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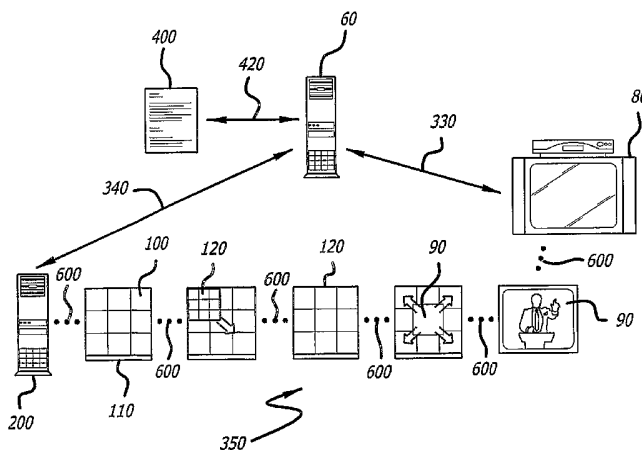
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(54) Title: SYSTEM FOR ENABLING VIDEO-BASED INTERACTIVE APPLICATIONS



(57) Abstract: A system and method for delivering interactive program guides includes encoding a plurality of different user interface screens of an interactive application into a series of short video segments. The video segments have associated metadata files that uniquely describe each segment, wherein the segment metadata enables the ingestion of the video segments via an asset distribution and management system into a video-on-demand server and facilitates their subsequent identification by the video-on-demand server. As viewers interact with the application, their input device key presses are processed and delivered to a mapping server that utilizes the data in a configuration file to instruct the video-on-demand server to splice the appropriate interactive application user interface digital video segment into the video stream being displayed on the display device.

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**SYSTEM FOR ENABLING VIDEO-BASED INTERACTIVE APPLICATIONS****CROSS-REFERENCES TO RELATED APPLICATION**

This application claims the benefit of U.S. Provisional Application Serial No. 5 60/623,369, filed October 29, 2004, the content of which is hereby incorporated herein by reference.

**BACKGROUND OF THE INVENTION**

This invention is in the field of systems and methods for delivering interactive applications to resource constrained devices that are capable of displaying video such as 10 digital television set-top boxes, mobile phones or other video capable devices. This invention enables new ways to deliver the user interface for interactive applications.

A very large number of today's digital video set-top boxes are limited by their inability to display graphically rich and dynamic user interfaces for interactive applications, such as interactive program guides. This limitation is due to the poor 15 graphics display capabilities that most set-top boxes exhibit, as well as the broadcast carousel-based delivery mechanism for graphics utilized in application user interfaces (UI).

The typical on-screen display (OSD) for a low-end set-top box supports only low resolution graphics with very limited number of displayable colors.

20 In addition, the performance of set-top box-based graphically rich applications which leverage broadcast data carousels, for example, a Digital Storage Media Command and Control (DSMCC) carousel, for graphics delivery is inversely proportional to the amount of graphics material utilized by the user interface of an application. In other words, the more user interface graphics that are utilized by the application, the slower the 25 access time for those graphics due to the cyclical nature of the broadcast carousel delivery mechanism is for the graphics which causes the application to wait for the needed graphic until it is repeated again in the carousel. Consequently, this causes a noticeably slow response time for the application when a remote control key is pressed that leads to an graphical update of the application's user interface.

30 These set-top limitations combined with recent feature additions to video-on-demand servers present an opportunity to significantly enhance the user interfaces of program guide applications and other types of interactive applications.

In recent years, video service providers (for example, cable companies) have made a great investment in the build-out of video-on-demand (VOD) infrastructure. Whether it

be network-based VOD servers or set-top box based digital video recorders (DVRs), the infrastructure is in place to deliver what people want to see, when they want to see it. These VOD servers are also capable of splicing together various streams of video to provide a seamless viewing experience – a feature primarily driven by the business of ad-  
5 insertion, but also useful in the invention which is about to be described.

Accordingly, what is needed and heretofore unavailable is a system and method for displaying graphically rich and dynamic user interfaces for interactive program guides and interactive applications on resource constrained video display devices such as digital video set-top boxes or mobile phones.

10

#### SUMMARY OF THE INVENTION

The multimedia content presentation system of the present invention enables the delivery and display of video-based interactive applications to resource-constrained devices that are capable of displaying video, such as digital television set-top boxes, mobile phones, personal computers (PC), personal digital assistants (PDA) or other video  
15 capable devices. The advent of substantial video-on-demand (VOD) infrastructure and associated splicing capabilities brings about a new system and method for displaying graphically rich and dynamic user interfaces for interactive program guides and interactive applications in general.

The systems and associated methods of the present invention are embodied in three  
20 different instantiations to deliver and display graphically rich and dynamic user interfaces for interactive program guides and other interactive applications on resource-constrained video display devices such as digital video set-top boxes or mobile phones. The first instantiation of the present invention is directed to enabling the delivery of a graphically rich and dynamic interactive application user interface to a low-end digital set-top box  
25 utilizing the video splicing capability of a VOD server located in a cable television network. The second instantiation of the present invention is directed to enabling the delivery of a graphically rich and dynamic interactive application user interface to a slightly more sophisticated digital video set-top box utilizing the video splicing capability of a VOD server located in a cable television system with more processing capability than  
30 the set-top box in the first instantiation. The third instantiation of the present invention is directed to enabling the delivery of a graphically rich and dynamic interactive application user interface to a much more sophisticated digital video set-top box with digital video storage and playout capability in a cable television system. The third instantiation would

also be functional in a one-way broadcast environment (for example, a terrestrial or satellite television network) wherein DVR set-top boxes are deployed.

The present invention includes systems and methods for delivering video-rich interactive application user interfaces. The system allows for encoding a plurality of  
5 different user interface screens of interactive applications into a series of short video segments. Associated metadata files uniquely describe each segment, wherein the segment metadata enables the ingestion of the video segments via an asset distribution and management system into a video-on-demand server and facilitates their subsequent  
10 identification by the video-on-demand server. As viewers interact with the application, their input device key presses are processed and delivered to a mapping server which utilizes the data in a configuration file to instruct the VOD server to splice the appropriate interactive application user interface digital video segment into the video stream being  
displayed on the display device.

The present invention also provides a video-on-demand server having seamless  
15 video splicing capability that is executed upon receiving data from a mapping server. The mapping server specifies which interactive application user interface digital video asset must be spliced into the video stream being served as part of a specific VOD session to a user. The mapping server receives data from the input processing component specifying the last input device (for example, remote control) key pressed by the viewer and which  
20 VOD session identification (ID) that viewer is assigned. Using the data in the configuration file, the mapping server then maps that key code and VOD session ID to the appropriate interactive application user interface digital video segment asset ID that must be spliced into the video signal being distributed via a specific VOD session to a viewer. The result is that when the viewer presses an input device button representing a selection  
25 presented by the current interactive application user interface digital video segment being displayed on the display device, the next appropriate interactive application user interface digital video segment is then displayed in the display component.

Other features and advantages of the invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings,  
30 which illustrate, by way of example, the features of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic drawing representing a network-based VOD server with simple client application.

FIG. 2 is a schematic drawing representing a mapping server process.

FIG. 3 is a schematic drawing representing network-based VOD server with intelligent client application.

FIG. 4 is a schematic drawing representing a set-top box-based VOD server with intelligent client application.

5 FIG. 5 is a block diagram of the video-on-demand server mapping process of the present invention.

FIG. 6 is an example configuration file format for the video-on-demand mapping process of the present invention.

#### DETAILED DESCRIPTION OF THE INVENTION

10 As shown in the drawings for purposes of illustration, the present invention is directed to a new system and method for displaying graphically rich and dynamic user interfaces for interactive program guides and interactive applications in general. The systems and associated methods of the present invention are embodied in three different instantiations to deliver and display graphically rich and dynamic user interfaces for  
15 interactive program guides and other interactive applications on resource-constrained video display devices such as digital video set-top boxes or mobile phones. Although the invention can be utilized to enable graphically rich and dynamic user interfaces for a multitude of interactive applications, the examples that follow will describe how the invention will enable the delivery and display of the user interface as described in the  
20 previously filed patent application for "SYSTEM FOR PRESENTATION OF MULTIMEDIA CONTENT," U.S. Serial 10/856,200 filed May 28, 2004, the content of which is hereby incorporated herein by reference.

Referring now to FIGS. 1-4, the system of the present invention includes several components or subsystems for (a) user interface configuration and conversion to  
25 individually encoded digital video segments (preparation component); (b) a mapping server to map user input device key presses to the appropriate interactive application user interface digital video segment (deployment component); (c) asset distribution and management to deliver the individually encoded video segments constituting the user interface of the interactive application to various VOD servers in a video network (asset  
30 distribution component); (d) video display device, such as a digital set-top box (display component); and (e) interactive application input device key press reporting (input processing component); and (f) interactive application usage reporting (metrics component). In addition, the present invention includes a subsystem having a VOD server with seamless video-splicing capability. Additional aspects of the system include a return

path gateway for delivering input device key press data to the deployment component, and a video multiplexing subsystem to interface between the VOD server and the video display device.

5 The preparation component 40 is a tool that enables the interactive application's various user states to be recorded as individual digital video segments and assigns a unique asset identifier (ID) to each individual digital video segment. In addition, the preparation component generates the configuration file(s) used by the mapping server (deployment component) to map the various input device key presses to the appropriate interactive TV application user interface digital video segment to be displayed in the display component.

10 The deployment component 60 is a mapping server which utilizes the configuration file(s) generated by the preparation component for a particular application to map user input device key presses to the appropriate interactive application user interface digital video segment to be played out by the VOD server component and subsequently displayed on the display device.

15 The asset insertion component 70 is a system for managing video content and provisioning VOD servers in entertainment networks with such content. The video content can consist of movies, television programs, or in the case of this invention, the pre-encoded digital video segment that make up an interactive application user interface.

20 The metrics component 150 is an interactive application usage measurement tool and data storage device 154 that allows entertainment companies and advertisers to aggregate and analyze interactive application usage by their audience. This information includes: what user interactive application navigation pathways are utilized most often and what interactive user interface components are utilized most often. The information provided by the metrics component allows interactive service providers to hone the effectiveness of their interactive applications. It is an optional component and not a core part of the invention for delivering and displaying a graphically rich and dynamic interactive application user interfaces on video-enabled resource-constrained devices.

30 The VOD server 200 supports a seamless video splicing capability that is executed upon receiving data from the mapping server component specifying which interactive application user interface digital video asset must be spliced into the video stream being served as part of a specific VOD session to a user. The mapping server receives data from the input processing component 720 specifying the last input device (for example, remote control) key pressed by the viewer, the interactive application name being utilized by the viewer and which VOD session ID that viewer is assigned. Using the data in the

configuration file, the mapping server 740 then maps the interactive application name, the key code and VOD session ID to the appropriate interactive application user interface digital video segment asset ID that must be spliced 770 into the video signal being distributed via a specific VOD session to a viewer 795. The result is that when the viewer  
5 presses an input device button representing a selection presented by the current interactive application user interface digital video segment being displayed on the display device, the next appropriate interactive application user interface digital video segment is then displayed in the display component.

In one aspect of the system of the present invention, and with particular reference  
10 to FIGS. 1 and 2, the invention includes the following six steps. In the first step 310, the different user interface screens of the interactive program guide are encoded by the preparation component 40 into a series of short video segments with associated metadata files that uniquely describe each segment. The segment metadata enables the ingestion of the video segments via an asset distribution and management system 70 into a VOD server  
15 200, and facilitates their subsequent identification by the VOD server. In the case of the System for Presentation of Multimedia Content patent application, these video segments may include:

A. visual presentation of a defined number (X) of NxM matrices of cells (display tiles) 100, where X, N and M may be a number from one to the capacity of  
20 the interactive application user interface. Each video segment could consist of a fade-in to display a NxM matrix of cells and then a fade-out.

B. NxM number of forward transitions 120. Each segment could consist of a fade-in to the appropriate transition and then a fade-out.

C. NxM number of backward transitions. Each segment could consist  
25 of a fade-in to the appropriate transition and then a fade-out.

D. NxM number of expansions from one cell 100 in the NxM matrix of cells 110 to full-screen content 90. Each segment could consist of a fade-in to the appropriate transition and then a fade-out, after which the VOD server will play the selected content.

E. NxM number of contractions to a NxM matrix of cells 110 from full  
30 screen content 90. Each segment could consist of a fade-in to the appropriate transition and then a fade-out, after which the appropriate NxM matrix of cells would be displayed.

F. A defined number (X) of interstitial advertising segments. Each segment could consist of a fade-in to brief advertiser brand impression and then a fade-out.

It is important to note that in addition to the application of this invention to the above referenced interactive program guide and its unique user interface, this same methodology can also be applied to other types of interactive application user interfaces.

Once the initial step 310 of the system and method of the present invention is complete, the second step 320 is to provision the VOD server 200 (FIG. 2) storage or DVR storage unit 84 (FIG. 4) with these video segments and their uniquely identifying metadata. The asset distribution component is utilized for this task and can manifest itself in a variety of mechanisms including, but not limited to:

- A. pitcher-catcher video provisioning networks,
- 10 B. dedicated broadcast channel for DVR content delivery, or
- C. the Internet.

In addition to provisioning the VOD segments and their metadata, a configuration file 400 (FIG. 2), which provides a map of how the video segments of an interactive application user interface are to be spliced together based upon input device key selections, must be sent 420 to a mapping server 60 or to the DVR-based client software which can incorporate a mapping server function. This configuration file allows the mapping server to relate the interactive application user states with the identifiers of the user interface video segments that make up the interactive application. As the video segments representing the user interface of an interactive application are played out from the VOD server, the mapping server processes input device key press, interactive application name and VOD session identification (ID) data sent via the set-top box 80 return path 240 and instructs the VOD server 200 to splice the user interface video segments 90 associated with the remote control key-presses and the currently displayed video segment comprising the user interface of the interactive application existing within a specific VOD session.

25 The subsequent interactive application utilization session involves the repeated execution of steps three, four and five. The third step 330 includes reporting to the mapping server 60 by the set-top application 80 of the remote control key-presses made by the viewer and an associated VOD session identification. The fourth step 340 provides instruction by the mapping server to the VOD server 200 which video segment to splice-in and playout to the set-top box within the identified VOD session. The fifth step 350 includes splicing and delivery of the appropriate interactive application user interface video segment by the VOD server to the set-top box within the appropriate VOD session. As shown in FIG. 2, there are several user interface video segment splicing operations illustrated 600 so as to deliver a seamless user interface for the interactive application as a



single video stream displayed by the display device. For analysis purposes, the system may optionally be configured to provide reporting 360 to the metrics component 150 of the interactive application navigation pathways utilized by viewers.

Referring now to FIG. 3, the second instantiation of the present invention includes  
5 the same architecture but moves the logic of the mapping server to exist as an application in the digital video set-top box. In this case, the overall configuration file could be delivered via a multiplexed broadcast data carousel to the set-top box application. Utilizing the remote control key press data from the interactive application user and the data in the configuration file, the set-top box client application would then communicate  
10 via the return path with the VOD server to instruct it to splice-in and playout the appropriate interactive application user interface video segments for that VOD session. Additionally in this second variation of the system of the present invention, the configuration file could be delivered with the video segments in piecemeal fashion such that only the portion of the configuration file associated with that video segment is  
15 delivered at any one moment. This allows for more efficient set-top memory utilization.

Referring now to FIG. 4, the third instantiation of the present invention entails moving both the logic of the mapping server and VOD server functionality into the set-top box application. This variation would be useful in a one-way broadcast environment, for example, a terrestrial or satellite television network in which DVR set-top boxes are  
20 deployed. Set-top-based VOD servers known as digital video recorders (DVR) are quickly being deployed by cable and satellite operators in the battle for subscriber dollars. In this case, the interactive application user interface video segments would be delivered directly to the DVR storage and played out from there as the client application decides what video segment to splice-in when the viewer presses a remote control key.

FIG. 6 shows a sample configuration file that may be used in the VOD mapping  
25 process. It is expressed in the syntax of XML, although the file could be expressed in many other syntactical formats as well. The "ApplicationName" element in the configuration file specifies the application currently being utilized by the viewer (for example, interactive program guide). The VideoSegment "AssetID" attribute specifies the  
30 application user interface video segment currently being displayed on the display device. The input "KeyCode" attribute specifies a input key code that if pressed on the input device would cause the splicing in and playout of the application user interface video segment associated with the associated "AssetID" attribute. For example, if a user was viewing the user interface video segment identified by AssetID="A153254" and they

pressed the "1" key on their input device (for example, a television remote control), then the application user interface video segment associated with AssetID="A153255" would be displayed on the display device.

5 While a particular form of the invention has been illustrated and described, it will also be apparent to those skilled in the art that various modifications can be made without departing from the spirit and scope of the invention. Accordingly, it is not intended that the invention be limited except by the appended claims.

I Claim:

1. A method for delivering graphically rich interactive application user interfaces to video-enabled resource-constrained devices, comprising :
  - 5 encoding a plurality of user interface screens into a series of video segments having associated configuration files;
  - provisioning a video-on-demand server with the video segments;
  - reporting to the deployment component video-on-demand (VOD) session identification data, application name and user input commands;
  - 10 utilizing the configuration files to map the VOD session identification data, the interactive application name and user input commands to the specific video asset ID representing a user interface component of an interactive application;
  - instructing the VOD server to splice that video segment into the identified VOD session;
  - 15 splicing a video segment within the identified VOD session; and
  - displaying the resultant video-based interactive application user interface for a viewer.
2. The method of claim 1, wherein encoding a plurality of user interface screens includes providing video segments having NxM number of expansions from one  
20 cell in the NxM matrix of cells to full-screen content.
3. The method of claim 1, wherein encoding a plurality of user interface screens enables the ingestion of the video segments via an asset distribution and management system into the video-on-demand server, and facilitates subsequent identification of the video segments by the video-on-demand server.
- 25 4. The method of claim 1, wherein provisioning a video-on-demand server includes using a pitcher-catcher video provisioning network.
5. The method of claim 1, wherein provisioning a video-on-demand server includes using a dedicated broadcast channel for content delivery.
6. The method of claim 1, wherein provisioning a video-on-demand server  
30 includes using an IP-based network such as the Internet.
7. The method of claim 1, further including sending to a mapping server a configuration file having a map of how the video segments comprising the interactive application user interface are to be spliced together based upon user input commands and VOD session identification data as well as interactive application name information.

8. The method of claim 1, wherein delivering the spliced-together video segments comprising the user interface of the interactive application from the video-on-demand server to a television set-top box enables seamless presentation of a graphically rich and dynamic interactive application user interface.

5 9. The method of claim 1, further including reporting to a metrics component the interactive program navigation pathways utilized by a user.

10 10. A system for presentation of multimedia content, comprising:  
a preparation component, wherein the preparation component encodes the user interface of an interactive application into individual digital video segments and associated configuration files;

a deployment component, wherein the deployment component utilizes the configuration files to map user input device key presses and associated interactive application and VOD session data to the appropriate interactive application user interface digital video segment to be displayed in the display component;

15 an asset distribution component, wherein the asset distribution component is configured to deliver the individually encoded video segments comprising the user interface of an interactive application to various video-on-demand (VOD) servers in a video network;

20 a display component, wherein the display component displays the result of the splicing together of the video segments comprising the user interface of an interactive application;

an input processing component, wherein the input processing component captures and sends the user key press and VOD session data to the deployment component;

25 a metrics component, wherein the metrics component is configured to collect and analyze interactive application user interface utilization statistics;

a VOD server component, wherein the VOD server component is configured to seamlessly splice together the digital video segments comprising the user interface of an interactive application and stream them to the display component;

30 a return path gateway component, wherein the return path gateway component is configured to capture data from the input processing component and transfer it to the deployment component; and

a video multiplexing subsystem component, wherein the video multiplexing subsystem component enables the multiplexing of the video stream presenting the

interactive application's user interface into a larger video transport stream for eventual reception and display by the display component.

11. The system of claim 10, wherein the functionality of the input processing component and the display component are combined in a single device such as a digital video set-top box or mobile phone and all other components exist and function  
5 independently of one another.

12. The system of claim 11, wherein the functionalities of the input processing component and the deployment component are combined with the display component in a single device such as a digital video set-top box or a mobile phone.

10 13. The system of claim 11, wherein the functionalities of the input processing component, the deployment component and the VOD server component are combined with the display component in a single device such as a digital video set-top box or mobile phone with video storage and playout capabilities, for example, a digital video recorder (DVR).

15 14. The system of claim 11, wherein all components exist in a video network capable of bi-directional network communication.

15. The system of claim 11, wherein all components exist in a video network capable of only uni-directional network communication.

16. A system for delivering graphically rich interactive application user  
20 interfaces to video-enabled resource-constrained devices, comprising:

means for encoding a plurality of user interface screens into a series of video segments having associated configuration files;

means for provisioning a video-on-demand server with the video segments;

25 means for reporting to the deployment component video-on-demand (VOD) session identification data, application name and user input commands;

means for utilizing the configuration files to map the VOD session identification data, the interactive application name and user input commands to the specific video asset ID representing a user interface component of an interactive application;

30 means for instructing the VOD server to splice that video segment into the identified VOD session;

means for splicing a video segment within the identified VOD session; and

means for displaying the resultant video-based interactive application user interface for a viewer.

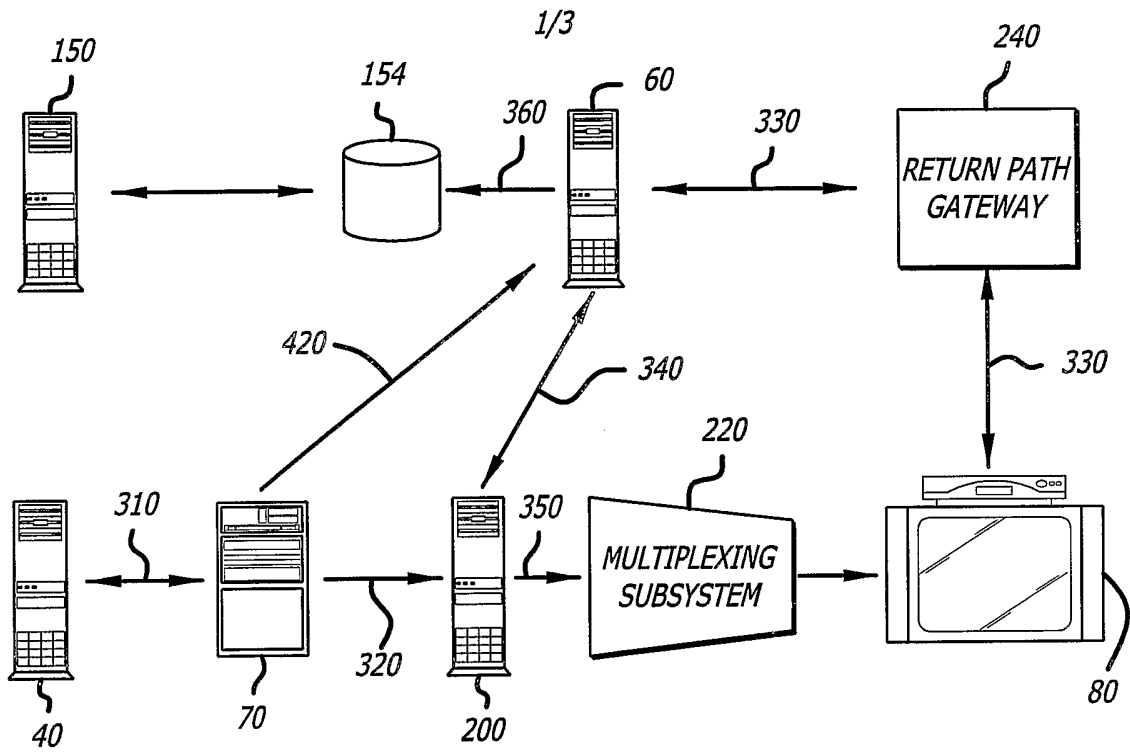


FIG. 1

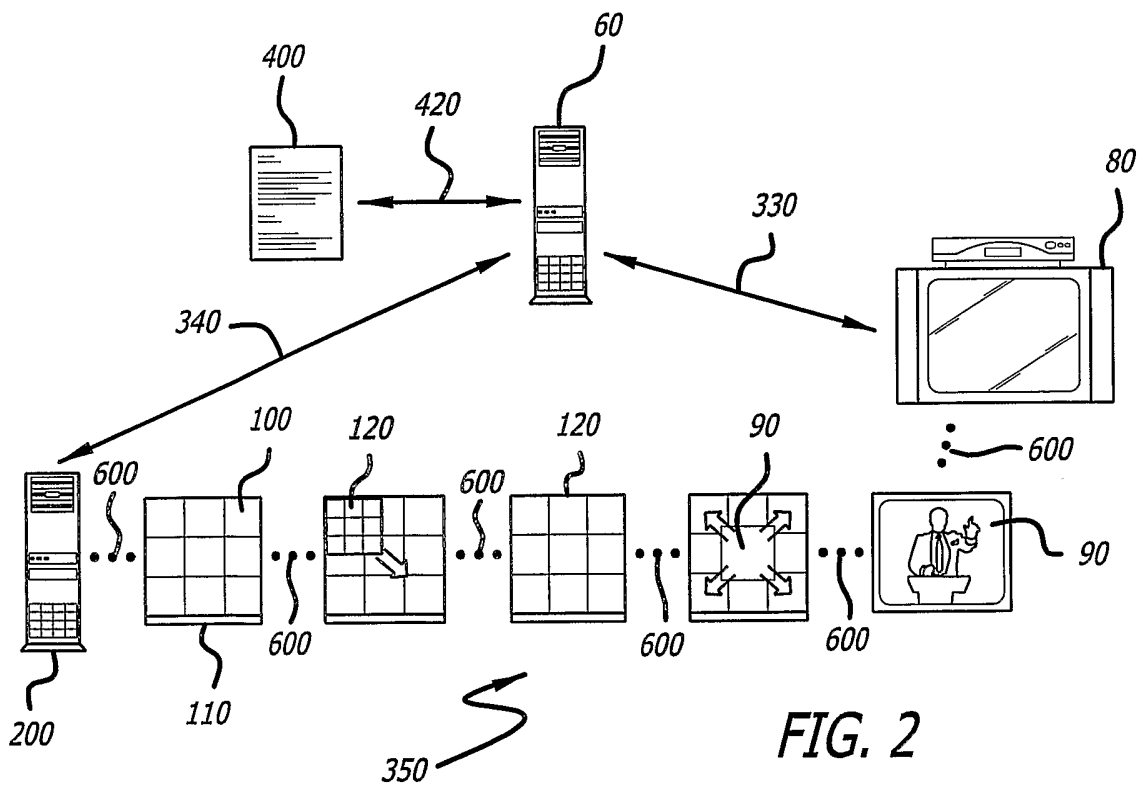


FIG. 2

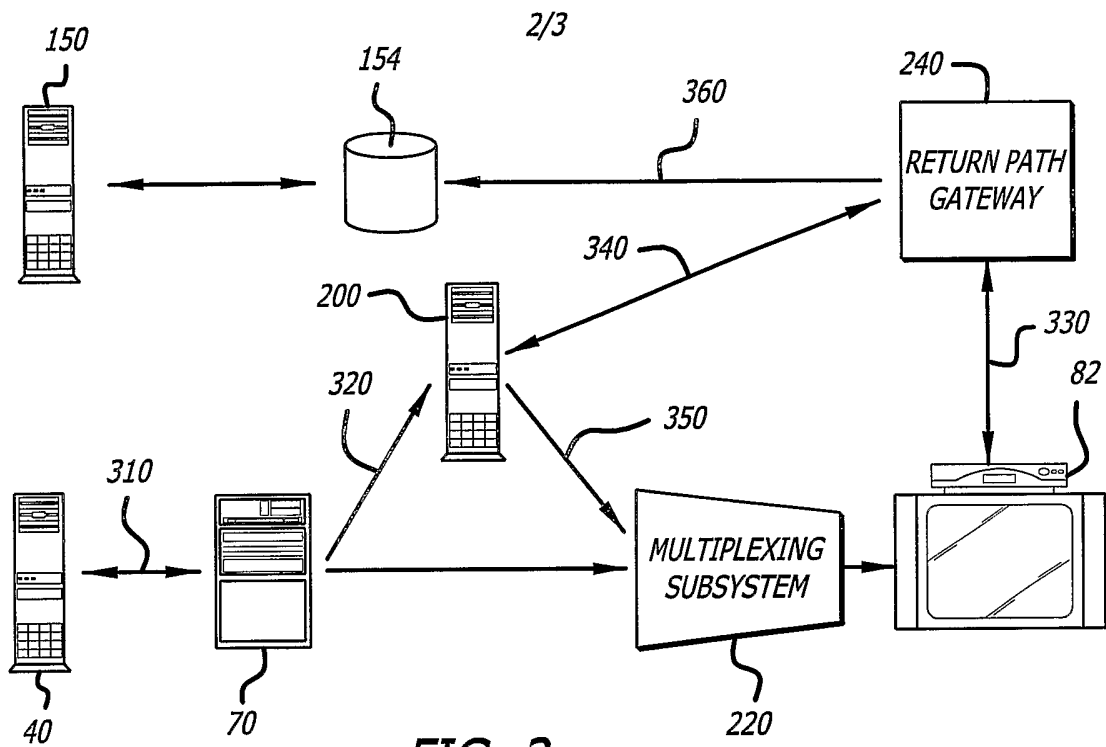


FIG. 3

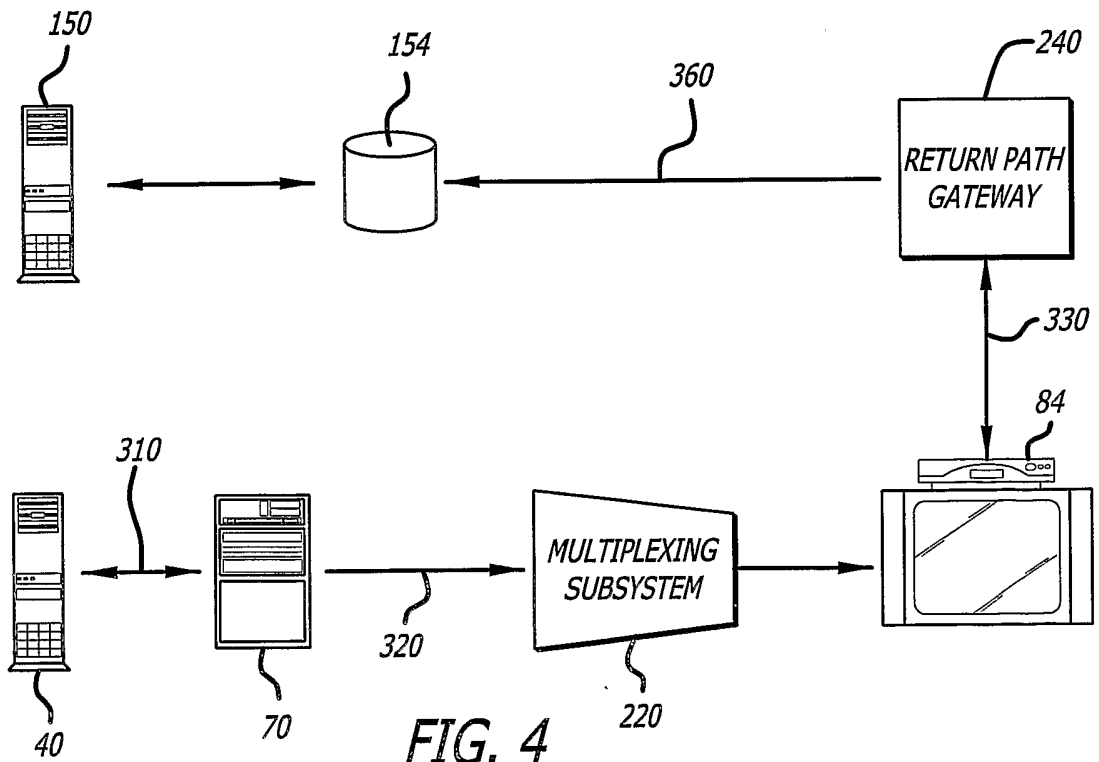


FIG. 4

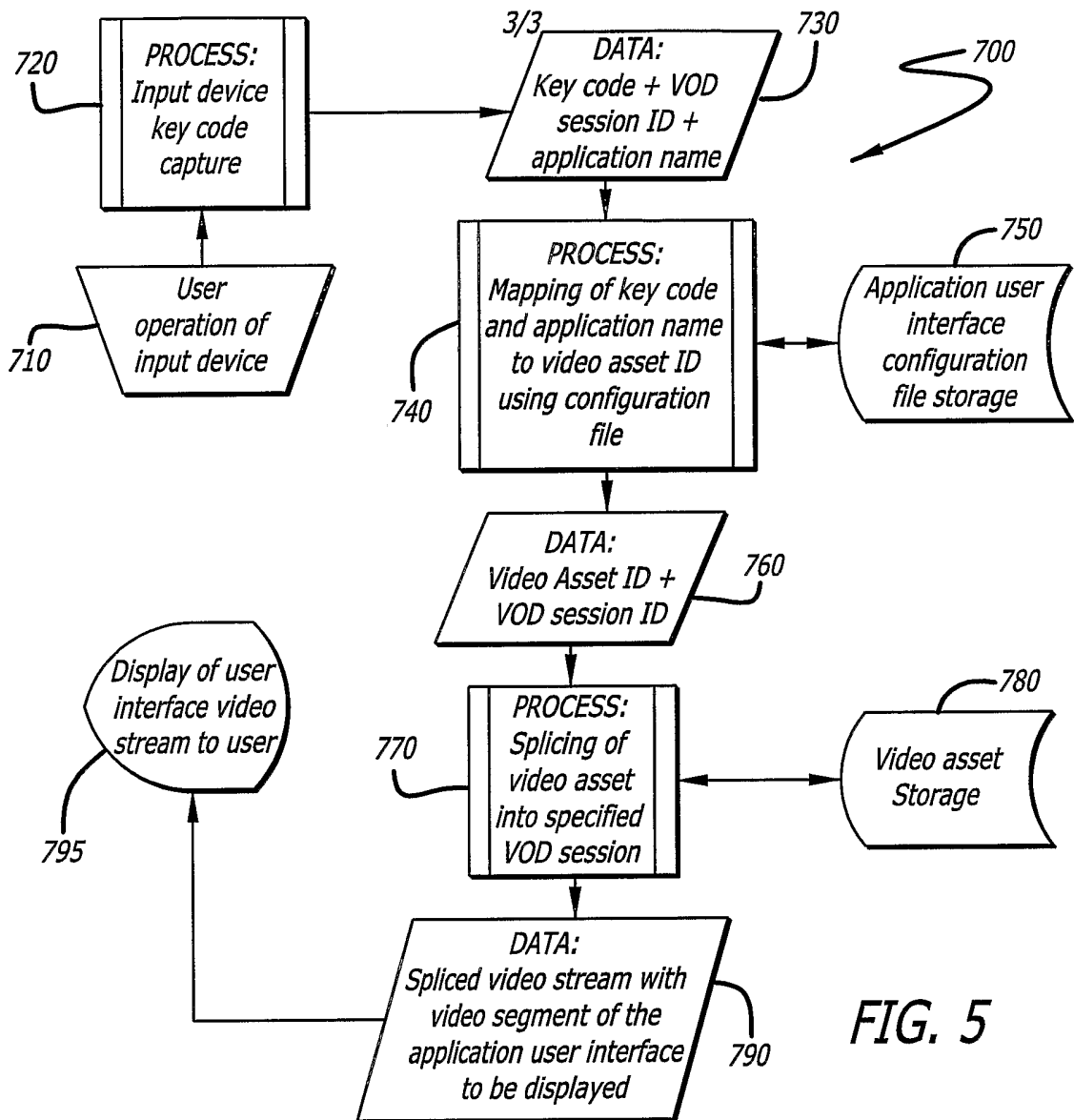


FIG. 5

```

<?xml version="1.0"?>
<ApplicationName>
  <VideoSegment AssetID="A153254">
    <input KeyCode="1" AssetID="A153255" />
    <input KeyCode="2" AssetID="A153256" />
    <input KeyCode="3" AssetID="A153257" />
    <input KeyCode="4" AssetID="A153258" />
    <input KeyCode="5" AssetID="A153259" />
    <input KeyCode="6" AssetID="A153260" />
    <input KeyCode="7" AssetID="A153261" />
    <input KeyCode="8" AssetID="A153262" />
    <input KeyCode="9" AssetID="A153263" />
  </VideoSegment>
</ApplicationName>
  
```

FIG. 6



## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2005/039025

A. CLASSIFICATION OF SUBJECT MATTER  
 H04N5/445 H04N7/173

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/158895 A1 (MURASE YOTARO ET AL) 31 October 2002 (2002-10-31) paragraph '0029! - paragraph '0031! -----	1-16
X	US 6 470 392 B1 (MURASE YOTARO ET AL) 22 October 2002 (2002-10-22) the whole document -----	1-16
X	US 2004/143848 A1 (KERRI YU KWOK YING ET AL) 22 July 2004 (2004-07-22) the whole document -----	1-16
A	US 5 748 196 A (COELHO ET AL) 5 May 1998 (1998-05-05) the whole document -----	1-16
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## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2005/039025

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