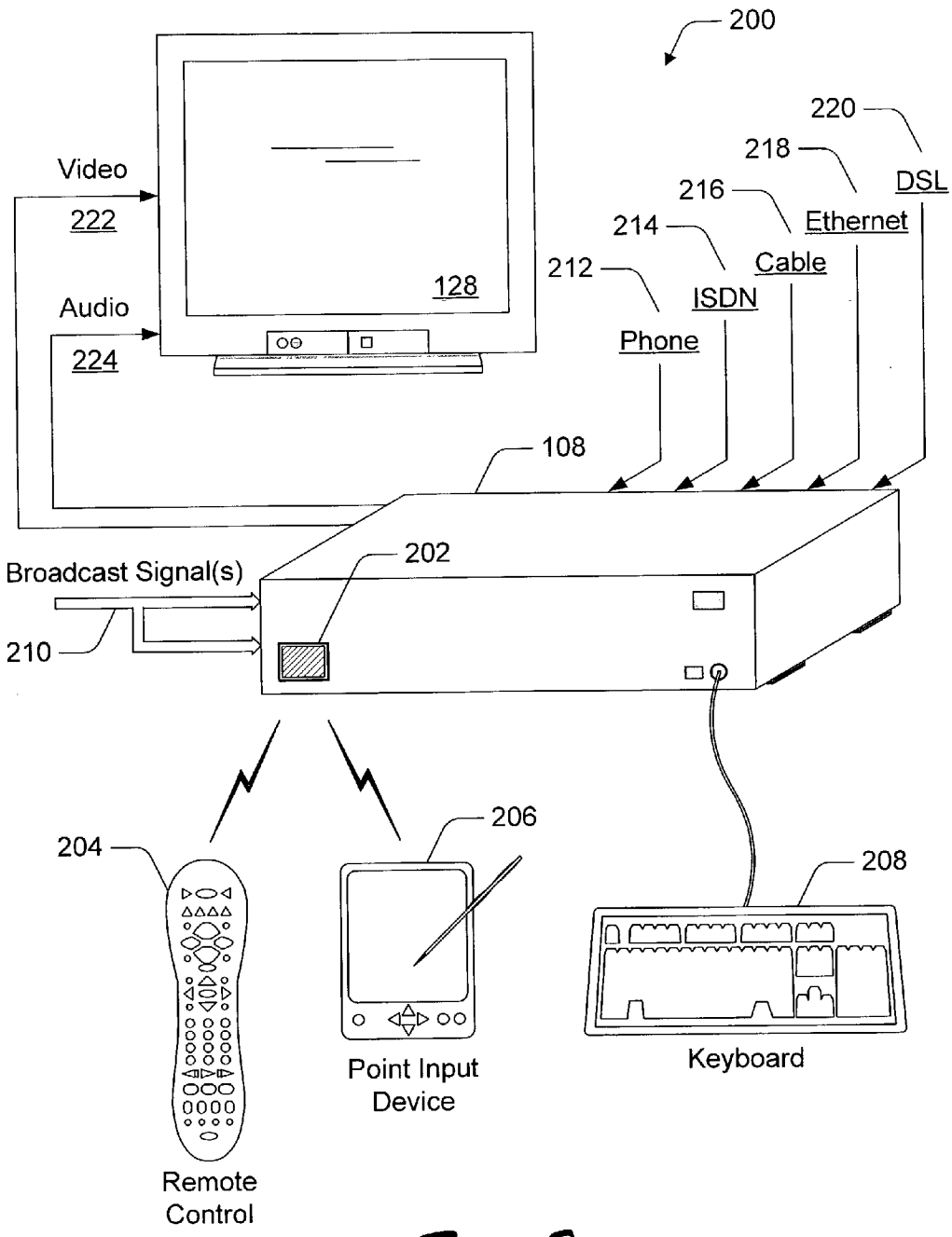

200
220
218
DSL
216
Ethernet
214
Cable
212
ISDN
Phone
Video
222
Audio
224
128
108
202
Broadcast Signal(s)
210
204
206
208
Remote Control
Point Input Device
Keyboard

Fig. 2

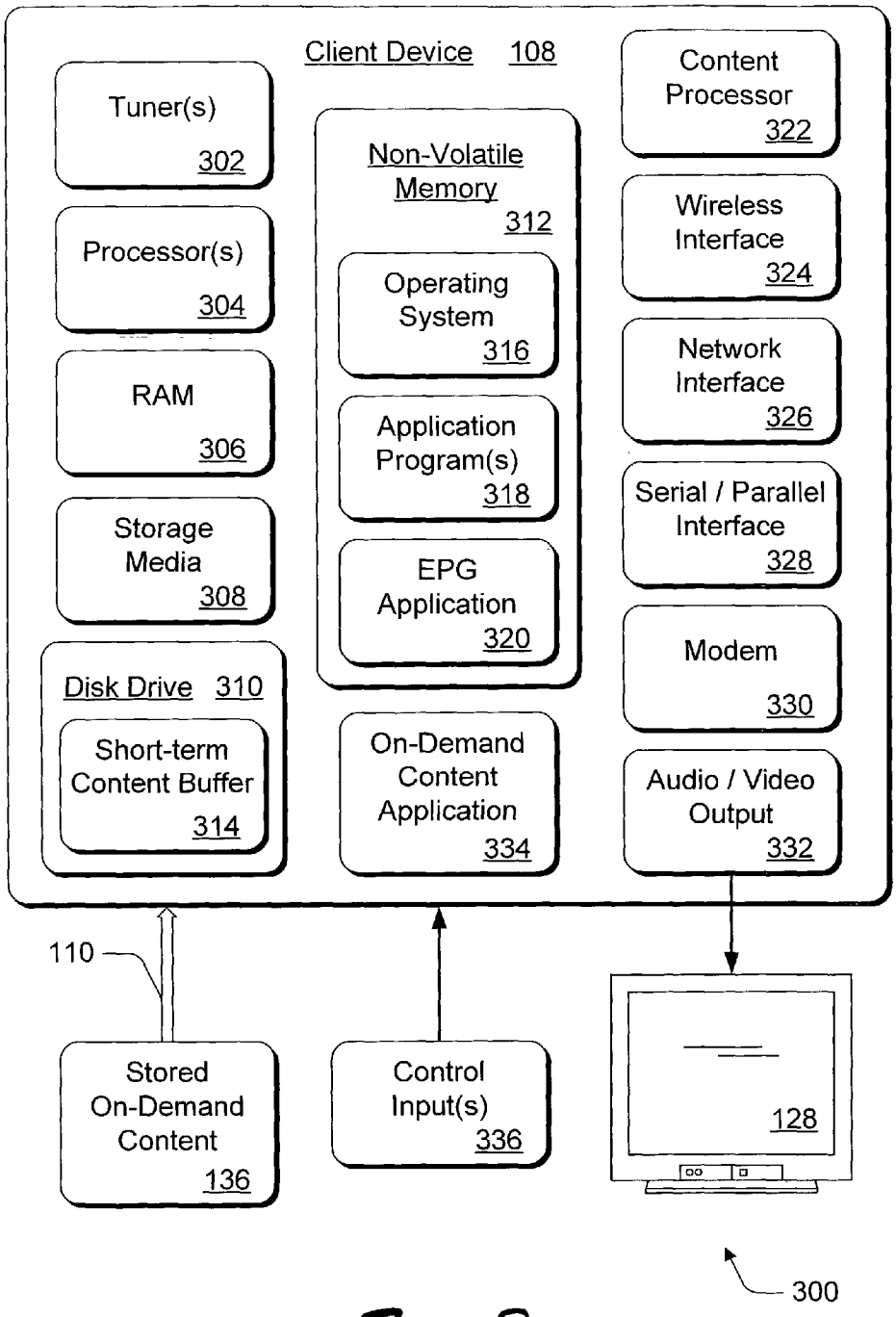

Client Device 108
Tuner(s) 302
Processor(s) 304
RAM 306
Storage Media 308
Disk Drive 310
Short-term Content Buffer 314
Non-Volatile Memory 312
Operating System 316
Application Program(s) 318
EPG Application 320
On-Demand Content Application 334
Content Processor 322
Wireless Interface 324
Network Interface 326
Serial / Parallel Interface 328
Modem 330
Audio / Video Output 332
110
Stored On-Demand Content 136
Control Input(s) 336
128
300

Fig. 3

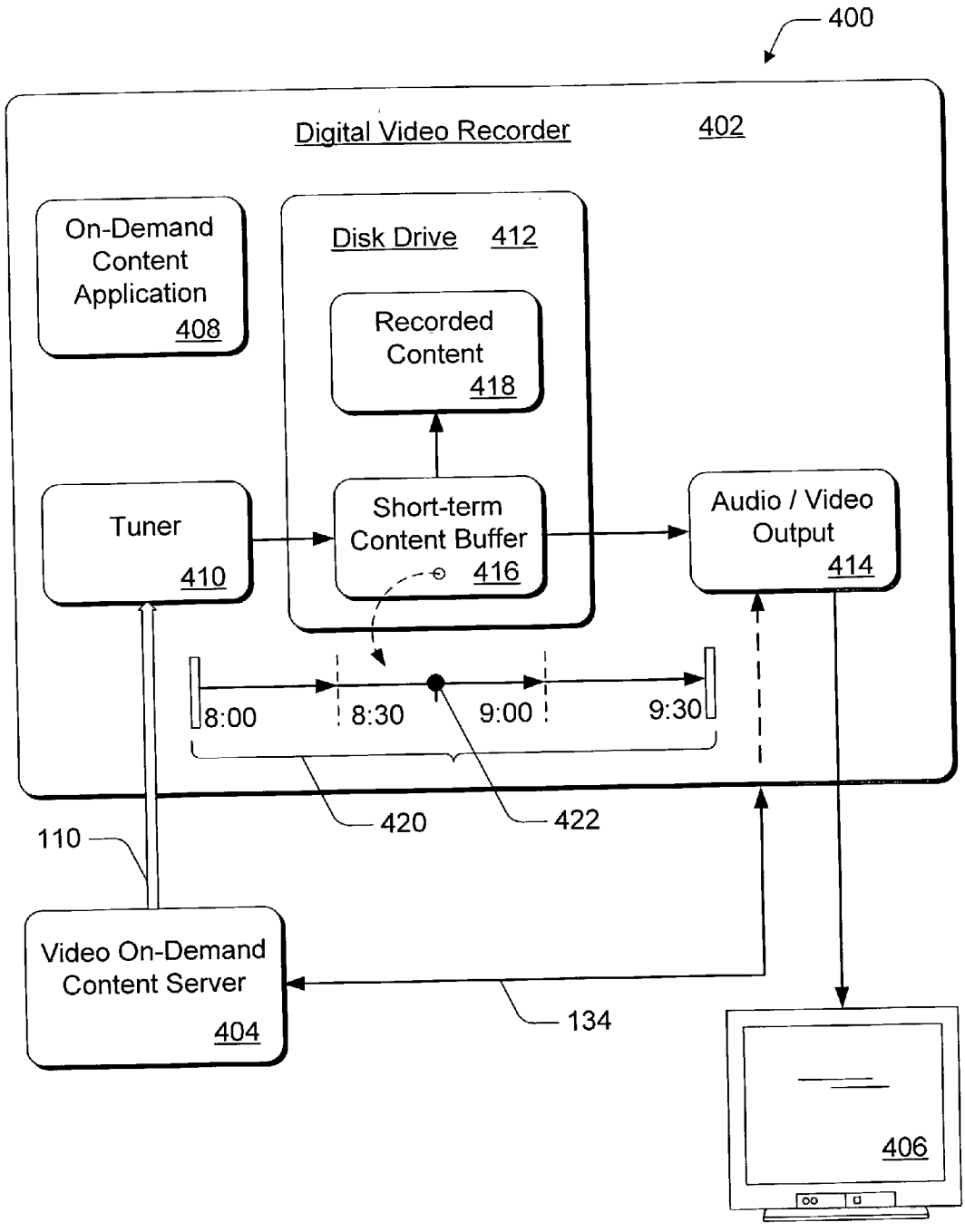

400
Digital Video Recorder
402
On-Demand Content Application
408
Disk Drive
412
Recorded Content
418
Tuner
410
Short-term Content Buffer
416
Audio / Video Output
414
8:00
8:30
9:00
9:30
420
422
110
Video On-Demand Content Server
404
134
406

Fig. 4

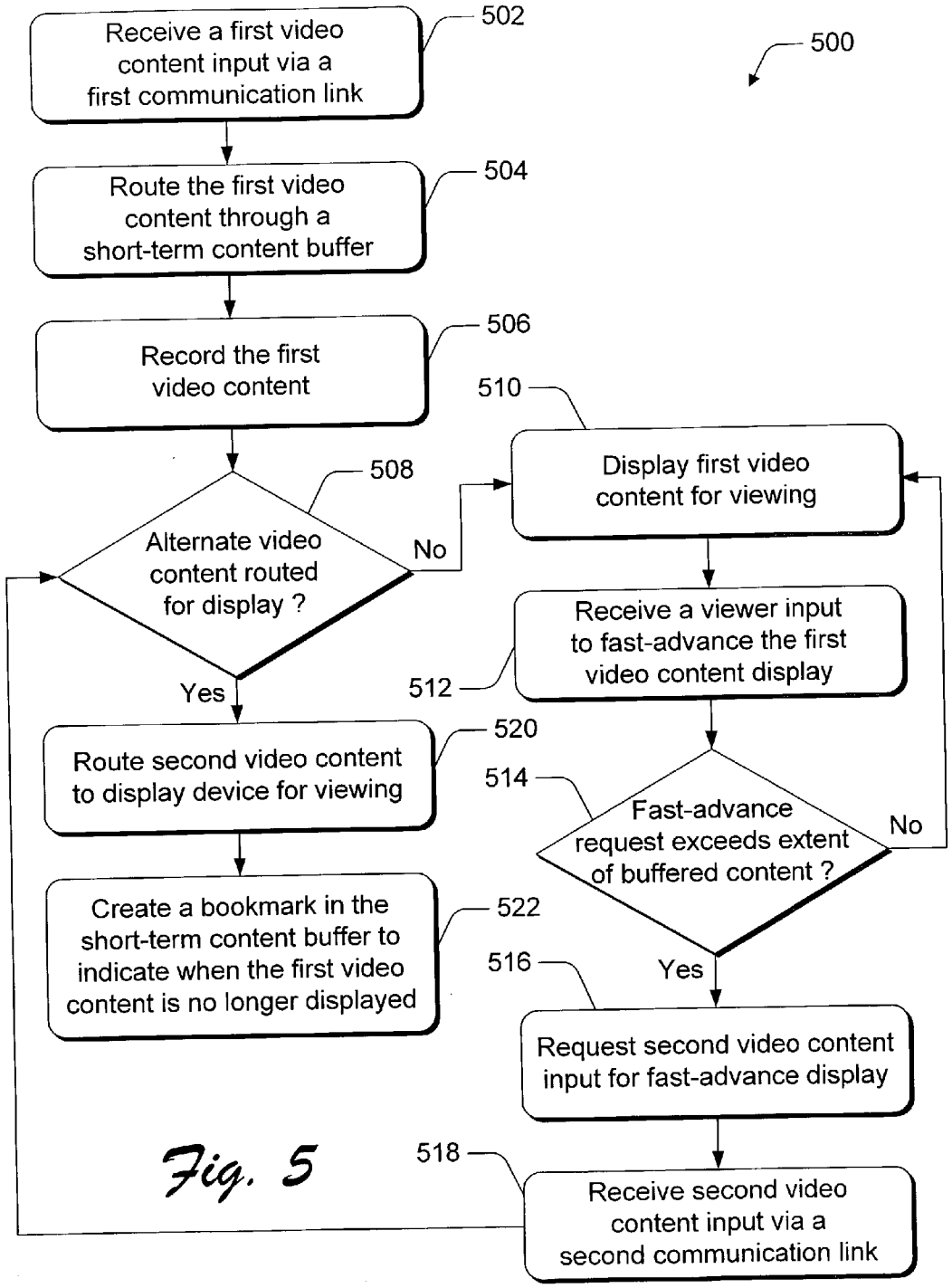

500
Receive a first video content input via a first communication link
502
Route the first video content through a short-term content buffer
504
Record the first video content
506
Alternate video content routed for display ?
508
No
Yes
Display first video content for viewing
510
Receive a viewer input to fast-advance the first video content display
512
Route second video content to display device for viewing
520
Create a bookmark in the short-term content buffer to indicate when the first video content is no longer displayed
522
Fast-advance request exceeds extent of buffered content ?
514
No
Yes
Request second video content input for fast-advance display
516
Receive second video content input via a second communication link
518

Fig. 5

FAST-ADVANCE WHILE RECORDING ON-DEMAND CONTENT

TECHNICAL FIELD

[0001] This invention relates to television entertainment and information architectures and, in particular, to fast-advancing a display of on-demand content while recording the on-demand content at a viewable playback speed.

BACKGROUND

[0002] Digital video recorders are implemented as client devices to receive video content in the form of on-demand entertainment, such as movies, and to receive broadcast and/or interactive television entertainment and information. A digital video recorder includes a hard disk memory so that a viewer can record the video content and other content of interest to the viewer. A digital video recorder also provides a viewer with convenient functionality, such as the ability to pause the broadcast of a television program and return to watch the video or program, while still in progress, from the point at which it was paused.

[0003] To implement this functionality, a digital video recorder includes a pause buffer to record the most recent segment of a paused broadcast program or on-demand video, and to playback the program or video for viewing from the beginning of the pause event when a viewer returns to continue watching the program or video. A pause buffer is typically configured as a circular, or ring, buffer on the hard disk memory and the amount of time which a television program can be delayed is dependent upon how much storage space is allocated for the pause buffer. When a pause buffer reaches capacity, such as after thirty minutes for example, the content corresponding to the beginning of a pause event will be written over. This example pause buffer is a sliding thirty minute recorder of the most recently displayed content.

[0004] When a viewer requests an on-demand video, such as a movie, from a video on-demand (VOD) provider, the video content is received with a client device, such as a digital video recorder, and can be routed through a pause buffer to both display the movie on a television and record the movie in the hard disk memory. A feature of on-demand content is that the viewer can request to jump ahead in the movie, such as to the end, and see the outcome without having to watch the entire movie. However, if the viewer is also recording the movie while watching it, and initiates a fast-forward command, the segment of the movie that was fast-forwarded over will be fast-forward recorded in the hard disk memory and can not be played back at a viewable playback speed for later viewing. The segment of the movie will be fast-forward recorded because the fast-forward command initiated by the viewer is sent to the video on-demand provider, or server, which then provides the video content as a fast-forward stream that is received by the client device and recorded as a fast-forward content stream.

[0005] Accordingly, for television-based entertainment and information systems, there is a need for a technique to fast-forward and fast-rewind the display of requested on-demand video content while also recording the on-demand video content at a viewable playback speed as it is being received.

SUMMARY

[0006] A digital video recording system receives a first stream of on-demand video content and can both record the video content and route the video content for viewing on a display device. In response to a viewer request to fast-advance the video content display, the digital video recording system can request a second stream of the on-demand video content and route the second video content for fast-advance display on the display device while continuing to record the first video content without interruption and without a change in the speed at which the video content is recorded. In an implementation, the digital video recording system includes a short-term content buffer that maintains a recent segment of the first video content and requests the second stream of the on-demand video content when the fast-advance request exceeds the extent of the buffered content.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The same numbers are used throughout the drawings to reference like features and components.

[0008] **FIG. 1** illustrates an exemplary system architecture in which systems and methods to fast-advance on-demand content while recording the on-demand content can be implemented.

[0009] **FIG. 2** illustrates an example client device, a television, and various input devices that interact with the client device.

[0010] **FIG. 3** illustrates various components of an exemplary digital video recording system that includes an example client device.

[0011] **FIG. 4** illustrates various components of an exemplary digital video recorder to enable fast-advance while recording on-demand content.

[0012] **FIG. 5** is a flow diagram that illustrates a method for fast-advance while recording on-demand content.

DETAILED DESCRIPTION

[0013] A digital video recording system receives a first stream of on-demand video content, such as a movie, when a viewer requests the movie from a video on-demand (VOD) provider. The movie can both be recorded on a hard disk memory in the digital video recorder and can be routed for viewing on a display device, such as a television, connected to the digital video recorder. In response to a viewer request to fast-forward or fast-rewind the movie displayed on the television, the digital video recording system can request a second stream of the on-demand video content from the video on-demand provider and route the second video content for fast-advance display on the television while continuing to record the movie from the first stream of video content without interruption and without a change in the speed at which the video content is recorded.

[0014] The following discussion is directed to television-based entertainment and information systems, such as interactive TV networks, cable networks that utilize electronic program guides, and Web-enabled TV networks. Client devices in such systems include full-resource clients with substantial memory and processing resources, such as TV-enabled personal computers and digital video recorders

equipped with hard-disks. While aspects of the described systems and methods can be used in any of these systems and for any types of client devices, they are described in the context of the following exemplary environment.

[0015] Exemplary System Architecture

[0016] **FIG. 1** illustrates an exemplary television entertainment system **100** that is an architecture in which a technique can be implemented to fast-advance the display of on-demand video content while also recording the on-demand video content at a viewable playback speed as it is being received. System **100** facilitates distribution of content and program data to multiple viewers, and includes one or more content providers **102**, one or more program data providers **104**, a content distribution system **106**, and multiple client devices **108(1)**, **108(2)**, . . . , **108**(N) coupled to the content distribution system **106** via a broadcast network **110**.

[0017] Content provider **102** includes a content server **112** and stored content **114**, such as movies, television programs, commercials, music, and similar audio and/or video content. Content server **112** controls distribution of the stored content **114** from content provider **102** to the content distribution system **106**. Additionally, content server **112** controls distribution of live content (e.g., content that was not previously stored, such as live feeds) and/or content stored at other locations to the content distribution system **106**. Program data provider **104** includes an electronic program guide (EPG) database **116** and an EPG server **118**. The EPG database **116** stores electronic files of program data which is used to generate an electronic program guide (or, "program guide"). Program data (or, "EPG data") includes program titles, ratings, characters, descriptions, actor names, station identifiers, channel identifiers, schedule information, and so on.

[0018] The EPG server **118** processes the program data prior to distribution to generate a published version of the program data which contains programming information for all channels for one or more days. The processing may involve any number of techniques to reduce, modify, or enhance the program data. Such processes might include selection of content, content compression, format modification, and the like. The EPG server **118** controls distribution of the published version of the program data from program data provider **104** to the content distribution system **106** using, for example, a file transfer protocol (FTP) over a TCP/IP network (e.g., Internet or an Intranet). Further, the published version of the program data can be transmitted from program data provider **104** via a satellite directly to a client device **108**.

[0019] Content distribution system **106** includes a broadcast transmitter **120**, one or more content processors **122**, and one or more program data processors **124**. Broadcast transmitter **120** broadcasts signals, such as cable television signals, across broadcast network **110**. Broadcast network **110** can include a cable television network, RF, microwave, satellite, and/or data network, such as the Internet, and may also include wired or wireless media using any broadcast format or broadcast protocol. Additionally, broadcast network **110** can be any type of network, using any type of network topology and any network communication protocol, and can be represented or otherwise implemented as a combination of two or more networks.

[0020] A content processor **122** processes the content received from content provider **102** prior to transmitting the content across broadcast network **110**. Similarly, a program data processor **124** processes the program data received from program data provider **104** prior to transmitting the program data across broadcast network **110**. A particular content processor **122** may encode, or otherwise process, the received content into a format that is understood by the multiple client devices **108(1)**, **108(2)**, . . . , **108**(N) coupled to broadcast network **110**. Although **FIG. 1** shows a single content provider **102**, a single program data provider **104**, and a single content distribution system **106**, exemplary system **100** can include any number of content providers and/or program data providers coupled to any number of content distribution systems.

[0021] Content distribution system **106** is representative of a headend service, or network operator, that provides EPG data, as well as content, to multiple subscribers. Each content distribution system **106** may receive a slightly different version of the program data that takes into account different programming preferences and lineups. The EPG server **118** creates different versions of EPG data (e.g., different versions of a program guide) that include those channels of relevance to respective headend services, and the content distribution system **106** transmits the EPG data to the multiple client devices **108(1)**, **108(2)**, . . . , **108**(N). In one implementation, for example, content distribution system **106** utilizes a carousel file system to repeatedly broadcast the EPG data over an out-of-band (OOB) channel to the client devices **108**.

[0022] Client devices **108** can be implemented in a number of ways. For example, a client device **108(1)** receives broadcast content from a satellite-based transmitter via a satellite dish **126**. Client device **108(1)** is also referred to as a set-top box or a satellite receiving device. Client device **108(1)** is coupled to a television **128(1)** for presenting the content received by the client device (e.g., audio data and video data), as well as a graphical user interface. A particular client device **108** can be coupled to any number of televisions **128** and/or similar devices that can be implemented to display or otherwise render content. Similarly, any number of client devices **108** can be coupled to a single television **128**.

[0023] Client device **108(2)** is also coupled to receive broadcast content from broadcast network **110** and provide the received content to associated television **128(2)**. Client device **108**(N) is an example of a combination television **130** and integrated set-top box **132**. In this example, the various components and functionality of the set-top box are integrated into the television, rather than using two separate devices. The set-top box integrated into the television can receive broadcast signals via a satellite dish (similar to satellite dish **126**) and/or via broadcast network **110**. In alternate implementations, client devices **108** may receive broadcast signals via the Internet or any other broadcast medium, such as back channel **134** which can be implemented as an Internet protocol (IP) connection using a modem connection and conventional telephone line, for example. Further, back channel **134** provides an alternate communication link between each of the client devices **108**, and between the client devices **108** and the content distribution system **106**.

[0024] Each client device **108** can run an electronic program guide (EPG) application that utilizes the program data. An EPG application enables a television viewer to navigate through an onscreen program guide and locate television shows and other broadcast content of interest to the viewer. With an EPG application, the television viewer can look at schedules of current and future programming, set reminders for upcoming programs, and/or enter instructions to record one or more television shows.

[0025] The exemplary system **100** also includes stored on-demand content **136**, such as video on-demand (VOD) movie content. The stored on-demand content **136** can be viewed with a television **128** via a client device **108** through an onscreen movie guide, for example, and a viewer can enter instructions to stream a particular movie, or other stored content, down to a corresponding client device **108**.

[0026] Exemplary Client Device

[0027] **FIG. 2** illustrates an exemplary implementation **200** of a client device **108** shown as a standalone unit that connects to a television **128**. Client device **108** can be implemented in any number of embodiments, including as a set-top box, a satellite receiver, a TV recorder with a hard disk, a digital video recorder (DVR) and playback system, a game console, an information appliance, and so forth.

[0028] Client device **108** includes a wireless port **202**, such as an infrared (IR) or Bluetooth wireless port, for receiving wireless communications from a remote control device **204**, a handheld input device **206**, or any other wireless device, such as a wireless keyboard. Handheld input device **206** can be a personal digital assistant (PDA), handheld computer, wireless phone, or the like. Additionally, a wired keyboard **208** can be coupled to communicate with client device **108**. In alternate embodiments, remote control device **204**, handheld device **206**, and/or keyboard **208** may use an RF communication link or other mode of transmission to communicate with client device **108**.

[0029] Client device **108** receives one or more broadcast signals **210** from one or more broadcast sources, such as from a satellite or from a broadcast network, such as broadcast network **110** (**FIG. 1**). Client device **108** includes hardware and/or software for receiving and decoding broadcast signal **210**, such as an NTSC, PAL, SECAM, or other TV system video signal. Client device **108** also includes hardware and/or software for providing the user with a graphical user interface by which the user can, for example, access various network services, configure the client device **108**, and perform other functions.

[0030] Client device **108** can communicate with other devices via one or more connections including a conventional telephone line **212**, an ISDN link **214**, a cable link **216**, an Ethernet link **218**, a DSL link **220**, and the like. Client device **108** may use any one or more of the various communication links **212**-**220** at a particular instant to communicate with any number of other devices.

[0031] Client device **108** generates video signal(s) **222** and audio signal(s) **224**, both of which are communicated to television **128**. The video signals and audio signals can be communicated from client device **108** to television **128** via an RF (radio frequency) link, S-video link, composite video link, component video link, or other communication link. Although not shown in **FIG. 2**, client device **108** may include one or more lights or other indicators identifying the current status of the device. Additionally, the client device may include one or more control buttons, switches, or other selectable controls for controlling operation of the device.

[0032] Exemplary Digital Video Recording System

[0033] **FIG. 3** illustrates an exemplary digital video recording system **300** that includes selected components of television system **100**, such as an exemplary client device **108** as shown in **FIGS. 1 and 2**, and a television **128**. Client device **108** includes components to implement a digital video recording system and techniques to fast-forward and/or fast rewind a display of on-demand content while recording the on-demand content.

[0034] Client device **108** includes one or more tuners **302** which are representative of one or more in-band tuners that tune to various frequencies or channels to receive television signals, as well as an out-of-band tuner that tunes to the broadcast channel over which the EPG data is broadcast to client device **108**. Client device **108** also includes one or more processors **304** which process various instructions to control the operation of client device **108** and to communicate with other electronic and computing devices.

[0035] Client device **108** can be implemented with one or more memory components, examples of which include a random access memory (RAM) **306**, a mass storage media **308**, a disk drive **310**, and a non-volatile memory **312** (e.g., ROM, Flash, EPROM, EEPROM, etc.). The memory components (e.g., RAM **306**, storage media **308**, disk drive **310**, and non-volatile memory **312**) store various information and/or data such as received content, EPG data, configuration information for client device **108**, and/or graphical user interface information. Further, disk drive **310** includes a portion of memory allocated as a short-term content buffer **314** which maintains segments of stored on-demand content **136** received via broadcast network **110**. The short-term content buffer **314** maintains the most recent segment(s) of a paused broadcast program or segments of a received on-demand video.

[0036] An operating system **316** and one or more application programs **318** can be stored in non-volatile memory **312** and executed on a processor **304** to provide a runtime environment. A runtime environment facilitates extensibility of client device **108** by allowing various interfaces to be defined that, in turn, allow application programs **318** to interact with client device **108**. The application programs **318** that may be implemented in client device **108** can include a browser to browse the Web (e.g., "World Wide Web"), an email program to facilitate electronic mail, a video recorder application or component to facilitate storing received content on disk drive **310** for example, and so on. An EPG application **320** is stored in memory **312** to operate on the EPG data and generate a program guide. Client device **108** can also include other components pertaining to a television entertainment system which are not illustrated in this example. For instance, client device **108** can include a user interface application and user interface lights, buttons, controls, and the like to facilitate viewer interaction with the device.

[0037] Client device **108** also includes a content processor and/or decoder **322** to process and decode a broadcast video signal, such as an NTSC, PAL, SECAM, or other TV system

video signal. Content processor **322** can also include a video decoder and/or additional processors to receive, decode, and/or process video content received from content distribution system **106** (e.g., a network operator). For example, content processor **322** may include an MP3 or MPEG-2 (Moving Pictures Experts Group) decoder that decodes MPEG-encoded video and advertisement content. MPEG-2 supports a variety of audio/video formats, including legacy TV, HDTV (high-definition television), DVD (digital versatile disc), and five-channel surround sound.

[**0038**] Typically, video content includes video data and audio data that corresponds to the video data. Content processor **322** generates video and/or display content that is formatted for display on display device **128**, and generates decoded audio data that is formatted for broadcast by a broadcast device, such as one or more speakers (not shown) in display device **128**. Content processor **322** can include a display controller (not shown) that processes the video and/or display content to display corresponding images on display device **128**. A display controller can include a microcontroller, integrated circuit, and/or similar video processing component to process the images. It is to be appreciated that the systems and methods described herein can be implemented for any type of encoding format as well as for data and/or content streams that are not encoded.

[**0039**] Client device **108** further includes a wireless interface **324**, a network interface **326**, a serial and/or parallel interface **328**, and a modem **330**. Wireless interface **324** allows client device **108** to receive input commands and other information from a user-operated input device, such as from a remote control device or from another IR, Bluetooth, or similar RF input device.

[**0040**] Network interface **326** and serial and/or parallel interface **328** allows client device **108** to interact and communicate with other electronic and computing devices via various communication links. Although not shown, client device **108** may also include other types of data communication interfaces to communicate with other devices. Modem **330** facilitates client device **108** communication with other electronic and computing devices via a conventional telephone line. Client device **108** also includes an audio and/or video output **332** that provides signals to television **128** or to other devices that process and/or display, or otherwise render, the audio and video data.

[**0041**] Client device **108** includes an on-demand content application **334** that manages received on-demand video content **136** which can be maintained in short-term content buffer **314**, recorded onto disk drive **310**, and/or routed for display on television **128**. The on-demand content application **334** can be implemented as a software component that executes on a processor **304** and is stored in non-volatile memory **312**. The on-demand content application **334** can also receive viewer commands as control inputs **336**, such as from viewer-operated remote control device **204**, handheld device **206**, and/or keyboard **208**. The viewer-inputs can include video display commands such as record, fast-forward, rewind, pause, and the like. The input commands may be input via an RF, IR, Bluetooth, or similar communication link or other mode of transmission to communicate with on-demand content application **334**.

[**0042**] Although shown separately, some of the components of client device **108** may be implemented in an application specific integrated circuit (ASIC). Additionally, a system bus (not shown) typically connects the various components within client device **108**. A system bus can be implemented as one or more of any of several types of bus structures, including a memory bus or memory controller, a peripheral bus, an accelerated graphics port, or a local bus using any of a variety of bus architectures. By way of example, such architectures can include an Industry Standard Architecture (ISA) bus, a Micro Channel Architecture (MCA) bus, an Enhanced ISA (EISA) bus, a Video Electronics Standards Association (VESA) local bus, and a Peripheral Component Interconnects (PCI) bus also known as a Mezzanine bus.

[**0043**] **FIG. 4** illustrates a digital video recording system **400** which includes an exemplary digital video recorder **402** to enable fast-advancing a video display of on-demand video content while recording the on-demand video content. The system **400** also includes a video on-demand content server **404**, such as may be implemented by a content provider, and includes a display device **406**, such as a television.

[**0044**] The digital video recorder **402** includes various components described with reference to exemplary client device **108** shown in **FIG. 3**, and can include any number and combination of the components to implement digital video recorder **402**. In this example, digital video recorder **402** includes an on-demand content application **408**, a tuner **410**, a disk drive **412**, and an audio and/or video output component **414**. The disk drive **412** includes a short-term content buffer **416** and recorded content **418**.

[**0045**] When a viewer requests to receive a movie, for example, from the video on-demand content server **404**, a video content stream is communicated to digital video recorder **402** via broadcast network **110** and received with tuner **410**. The video content stream is routed to the short-term content buffer **416** which maintains segments of the video content stream, such as the most recent thirty minutes, for example. A time duration **420** illustrates that a viewer-requested movie is an hour and a half long, from a start time of 8:00 to and end time of 9:30. The example illustrates that a first segment of the movie from the start time of 8:00 to 8:30 has been routed through the short-term content buffer **416** while a next segment of the movie from 8:30 to 9:00 is maintained in short-term content buffer **416**. A next segment of the movie from 9:00 until the end of the movie at 9:30 is yet to be received and routed through the short-term content buffer **416**.

[**0046**] The video content stream is routed from the short-term content buffer **416** to the audio and/or video output component **414** which communicates the video content to television **406** where the movie is displayed for viewing. Additionally, the video content stream is routed from the short-term content buffer **416** to generate a recording **418** of the movie which can be played back for later viewing.

[**0047**] If the viewer requests to fast-advance the movie being displayed on television **406**, such as to jump ahead and see the ending of the movie without having to watch the entire movie, the on-demand content application **408** can request a second input of the same video content from the video on-demand content server **404** so as not to interrupt, or change the speed at which the first video content is being recorded. In a digital video recorder having a short-term content buffer, as is illustrated in this example, the on-

demand content application **408** can be configured to request the second video content when the segment of the movie that will be fast-forwarded over is not currently maintained in the short-term content buffer.

[**0048**] For example, if the viewer requests to fast-forward the movie at 8:35 and stops the fast-forward at 8:45, which is within the segment of the movie currently maintained in short-term content buffer **416** (i.e., movie segment 8:30 to 9:00), then the first video content recording will not be interrupted and the speed of the recording will not be changed because of the remaining fifteen minute delay (i.e., 8:45 to the end of the buffered content at 9:00). Thus, a second input of the same video content will not be needed for display to prevent interrupting or altering the recording speed of the first video content, and the fast-forward command is managed within short-term content buffer **416**. However, if the viewer requests to fast-forward the movie at 8:35 and stops the fast-forward at 9:15, for example, the on-demand content application **408** will request a second input of the same video content because the fast-forward command exceeds the end of the buffered content at 9:00.

[**0049**] The on-demand content application **408** can be configured with any number of detection policies to determine when to request the second video content input. For example, the second video content input can be requested five minutes before the end of the buffered content, one minute before, and the like. Further, it is to be appreciated that although this discussion is directed to fast-forwarding and recording on-demand content, the described systems and methods are applicable to an implementation for rewinding and recording the on-demand content. For example, if a viewer initiates a rewind command of the movie being displayed, and the viewer requests to rewind past the beginning of the buffered content at 8:30, then the on-demand content application **408** can request a second input of the same video content for display so as to not interrupt or alter the first video content recording.

[**0050**] The on-demand content application **408** can request that the second video content be provided at the same channel frequency that the first video content is received so that the tuner **410** also does not interrupt receiving the first video content that is being recorded. A second video content stream received at the same channel frequency is communicated to digital video recorder **402** via back channel **134** and is routed directly to the audio and/or video output component **414** which communicates the second video content to television **406** where the movie is fast-forward displayed for viewing. Although the first video content is no longer displayed on television **406**, the first video content is still received via broadcast network **110** and is still being recorded in disk drive **412** without interruption.

[**0051**] The on-demand content application **408** also creates a bookmark **422** in the short-term content buffer, or the bookmark **422** references to the video content in the short-term content buffer, to indicate when during the first video content the viewer requested that the movie display be fast-advanced. The bookmark **422** can be created within the short-term content buffer **416** itself and maintained as part of the first video content segment that it identifies, or is otherwise associated with. The bookmark **422** can also be created as an indication point within the video content, or as any number and type of indicators or identifiers, such as flags, data bits, and the like. Further, the bookmark **422** can be created as a data structure that references to a position in the content buffer **416**, but is maintained separately.

[**0052**] When the viewer finishes watching the end of the movie, the viewer can return to the point in the video content from which the fast-advance was initiated before the point is written over in the short-term content buffer **416** (e.g., within thirty minutes if the short-term content buffer is a thirty minute pause buffer, for example). The viewer can resume watching the first video content from the fast-advance point identified by bookmark **422**. Alternatively, the viewer can playback the recording **418** of the movie at a later time which will have been recorded in its entirety without interruption and without a change in the speed at which the first video content stream is recorded.

[**0053**] Method for Fast-Advance While Recording On-Demand Content

[**0054**] A method for fast-advancing a display of on-demand content while recording the on-demand content may be described in the general context of computer-executable instructions. Generally, computer-executable instructions include routines, programs, objects, components, data structures, and the like that perform particular functions or implement particular abstract data types. The described method may also be practiced in distributed computing environments where functions are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, computer-executable instructions may be located in both local and remote computer storage media, including memory storage devices.

[**0055**] **FIG. 5** illustrates a method **500** for fast-advancing a display of on-demand content while recording the on-demand content. The order in which the method is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method. Furthermore, the method can be implemented in any suitable hardware, software, firmware, or combination thereof.

[**0056**] At block **502**, a first video content input is received via a first communication link. For example, tuner **410** in digital video recorder **402** receives on-demand video content, which can be received as a stream of video content, from the video on-demand content server **404** via the broadcast network **110** (**FIG. 4**). At block **504**, the first video content is routed through a short-term content buffer. For example, short-term content buffer **416** in digital video recorder **402** receives the first video content and maintains segments of the first video content, such as the most recent thirty minutes, for example.

[**0057**] At block **506**, the first video content is recorded. For example, the first video content is routed from the short-term content buffer **416** in digital video recorder **402** to generate recorded content **418** (i.e., a recording of the first video content) in disk drive **412**. At block **508**, a determination is made as to whether alternate video content is routed for display. If alternate video content is not routed for display in digital video recorder **402**, for example (i.e., "no" from block **508**), the first video content is displayed for viewing at block **510**. For example, the first video content is routed from the short-term content buffer **416** in digital video recorder **402** to the audio/video output component **414** and to display device **406**.

[0058] At block **512**, a viewer input to fast-advance the first video content display is received. A viewer request to fast-advance the first video content can include fast-forwarding the video content or fast-rewinding the video content. At block **514**, a determination is made as to whether the fast-advance request exceeds the extent of the buffered content. For example, if the viewer request to fast-advance the first video content is within the segment of the video content currently maintained in short-term content buffer **416**, then the first video content recording will not be interrupted and the speed of the recording will not be changed due to the buffered content delay. If the fast advance request does not exceed the extent of the buffered content (i.e., "no" from block **514**), the first video content continues to be displayed for viewing at block **510**.

[0059] If the fast advance request does exceed the extent of the buffered content (i.e., "yes" from block **514**), a second video content input is requested for fast-forward or fast-rewind display at block **516**. For example, on-demand content application **408** in digital video recorder **402** receives the fast-advance request (e.g., viewer input) and requests a second input of the same video content from the video on-demand content server **404**. The on-demand content application **408** can request that the second video content be provided at a particular channel frequency, such as at the same channel frequency that the first video content is received.

[0060] At block **518**, the second video content input is received via a second communication link that is separate from which the first video content is received. For example, digital video recorder **402** receives the second video content input from the video on-demand content server **404** via back channel **134**. When the second video content input is received (block **518**), the method returns to determine whether alternate video content is routed for display (block **508**).

[0061] If alternate video content is routed for display in digital video recorder **402**, for example (i.e., "yes" from block **508**), the second video content (i.e., the alternate content) is routed for display at block **520**. When digital video recorder **402** receives the second video content at the same channel frequency that the first video content is received, the second video content is routed in digital video recorder **402** to the audio/video output component **414** and to display device **406**. Although the first video content is no longer displayed, the first video content is still received via broadcast network **110** and is still being recorded without interruption.

[0062] At block **522**, a bookmark is created in the short-term content buffer to indicate when the first video content is no longer displayed. For example, the on-demand content application **408** creates a bookmark **422** in the short-term content buffer **416** in digital video recorder **402** to indicate when during the first video content the viewer requested that the video content be fast-advanced. Providing that the viewer returns to the point in the video content from which the fast-advance was initiated before the point is written over in the short-term content buffer (e.g., within thirty minutes if the short-term content buffer is a thirty minute pause buffer, for example), the viewer can resume watching the first video content from the fast-advance point identified by bookmark **422**.

[0063] Conclusion

[0064] Although the invention has been described in language specific to structural features and/or methods, it is to be understood that the invention defined in the appended claims is not necessarily limited to the specific features or methods described. Rather, the specific features and methods are disclosed as preferred forms of implementing the claimed invention.

1. A digital video recording system, comprising:

a tuner configured to receive a first stream of on-demand content;

a recording component configured to record the first stream of the on-demand content;

an on-demand content application configured to:

route the first stream of the on-demand content for display;

receive a request to fast advance the on-demand content display;

request a second stream of the on-demand content; and

route the second stream of the on-demand content for fast-advance display to replace the first stream of the on-demand content display:

2. A digital video recording system as recited in claim 1, further comprising a short-term content buffer configured to maintain segments of the first stream of the on-demand content before the segments are recorded.

3. A digital video recording system as recited in claim 1, wherein the on-demand content application is further configured to route the first stream of the on-demand content through a short-term content buffer before the first stream of the on-demand content is recorded.

4. A digital video recording system as recited in claim 1, wherein the on-demand content application is further configured to route the first stream of the on-demand content through a short-term content buffer, and create a bookmark in the short-term content buffer to indicate when the first stream of the on-demand content is replaced on the display.

5. A digital video recording system as recited in claim 1, wherein the memory component is further configured to record the first stream of the on-demand content without interruption.

6. A digital video recording system as recited in claim 1, wherein the memory component is further configured to record the first stream of the on-demand content without a change in the speed at which the first stream of the on-demand content is recorded.

7. A digital video recording system as recited in claim 1, wherein the on-demand content application is further configured to receive the second stream of the on-demand content at a channel frequency that the first stream of the on-demand content is received.

8. A digital video recording system as recited in claim 1, wherein the on-demand content application is further configured to request the second stream of the on-demand content at a particular channel frequency.

9. A digital video recording system as recited in claim 1, wherein the on-demand content application is further configured to receive the second stream of the on-demand content via a separate communication link from which the first stream of the on-demand content is received.

10. A television-based entertainment system comprising the digital video recording system as recited in claim 1.

11. A computing device comprising the digital video recording system as recited in claim 1.

12. A client device, comprising:

a tuner configured to receive a first video content input from a content provider via a communication link;

a recording component configured to record the first video content while the first video content is displayed;

an application component configured to:

receive a viewer input to fast-forward the first video content display;

request a second video content input for fast-forward display;

receive the second video content input from the content provider via a second communication link; and

route the second video content for display instead of the first video content while the first video content is recorded.

13. A client device as recited in claim 12, further comprising a short-term content buffer configured to receive segments of the first video content before the segments are recorded.

14. A client device as recited in claim 12, wherein the application component is further configured to route the first video content input through a short-term content buffer before the first video content is recorded.

15. A client device as recited in claim 12, wherein the application component is further configured to route the first video content input through a short-term content buffer, and create a bookmark in the short-term content buffer to indicate when the first video content is no longer routed for display.

16. A client device as recited in claim 12, wherein the recording component is further configured to record the first video content without interruption when the viewer input is received and when the second video content input is received.

17. A client device as recited in claim 12, wherein the recording component is further configured to record the first video content without a change in the speed at which the first video content is recorded.

18. A client device as recited in claim 12, wherein the application component is further configured to receive the second video content input at the same channel frequency that the first video content input is received.

19. A client device as recited in claim 12, wherein the application component is further configured to request the second video content input be provided at a particular channel frequency.

20. A digital video recording system comprising the client device as recited in claim 12.

21. A method, comprising:

displaying a first stream of on-demand content for viewing;

recording the first stream of the on-demand content;

receiving a request to fast-advance displaying the on-demand content;

requesting a second stream of the on-demand content;

fast-advancing the second stream of the on-demand content; and

displaying the second stream of the on-demand content for viewing instead of the first stream of the on-demand content.

22. A method as recited in claim 21, wherein receiving the request includes receiving a viewer input for fast-forward displaying the on-demand content while continuing recording the first stream of the on-demand content.

23. A method as recited in claim 21, wherein receiving the request includes receiving a viewer input for fast-rewind displaying the on-demand content while continuing recording the first stream of the on-demand content.

24. A method as recited in claim 21, further comprising routing the first stream of the on-demand content through a short-term content buffer before recording the first stream of the on-demand content.

25. A method as recited in claim 21, further comprising routing the first stream of the on-demand content through a short-term content buffer, and creating a bookmark in the short-term content buffer to indicate when the first stream of the on-demand content is no longer displayed.

26. A method as recited in claim 21, wherein recording includes recording the first stream of the on-demand content without interruption.

27. A method as recited in claim 21, wherein recording includes recording the first stream of the on-demand content without a change in the speed at which the first stream of the on-demand content is recorded.

28. A method as recited in claim 21, further comprising receiving the second stream of the on-demand content at a channel frequency that the first stream of the on-demand content is received.

29. A method as recited in claim 21, wherein requesting includes requesting the second stream of the on-demand content at a particular channel frequency.

30. A method as recited in claim 21, further comprising receiving the second stream of the on-demand content via a separate communication link from which the first stream of the on-demand content is received.

31. One or more computer-readable media comprising computer-executable instructions that, when executed, direct a digital video recording system to perform the method of claim 21.

32. One or more computer-readable media comprising computer-executable instructions that, when executed, direct a computing device to perform the method of claim 21.

33. A method, comprising:

displaying a first stream of on-demand content for viewing;

recording the first stream of the on-demand content;

receiving a request to fast-advance displaying the on-demand content; and

determining whether to request a second stream of the on-demand content for a fast-advance display of the on-demand content.

34. A method as recited in claim 33, further comprising:

requesting the second stream of the on-demand content; and

displaying the second stream of the on-demand content for viewing instead of the first stream of the on-demand content.

35. A method as recited in claim 33, wherein determining includes determining whether the request to fast-advance the first stream of the on-demand content exceeds a buffered segment of the first stream of the on-demand content.

36. A method as recited in claim 33, further comprising:

requesting the second stream of the on-demand content; and

displaying the second stream of the on-demand content for viewing instead of the first stream of the on-demand content if the request to fast-advance the first stream of the on-demand content exceeds a buffered segment of the first stream of the on-demand content.

37. A method as recited in claim 33, wherein receiving the request includes receiving a viewer input for fast-forward displaying the on-demand content while continuing recording the first stream of the on-demand content.

38. A method as recited in claim 33, wherein receiving the request includes receiving a viewer input for fast-rewind displaying the on-demand content while continuing recording the first stream of the on-demand content.

39. A method as recited in claim 33, further comprising routing the first stream of the on-demand content through a short-term content buffer before recording the first stream of the on-demand content.

40. A method as recited in claim 33, further comprising routing the first stream of the on-demand content through a short-term content buffer, and creating a bookmark in the short-term content buffer to indicate the fast-advance request.

41. A method as recited in claim 33, wherein recording includes recording the first stream of the on-demand content without a change in the speed at which the first stream of the on-demand content is recorded.

42. A method as recited in claim 33, further comprising requesting the second stream of the on-demand content at a particular channel frequency if the request to fast-advance the first stream of the on-demand content exceeds a buffered segment of the first stream of the on-demand content.

43. A method as recited in claim 33, further comprising receiving the second stream of the on-demand content via a separate communication link from which the first stream of the on-demand content is received.

44. One or more computer-readable media comprising computer-executable instructions that, when executed, direct a digital video recording system to perform the method of claim 33.

45. One or more computer-readable media comprising computer-executable instructions that, when executed, direct a computing device to perform the method of claim 33.

46. A video recording system, comprising:

means for receiving a first video content input via a first communication link;

means for recording the first video content while the first video content is routed for display;

means for receiving a viewer input to fast-forward the first video content display;

means for requesting a second video content input for fast-forward display;

means for receiving the second video content input via a second communication link; and

means for routing the second video content for display instead of the first video content while the first video content is recorded.

47. A video recording system as recited in claim 46, further comprising means for routing the first video content input through a short-term content buffer before the first video content is recorded.

48. A video recording system as recited in claim 46, further comprising means for receiving the second video content input at the same channel frequency that the first video content input is received.

49. A video recording system as recited in claim 46, further comprising means for requesting that the second video content input be provided at a particular channel frequency.

50. One or more computer-readable media comprising computer-executable instructions that, when executed, direct a client device of a video on-demand system to:

receive a first video content input via a communication link from a content provider;

record the first video content while displaying the first video content;

receive a viewer input to fast-forward the displaying first video content;

request a second video content input for fast-forward display;

receive the second video content input via a second communication link from the content provider; and

route the second video content for display instead of the first video content while the first video content is recorded.

51. One or more computer-readable media as recited in claim 50, further comprising computer executable instructions that, when executed, direct the client device of the video on-demand system to maintain segments of the first video content in a short-term content buffer before the segments are recorded.

52. One or more computer-readable media as recited in claim 50, further comprising computer executable instructions that, when executed, direct the client device of the video on-demand system to route the first video content input through a short-term content buffer before the first video content is recorded.

53. One or more computer-readable media as recited in claim 50, further comprising computer executable instructions that, when executed, direct the client device of the video on-demand system to route the first video content input through a short-term content buffer, and create a bookmark in the short-term content buffer to indicate when the first video content is no longer routed for display.

54. One or more computer-readable media as recited in claim 50, further comprising computer executable instructions that, when executed, direct the client device of the video on-demand system to record the first video content without interruption when the viewer input is received and when the second video content input is received.

55. One or more computer-readable media as recited in claim 50, further comprising computer executable instructions that, when executed, direct the client device of the video on-demand system to receive the second video content input at the same channel frequency that the first video content input is received.

56. One or more computer-readable media as recited in claim 50, further comprising computer executable instructions that, when executed, direct the client device of the video on-demand system to request the second video content input be provided at a particular channel frequency.

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