(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
12 June 2003 (12.06.2003)

PCT

(10) International Publication Number
WO 03/047710 A2

(51) International Patent Classification[7]: A63F 13/12

(21) International Application Number: PCT/GB02/05484

(22) International Filing Date: 5 December 2002 (05.12.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

0129161.6	5 December 2001 (05.12.2001)	GB
0203790.1	18 February 2002 (18.02.2002)	GB

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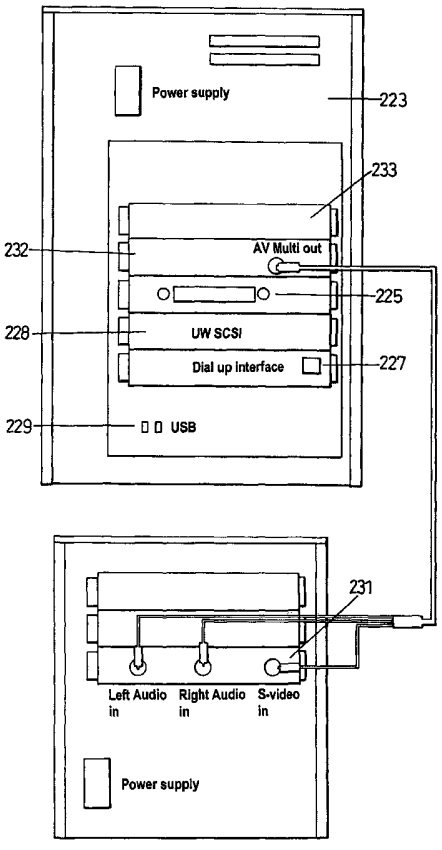
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK,

[Continued on next page]

(54) Title: INTERACTIVE TELEVISION VIDEO GAMES SYSTEM



(57) Abstract: A video games system for digital television that includes a Middleware Server, Games Servers (280, Fig 20), an MPEG Encoder 277 for encoding graphics rendered by Games Server 280 and a transport network connecting the users terminals to the Games Server 280. The users terminal may include a Set top box (260, Fig 20), Games Console (257, Fig 20), PC (266, Fig 20) that may be used to access and play video games stored remotely on the Games Server 280. The Games Server 280 may consist of a CPU, RAM, VRAM, Graphics Accelerator, Hard disc and Ethernet network interface for connecting to the cable network. The Games Server may be connected by S-video out to the MPEG Encoder (277, Fig 20). Data inputs and outputs provided by the users terminal are used by the Games Server 280 to process a video game.

WO 03/047710 A2

TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERACTIVE TELEVISION VIDEO GAMES SYSTEM

The invention described within the application relates to a video games system for digital television. In particular, this invention relates to a video games system for digital TV that combines transmission channels, live video streaming, middleware and server technology to enhance the gaming experience on a conventional Set top box, games consoles, PCs, mobile phones and emerging devices to that equal or superior to the gaming quality available on present games consoles or PCs.

An objective of the present invention is to provide an interactive games system that is easy to use and allows viewers to play 3D and 2D games equivalent to those available on a console or PC using viewers existing set-top boxes and TV screens for cable, terrestrial and satellite TV.

Another objective of the present invention is to provide an interactive games system, which does not require a games console or PC to play games. Whereby viewers would be able to remotely access games using existing digital set-top box that would provide a realistic video gaming experience superior to that of a games console, PC and interactive TV.

Another objective of the present invention is to provide an interactive video games system that allows viewers to have an individual gaming experience playing games equivalent to that available on a 128-bit games consoles or a 32-bit PC, using a thin client set top box and TV screen. The games system described herein may be used for cable, terrestrial and satellite TV subscribers with a conventional set top box.

Games on interactive TV are well known and provide a useful way to play casual games such as Tetras and Pong. Although this provides a useful way of playing games the gaming experience is equal to that of 20 years ago and not that of console games, which gamers of today expect and demand. This is disadvantageous.

Gaming on interactive TV is constrained by many factors including Set top box capabilities and legacy hardware that dramatically reduces the level of interactivity and quality of games. Currently games on interactive TV are equivalent to 256 colour 8-bit games and resemble games from the 8-bit Atari and Acorn systems of the 1980's. This is disadvantageous.

In contrast current games available on games consoles are 128-bit and provide a high level of interactivity and therefore are much more widely used as a games system than any other form.

A further objective of the present invention will be to enable the delivery of 256-bit games, unconstrained by the prevailing legacy model that is Set top box hardware

dependent. Thereby meeting the latent needs of serious gamers to access games anytime, anywhere with a real-life, gaming experience using an existing set top box to play the games as will explained in further detail.

Another objective of the present invention is to enable viewers to access video games anytime, on a standard digital TV, with high resolution images and digital quality sound, equal or superior to that of PC or console games systems and without a loss in frame rate or game play.

Games graphics engines are well known as software that based on commands from an application that sends instructions for creating graphic images to hardware that actually creates the images. All games on consoles and PCs are run by graphics engines installed on a hard disc, CD, DVD or memory cartridge. The majority of consoles and PC's also have a display adapter that handles high-speed graphic related processing, freeing the central processor unit for other tasks. This is sometime referred to as a graphics accelerator or video accelerator.

The current generations of set-top boxes for digital TV do not have a graphics accelerator and therefore in contrast large amount of processing to be carried out by a central processor unit. This is disadvantageous.

On digital television games are currently one of the most popular interactive services. Whilst this is a useful way of playing games, viewers cannot play similar games to those available on any games console or PC. This is due to processing power and memory limitations within a set-top box. Hence, gaming on digital TV at present is limited by the fact that the level of interactivity and graphics are extremely poor in comparison to console and PC games which viewers are familiar with. This is disadvantageous.

Current games available on interactive TV require large amounts of graphics and sound to be processed by the set-top box thus substantially reducing the quality of the graphics and game play particularly when compared to games consoles. This is disadvantageous.

However most current set-top boxes are capable of supporting resolution up to 720 x 576 pixels (max) and are equipped with a V.34 modem, 25-127 Mhz / 50-300 MIPS CPU, 2-4mb flash memory, a receiver, an MPEG encoder/decoder and a smart card drive.

The next generation of set-top boxes are equipped with Universal Serial Bus (USB) which is a serial bus with a data rate transfer of 12 (Mbps) Megabytes per second for connecting peripherals to the device. For example a set-top box with a built in USB would have the capability of installing 127 peripherals, such as DVD and storage disc drives. USB it specifically designed for high-speed applications that require a high Mbps, such as Interactive TV and games.

Later generations of set-top boxes expected in next five years are likely to be equipped with 16mb SDRAM, PCI, parallel ports, cat 5, 2D acceleration cards, co-processors and a hard disc. However this will still be greatly inferior to even today's standards for games consoles and PCs.

Interactive game services are currently available by some television service providers, such as Sky Digital or other digital TV providers, which can be accessed via a viewer's digital TV. These systems typically enable a viewer to play 2D games such as card games or puzzles. Whilst this enables the viewer to access games, currently this is via a walled garden system which has already used a large proportion of the set-top box flash memory leaving approximately 1mb flash memory for game play.

Flash memory is a type of nonvolatile memory, flash is similar to EEPROM memory in function but it must be erased in blocks, whereas EEPROM can be erased a byte at a time. Because of its block orientated nature flash is often used as a replacement for hard discs in portable computers. In context flash memory is either built in to a unit or available as PC card that can plugged into the PCMCIA. A disadvantage to flash is that it cannot be practically used as RAM because the set-top box needs to write memory in single-byte increments. This is fundamentally why games available on interactive TV resemble arcade games such as PONG from 1980's and not console video games like Grand Turismo on the PlayStation 2.

In comparison current video games on consoles such as the Sony PlayStation 2 require 32MB Ram and are able to process 66 polygons per second for 3D games. This is because unlike a set-top box a PS2 is equipped with a DVD drive, 124bit Graphics Processor, 277Mhz CPU, a memory card and 32MB Ram.

According to one aspect of the present invention there is a system comprising a user terminal having screen, a receiver, an encoder/decoder, a USB port, a games pad or remote control for sending commands to a middleware server located in a TV data center.

Means may be provided within a remote location for hosting, processing and transmitting game graphics within broadcast signal to a user terminal. A return path will facilitate means for interacting and playing a game, which will be explained in greater detail later.

Preferably the games system would be a plug-in software architecture compiled in C or Java and held remotely on a middleware server or application server at a TV data center or headend. This software would provide the core games functionality and would consist of application modules, device drivers, graphics engines, graphics controllers, hardware drivers and system protocols.

Preferably the games system software is operable to control the workings of the set-

top box and the middleware server for accessing games. The games system network software would also enable the communication within a bi-directional form between set top boxes and the middleware server and the exchange of signals between computers in the data center of a TV operator, backbone, local hub and the users terminals. The games systems may also comprise of protocols that enable the use of the return channel for standard receiver interfaces.

The means for using game pads and joysticks will be facilitated through software device drivers, which may be downloaded, installed or embedded on a set-top box.

Preferably games would be hosted remotely on a server situated in TV data centre or headend and accessible via an executable file on a dedicated TV channel which views may prompt using either a remote control, joystick or games pad.

Preferably, the system will enable viewers to select and download games from TV programs and adverts, enabling the viewer to play games directly from their TV without the need for a game console. This is advantageous.

The means for control of game content may be provided through a return path that carries information back to the broadcaster. Information could be anything from casting a vote to requesting the display of graphics within a game.

In the case of satellite and terrestrial digital TV the return path is via a traditional modem and the consumer's existing phone line.

Alternatively in the case of satellite the return path could be a two-way path available on digital satellite broadcasting systems equipped with transponder bandwidth capabilities.

Means may be provided for control of game content, may be a two-way path, available on broadband cable TV, where is returned in the same way that it is received.

Means may be provided to enable a viewers to interact with a game on the TV either through a remote control, infra red keyboard or games pad connected to the Set-top box via a USB port, depending on preference. Devices such as joysticks and game paddles use potentiometers to represent their positions as varying voltage levels; a game controller converts these levels to numbers using an analogue to digital converter (ADC), which is installed on a set-top box.

Alternatively means may be provided to control the game via a remote control or a new form of games pad, joystick equipped with infrared which can transmit radiation at varied frequencies in a electromagnetic spectrum to represent viewers position within the game. Through an optical port on the viewers set-top box a game controller then converts these waves into a command for controlling a game. Communication is then achieved without a physical connection through wires. This is advantageous.

This would provide viewers without USB a device to play game which is similar to those on the PC and games consoles such as the Nintendo 64, Sony PlayStation and PS2 however without the wires. The buttons on the game pad enable the player to control direction, speed and other actions on screen. This is advantageous. This is advantageous.

According to yet further aspect of the present invention, there is provided a games system, which enables viewers via an optical port on the viewers TV set to use a games pad, joystick or mouse without wires for Games Console. This is advantageous.

Alternatively there is provided a games system, which enables viewers via an optical port on the viewers PC or Mac to use an infrared games pad, joystick or mouse without wires. This is advantageous.

According to yet further aspect of the present invention, there is provided a games system, which enables viewers to select and play games via a dedicated TV Channel. Whereby graphics are transmitted to the set-top box or integrated digital TV via a broadcast stream and a graphics engine located on the device compiles graphics on to the TV screen.

Alternatively the graphics engine could be located remotely, for example on a middleware server, whereby the middleware server is able to process all of the games graphics. This would mean that the set-top box would only being required to transmit requests via the return path to the middleware server, which then processes and transmits graphics back to the set-top box. This is advantageous.

According to yet further aspect of the present invention, there is a games system based within a TV operator data centre/headend. The games system comprises of middleware servers, a graphics engine, a data server, a graphics accelerator, a cache engine for buffering graphics and data, a graphics controller, a database for storing player data files, a broadcast server for storing and transmitting graphics and video, an mpeg encoder and means of transmitting content over a television signal.

The graphics engine may produce images using various techniques, wire-frame, painters, area-subdivision, z-buffer and raytracing. The raytracing functionality includes shadows and image texturing. Image texturing is a process of mapping a pattern to a surface in a game.

The graphics engine would be fully capable of performing 3D rendering, shaded perspective texture mapping, mip mapping, bump mapping, environment mapping, multipass rendering, fogging, deformable meshes, key framed animation, multitextured, perspective mapping, atmospheric effects, texture filtering and transparency.

The middleware server will typically have 1000MB RAM, 24x 1Ghz CPU's and be able to process over a thousand polygons per second. The middleware server will also be equipped with a video adapter that contains a graphics co-processor. This is advantageous as graphics accelerator can update the video display much quicker than CPU freeing up CPU for other tasks. This is advantageous

In addition to graphics hardware and middleware server within the TV operator data centre would include NVOD/VOD servers, local advert insertion, mpeg encoder/decoders, Mux/Multiplexers and means for transmitting content to viewers terminals which could be a broadcast signal. There is also an operation support system for billing and authentication.

According to yet further aspect of the present invention, there is provided a games system which uses TV channels as a medium for accessing games and transmitting graphics for in game and cut scene graphics on a specified PID.

The Program Identifier PID identifies the games contents of a transport stream packet. The TS packets carry the digital audio, video, text data for a game. The PID identifies the game for which the data will be used. In addition, four PIDs are used for control purposes, specifically 0, 1, n, and m. With analogue TV, channel selection is performed when the receiver tunes to a single sub band of a frequency multiplex broadband channel. With digital TV, joining a broadcast stream of digitally encoded packets performs channel selection. In the case of MPEG-2, tuning is PID selection.

Through processing graphics remotely and then transmitting the graphics in an MPEG-2 form within a wideband or narrowband signal the set-top box is only required to decode the content. This is advantageous as background graphics, cut scenes, animations, in game graphics, video, music and sound can be broadcast during a game, thus freeing up the set-top box CPU for other tasks.

In addition content may be broadcast in the data stream of MPEG-2 transport stream for combining compressed background graphics with rendered foreground game graphics. Thus enhancing the visual affects of a game.

Alternatively content may be transmitted downstream to the set-top box through the return path. This could be combined with graphics transmitted via a broadcast signal to provide a further enhancement to the visual affects of a game.

Preferably game menus can be overlaid on direct broadcast thus the viewer is able to select options whilst the background, graphics, video and music are being broadcast. This is advantageous, as it does not require the set-top box to process and draw background graphics or process sound as this is already being broadcast. Thus the set-top box is only required to transmit requests to the middleware server for content to be sent which is made possible by the return path.

Through using a TV channel as a medium to provide graphics and sound the present invention would enable viewers play a game at a frame rate of 30/60 fps and with equal quality as video games available on consoles such as the PS2, Nintendo or X-Box. Using this method the present invention is able to provide a refresh rate of 60 fps because the content is being broadcast at 60 fps within an MPEG-2/MPEG-4 format as with any TV program on digital TV. This is advantageous.

MPEG-2 (Motion Picture Experts Group) refers to a family of protocols designed for encoding, compressing, storing, and transmitting audio and video in digital form, which is used by the present invention for the video games. MPEG-2 is the protocol of choice for digital video of the HDTV and supports both progressive and interlaced displays.

MPEG-2 is capable of handling standard-definition digital television (SDTV), HDTV, and video games. MPEG-2 supports data transmission, which is used for sending control information to digital set top boxes, and can be used for transmitting user data such as games menus, prompts, in-game data.

Furthermore, MPEG-2 is backward compatible with MPEG-1, which means that MPEG-2 decoders can display MPEG-1-encoded files, such as CD-ROMs therefore enabling back listed video games in MPEG-1 format to be ported on the games system. This protocol family also has full functionality for video on demand (VoD) which will described in greater detail relating to the present invention.

Without digital compression, RBB video games would not be possible because uncompressed video consumes too much bandwidth.

A game consists of at least three streams: a video stream, an audio stream, and a text stream, which contains closed-captioned text. Other streams might be associated with the game as well, such as foreign language audio. The PID identifies the streams.

Each game therefore consists of at least three PIDs. Games are mapped to PIDs through the Program Map Table (PMT). When a viewer wants to view a game he uses the remote control, to access the games system from which he can access a window that displays what is available to play and then makes a selection. In turn the viewer is then able to select via remote tuner the required PID for decoding. This is unique.

The games system network software is based on open architecture designed to operate across various delivery lines, IP and Digital including Digital Subscriber Line (DSL) Technology. DSL provides analogue to digital transmission technology using modems attached to twisted pair copper line infrastructure, DSL is simply a method of delivery for graphics.

DSL can provide higher transmission capacities for delivery of high speed broadband data to home user which by utilising existing telephone lines avoids the costly installation of fiber cable.

DSL could be used to provide the games system Interactive TV services on digital satellite or terrestrial TV. DSL has the ability to support Internet access through rerouting traffic from voice and data networks, which reduces the number viewers on congested public telephone network switches (PTNS). This offers considerable performance advantages as data travels on a dedicated line, as such user transmission speeds are not affected by new users joining in multi-player networked games, whereas traditional dial-ups modem services would suffer in performance.

There are several versions of DSL, which may be used to deliver games content to viewers. Digital Subscriber Line referred to as DSL or xDSL is the standard format which is similar to DSL Lite which is a variation of DSL that operates at a lower level of 1.544 Mbps.

Asymmetric DSL provides greater bandwidth downstream to end users than upstream transmissions from users. ADSL is ideals for video-on-demand, home shopping, Internet access, remote Lan access and games. In the instance of MPEG video viewers would require 1.5 to 2Mb/s to be delivered downstream and require only 64 kb/s or 16 kb/s for upstream traffic. Operates on a ratio of 10-to-1 of downstream to upstream data transmission. ADSL could be used by the games system for video-on-demand and commerce. ADSL is also ideal as it provides rapid rollout of service via network operators local exchanges enabling them to deliver services at up to 4.5 Mb/s ensuring that quality of games graphics is retained.

Symmetric DSL (SDSL) enables providers to offer T1 (1.544 Mb/s) or E1 (2.048 Mb/s) service can accommodate data application such as game hosting, servers and LANs, that need symmetric access - equal rates of data transmission upstream and downstream from and to the end user.

Higher data rate DSL-2 (HDSL-2) provides advanced modulation technologies for transmitting T1/E1 singles at high transmission speeds.

VDSL - Very high rate DSL, operates at up to 60 Mb/s through a trading off loop length. This will be required for high bandwidth graphic intensive games.

RDSL - Rate-adaptive asymmetric digital subscriber line which offers a flexible high-speed bandwidth which is a variation of ADSL, which capable of adjusting transmission speed based on signal quality and length of transmission which can be used to ensure bandwidth utilisation. The advantage to RDSL is that the transmission speed can adjust as signal quality improves or deteriorates therefore retaining the same level of quality and speed.

However it is important to note that the games system will also operate on Broadband networks to deliver applications and content using coaxial and fiber-optics cable for data transmission. Broadband a communication system which the method of transmission (i.e. fiber-optic cable) carries multiple messages at a time, each message is modulated on its own frequency by means of modems.

Broadband is commonly used in wide area networks and is being used as a delivery method for Digital TV which graphics, video and data can be delivered over. Typically Broadband networks stations are connected by coaxial, Hybrid Fiber Coax and fiber-optic cable, which can be used to carry video, data and voice simultaneously over multiple transmission channels that are distinguished by frequency. The advantage to this is that it is capable of delivering 20 megabytes or more. Broadband technology is used by cable TV operators and is sometimes referred to as wideband or narrowband transmissions.

CATV is a television broadcasting system that uses coaxial or fiber-optic cable to distribute a broadband signal containing many separate television channels. CATV systems are also increasingly being used to carry digital data, for example internet connections to and from subscribers.

The games system may operate within a wideband transmission, on a broadband network however recognising that most cable systems are constrained by available spectrum, the games system would preferably operate within narrow 1.2 MHz digital carriers. This is advantageous as cable operators could easily accommodate the games system in unused areas of bandwidth, i.e. between their existing video channels.

The performance of narrow carriers is superior to wider carriers in the lower spectrum area between 48 to 54 MHz, referred to as the 'roll-up' area. The top of the available spectrum is referred to as the 'roll-off' where it is less susceptible to signal attenuation. Within a Cable TV network signals are modulated by using the Quadrature Phase Shift Keying (QPSK) technique making systems carriers more likely to function optimally in the 'roll-up' and 'roll-off' areas.

The method of using television satellite networks to transmit game data and video uses a device that provides transponder bandwidth capability. This enables a transceiver in a communications satellite to receive signals from an earth station and retransmit the data on a different frequency to one or more earth stations. This method involves transmitting data and communications across Digital Satellite Systems (DSS). The Direct broadcast satellite (DBS) technology uses geostaionary orbit satellite (GEO) to receive digitised signals transmitted by ground link upbased centres; which the satellite then beams the signal across a wide swath which then uses 18-inch satellite dishes to bring the signal to a set-top box decoder for playback. The dish achieves this by transmitting the signal to a converter box, which changes the transmission to a analogue signal before sending it to the television set. The

games system uses DBS technology to broadcast TV channels which in conjunction to the return path enables viewers to access services and games via a set-top box.

The games system may operate across various Digital Signals (DS) depending on bandwidth requirements. There are various categories used in reference to the transfer speed, number of channels and characteristics of the transmissions whether T1, T2, T3 and T4 lines of communication. The lowest DS unit, or level 1 referred to as DS-0, which transmits data at a rate of 64 Kbps the rate of a single T1 channel. Higher speeds consist of multiple DS-0 levels, for example DS-1 represents a single T1 line that transmits at a rate of 1.544 Mbps. Other higher rates are made up of T1 lines which are multiplexed to create DS-2(a T2 line that comprises of four T1 channel which transmits at 6,312 Mbps), DS-3 (a T3 line comprising of 28 T1 channels that transmits at faster rate of 44.736 Mbps) and finally there is a DS-4(a T4 line comprising of 168 T1 channels that produces a rate of transmission of 274.176 Mbps. DS are used in context to the bandwidth required for specified application or number users. For example the greater the content and number users the higher the bandwidth required and the greater level of DS required.

A method of facilitating access to the internet which the Games System uses is DSLAM, Digital Subscriber Line Access Multiplexer, which is device controlled with a telephone company central office that splits the DSL subscriber lines and connects users to the Internet network hosts and PTNS, Public Telephone Network System. The Advantage to DSLAM is that it enables both voice and data services through a pair of twisted copper wires.

The Games System uses various broadcasting techniques and methods to transmit content over television, wireless and IP based networks these include;

Narrowcast to transmit data programming to a defined or limited area or audience. A cable television company narrow casts its programs only to subscribers, whereas network television stations broadcast to everyone with the reception equipment in range. On the Internet, content delivered via push technology which represents a form of narrowcasting

Unicast is method used by the games system to transmit data between a single sender and a single receiver over a network, referred to as a two-way, point-to-point transmission. The games system uses this method to transmit video content between users on the same TV network, Mobile Network or Internet.

Multicasting is a method, which is used within the Games System to transmit messages or content to more than one destination across a communications network.

Webcasting is a method used by the Game System for broadcasting data over the internet through using push and pull technologies which enable the transmission of

data from a server to a client.

Global System for Mobile Communications (GSM) is a method used by the Games System for broadcasting data over a wireless network to mobile phone handsets and wireless devices. Through GSM the phone has return path which allows users to communicate with a middleware server, which interprets users inputs and exchanges data. This enables mobile phone users to play multi-player network games with TV viewers and PC users.

GSM is essentially a wireless platform based on TDMA (Time Division Multiple Access) to digitise data. GSM can support multiples functions including telephony, voice mail, call forwarding, fax, caller ID, Internet access and games. GSM operates at three different ranges of frequencies, 900MHz (GSM900) in Europe and most of the World, 1800MHz (GSM1800) in a few European countries and 1900MHz (GSM 1900 also known as PCS 1900 or DCS 1900 in the United States. The Games System will supports current mobile technologies such as GPRS, WAP, G3 and emerging mobiles with DTV receivers.

Although most 1st generation and 2nd generation set-top boxes do not have a hard disc the viewer may still save games, through a middleware server located at the headend of a TV operator. This is achieved by sending a request upstream from the viewers set-top box to the middleware server which then interprets the requests and creates a data file containing information of the viewers game which is stored remotely on a server. This is advantageous

Means may be provided to viewers to access data files of saved games via a user interface from which they can select files to continue playing from the point at which they left the game. This is advantageous

Alternatively means may be provided to store data files locally on set-top boxes which are equipped with hard disc, smart card, memory card or RDVD. This is advantageous

During games viewers may pause play and go to options menu, or to switch over to a TV channel. This is achieved through using existing recording technology which can store up to 320 hours of content. When the viewer returns to play, they are then able to continue from the point at which they left the game.

Means may be provided to store details on the viewer's game within a remotely located database, whereby when the viewer returns to play, they are then able to continue from the point at which they left the game.

According to yet a further aspect of the present invention, means may be provided to enable a viewer to rewind a game to earlier point of play whereby the user is able to continue playing. This is achieved by remotely storing file data relating to inputs,

outputs and history of a user on a middleware server. Thus if a viewer loses in game they can simply rewind game and try again. This is advantageous as the viewer no longer needs to save a game and load a game.

Alternatively means may be provided to rewind a game by storing file data relating to inputs, outputs and history of player locally on a hard disc or by caching player data. Thus if a user loses in game they can simply rewind game and try again. This is advantageous as the viewer no longer needs to save a game and load a game.

According to yet a further aspect of the present invention, content may be provided across multiple TV channels, thereby providing greater capacity and options to the viewer. For example a TV operator may provide three channels which are all operating at 1 hour plus to each other thereby extending the time of play on any one game being broadcast on three different channels. Thus the viewer is able to play games for up to three hours.

According to yet further aspect of the present invention, means may be provided that would allow the viewer to play a game on-demand at any time regardless of whether it is being broadcast. This is achieved through using video on demand and near video on demand whereby content is streamed directly to viewers set-top box via a high speed DSL or HFC return path.

According to yet further aspect of the present invention, means may be provided that would allow the viewer to capture and store games content locally on a hard disc. Whereby the viewer is able to download a game via a broadcast signal on to a hard disc.

Means may be provided to allow a viewer select a game via a listing, TV advert, TV program, Electronic Program Guide or Interactive Program Guide. This may be VOD/NVOD whereby graphics would be transmitted on demand using streaming techniques at 2 mb/s - 4 mb/s.

Means may be provided to allow a viewer to access a dedicated channel through a listing, TV program, TV advert, Electronic Program Guide or Interactive Program Guide and access games on the games system.

Preferably means would be provided which would enable viewers to select games category via a user interface and be presented with games available to play. Preferably previews and information relating to the game would be shown aiding the viewer in their selection. This would be achieved by either transmitting video over a broadcast signal or by streaming video downstream through the return path.

Preferably means would be provided which would enable viewers to select games by voting via a TV terminal using their remote control. Whereby viewers would be provided the option to play one of three games and the game that receives the largest

vote is then broadcast. This would be achieved through the middleware server which processes data sent upstream from viewers set-top box and sends an instruction to the broadcast server to transmit the required video content relating to the program ID (PID) of the game which received the largest requests. This of course could be used for voting for TV programs and adverts.

Means may also be provided where a viewer is able to select game and pay to play the game, or pay for a period of time to play the game. Upon selection of a game a credit check would be performed via the Banking Automated Credit System (BACs) and an authentication of viewer would be performed. Upon credit verification an instruction would be sent to set-top box to switch channels to require program ID (PID) for the games content. Game data is then downloaded on to the set-top box and a two way communication path is opened between the middleware server and the viewers terminal.

Preferably whilst data, device drivers and content is downloaded onto the set-top box the viewer is able to view video content of TV adverts, game trailers followed by the game start sequence through the TV channel. Once the data has been loaded onto the set-top box the viewer is then informed that the game is about to launch. The game then launches and using their remote control or games pad the viewer is able interact with the game, graphics and content are transmitted to the viewer via the return path and broadcast signal as the viewer interacts.

According to yet further aspect of the present invention, means may be provided that would allow the viewer to input text details, via a remote or games pad, of their name, location and e-mail address. This information is then stored in a database which is transmitted on a score table which can be accessed by viewers who switch to a channel which is operating the games system. Viewers can then see details of other viewers scores. This may relate to multi-player or single player games.

Means may be provided to select viewers via a score table and challenge them to a multi-player game. Whereby viewers are informed via screen prompts that they have been challenged and may select play. On confirmation from both viewers the games system then launches a multi-player game of their choice.

According to yet further aspect of the present invention, means may be provided that would allow viewers to play multi-player networked games, whereby viewers are able to play against each other.

The method for facilitating a multi-player networked game on digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between a player's set-top boxes to a middleware server which processes the collected game data and transmits the data accordingly.

This allows viewers to play games within a multi-player networked environment

whereby the middleware server exchanges data via return path between the viewer's terminals. Because the return path has the capacity of 2-4mb/s this allows multi-player networked games to be played at a higher performance than any current Internet system, which even with a high-speed broadband internet connection peak at a 512kb/s download and 128kb/s upload. This is advantageous.

According to yet further aspect of the present invention, means may be provided that would allow viewers to play multi-player networked games using alternative devices such as a games console, a PC, a Mac or mobile phone.

According to yet further aspect of the present invention, means may be provided that would allow viewers to play multi-player networked games from alternative networks whether satellite, cable or terrestrial TV whereby means are provided for gathering file inputs and outputs and exchanging data via the return path.

Data would then be processed by a middleware server, which would transmit data across a communication link whether optical cables, DSL or a broadcast signal to servers located at within the data centres of another TV network. File inputs and outputs and data would then be transmitted downstream via the return path to viewers device. This allows viewers to play other viewers on other networks and other channels providing the service. This is advantageous

Means may be provided whereby on completion of the game data on results and highlights of the game including replays gathered by the middleware servers could be broadcast via the TV games channel providing the service.

Using the method and system for the multi-player networked games on digital TV according to the present invention, viewers can connect alternative devices and take advantage of the return path that would enhance network games performance on a games console, PC or Macintosh. Whereby devices are connected to a TV receiver, TV screen and return path which may be two-way broadband or a phone which is linked to a high speed asymmetric digital subscribe line (ADSL) connection. This is advantageous.

According to yet a further aspect of the present invention, means may be provided that would allow viewers to view, select and join in live multi-player network games via a dedicated TV channel, which is operable to broadcast live games. The viewer is also able to see information on game including time of play, player details, high scores, player performance and details of the game itself.

This is achieved through an application located on the middleware server which collects file data inputs, outputs and commands from viewers playing a multiplayer network game and then compiles a game file which replicates the viewers current play which is translated into an mpeg file and broadcast over a TV channel. Data on games is also provided as text, which can be combined in a user interface with live

game footage.

Thus viewers are able to see live multi-player networked games being played and see information relating to the multi-player network game. This is advantageous.

Viewers are able to select a multi-player game through a remote control, games pad or joystick, which then sends a request upstream via the return path to the middleware server to access the selected game. The middleware server then sends an instruction downstream to the viewers receiver to switch channels to the required channel PID for the game. The viewers receiver the switches channels and the viewer is able to begin play.

The Program Identifier PID identifies the games contents of a transport stream packet. Most TS packets carry digital audio, video, or closed-captioned text data for a TV program. The PID identifies the game for which the data will be used. In addition, four PIDs are used for control purposes, specifically 0, 1, n, and m. In the analogue world, channel selection is performed when the receiver tunes to a single sub band of a frequency multiplex broadband channel. In the digital world, joining a broadcast stream of digitally encoded packets performs channel selection. In the case of MPEG-2, tuning is PID selection.

According to yet further aspect of the present invention, means may be provided that would allow viewers to play multi-player games with other viewers on one device, whereby a split screen is provided enabling up to 4 players to play on any one device. This is advantageous

The method for facilitating a multi-player game on digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data from the player's terminals to a middleware. The middleware server processes the collected game data and transmits the data downstream to the each of the viewers who are identifiable by their IP address or their unique player identity. This is advantageous

Preferably means may be provided whereby a viewer is able to play multi-player game with other viewers on separate terminals connected by a modem, or directly to set-top box.

The method for facilitating a multi-player games on digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between a player's devices to a middleware server which processes the collected game data and transmits the data accordingly.

Preferably means may also be provided so that viewers may play back game highlights on a viewer's terminal; and on a TV channel using the game data transmitted from the viewers device whether a set-top box, games console, PC or

mobile phone to the middleware server. This is advantageous

Using the method and system for single and multi-player games on digital TV. According to the present invention, a viewer may watch a live game played at the time on a TV channel, or may watch a recorded game using the game data recorded by a middleware server from a database. Alternatively live games may be captured and transmitted via a TV channel in an MPEG format. This is advantageous.

According to yet further aspect of the present invention, means may be provided to enable a viewer using telephone and modem to talk with other viewers during a multi-player game. Whereby through using voice over IP technology, data and voice requests may be transmitted upstream to a middleware server 1, which is operable control the transmission of voice and data across a HFC between viewers during a game play.

Preferably means would be provided whereby viewers may switch communication channels to communicate players by pressing number keys and on the remote control to communicate with players.

Means may also be provided through a menu during a multi-player networked game to enable views to create a team file, whereby through pressing yellow button during play a communications channel is the opened from a viewers set-top box to multiple viewers devices whereby a conference call is initiated. This is advantageous, as this will enable viewers to communicate with fellow players during a multi-player network game, thus enhancing the game play experience.

VoIP delivers digitalised audio in packet forms, which may be transmitted over a ATM or Broadband network. Through using the connection to the return path, which connects on to an high-speed network, this provides the means for communication between a set-top box and set-top box or PC and games console or even games console and set-top box using VoIP.

VoIP suffers when there is only a 56 kb/s link, however with a 128 kb/s or even a 512 kb/s link there is no deterioration in quality. Currently the return path will facilitate up to a 4 mb/s which even if 128 kb/s were used for voice the quality would be equal to that of a telephone.

According to yet further aspect of the present invention, means may be provided that would allow a user to pay for access games by using a smart card. Whereby the viewer to inputs a smart card, via a smart card drive on the set-top box, and a transaction is processed for content within a secure environment using a smart card.

A smart card is a credit card-sized, tamper-resistant security device that offers functions for secure information storage and information processing that rely on VLSI chip technology. A smart card contains a secure microprocessor chip embedded in

the card. The chip can implement a secure file system, compute cryptographic functions, and actively detect invalid access attempts to content on the games system. Of course with the same application of file system access rights, a smart card can be safely used on terrestrial, cable and satellite TV to access multiple, independent sources of content, including the games, shopping, banking, pay-per view movies and subscription channels. This is advantageous

A smart card is distinguished from a magnetic stripe card similar to a credit card. The basic smart cards have clock rate of 3.5-8 MHZ, 8-16 Kb/s of non-volatile memory for data storage, 8-16 Kb/s ROM for the card operating system, Around 256-500 bytes of RAM for operating system computation, 2-8 Kb/s EEPROM (externally-accessible, non-volatile).

This enables the card to process and encrypt transactions which can be processed by the set top box.

According to one aspect of the present invention there is a system comprising of a user terminal having a TV screen, a receiver, a MPEG decoder, a USB port, a games pad or remote control for sending instructions to a Game Server located in a TV data center or at the local hub.

Each user terminal is a Set top box that includes a CPU, RAM memory, non-volatile memory, a TV screen, display driver circuitry, a speaker, a remote control, an IR interface, a user interface (UI), a dial up interface, a data input for receiving signals and an MPEG decoder.

The viewer's terminal may also include EEPROM, or Flash memory in which components of operating system and application software can be stored. Additionally the viewer's terminal may also include up to 4mb of RAM memory depending on Set top box model and make.

The remote control and IR interface are standard in all current Set top boxes and are used to relay user commands to the Set top box. In this way the user is able to control a game through the manipulation of the buttons on the remote control.

The return path provides connection via a cable modem to the Games servers. Satellite and Terrestrial systems also use a modem however the connection is via a dial up interface that is connected to a telephone communication line.

Asymmetric Digital Subscriber Line (ADSL) is typically used for Satellite and Terrestrial interactive TV whereas with Cable TV the connection is a two-way Hybrid Fiber optic Coaxial (HFC) cable and does not require a telephone.

It will be appreciated that various different modems and communication lines such as SDSL, VDSL, HDSL and ISDN can be used to connect the viewers terminal to the

Games server.

According to yet a further aspect of the present invention means may be provided within a remote location for hosting, processing, digitalising and transmitting game graphics within a live video transport stream to a user terminal where the video content is then decoded by the MPEG decoder and frames are displayed on the user TV screen.

The means for controlling games is provided through the return path, which as described for Cable TV is two-way and with Satellite and Terrestrial TV this is achieved via dial up interface that is connected to a telephone.

Within the return path Hyper Text Markup Language (HTML) and Java instructions are exchanged between the viewers Set top box and the Game Servers which are held remotely at broadcaster headend or at the local hub. Instructions could be anything from a user interface, to data inputs or instructions from the Game Server to the viewers set top box to switch channels.

For example the Game Server might send an instruction in HTML or Java to a viewers Set top box via the return path to switch channels to a predetermined program ID which provides previews of games. Alternatively the Game Server may send an instruction to the Set top box to decode a video stream which may be live game content captured from the Game Server.

In addition to the return path facilitating means for communicating with Game Server and controlling a game, graphics rendered by the Game Server may be streamed downstream along the return path to the viewers set top box as an MPEG video stream. An MPEG decoder in the set top box is operable to convert the MPEG video stream into successive video frames that are displayed on the viewer's TV screen.

The method used to transmit the MPEG video stream is referred to as Unicasting whereby a point to point broadcast takes place. In this way live video content, which is produced by the Game Server, is transmitted to a single user, providing an individual gaming experience.

It is important to distinguish between Unicasting and Multicasting. Unicasting is where video is transmitted to an individual viewer and Multicasting is where video is transmitted to multiple viewers.

Those skilled in the art will realize that Multicasting is ideal for streaming game replays, scoreboards or live coverage of multiplayer network games. However it can not be used for playing games as games are an individual experience, hence the need for Unicasting.

Alternatively another method of providing content may be by transmitting live video

content corresponding to the viewers inputs via a transmission channel whereby the Set top box is required to tune to specific frequency using the RF tuner portion of data interface. Whereby a live video feed of the games video is then transmitted over a transmission channel to a single viewers Set top box which then displays the corresponding frames on the TV screen to the viewers inputs on the remote control.

For example if the viewer pressed the number 2 button of the remote control an instruction would be sent upstream to the Game Server which would interpret the file input and render the games frames which the viewer would see on their TV screen in real time.

Of course there may be a delay of 20 milliseconds, which is about the time it takes for human brain to react to a paper cut, in the instruction reaching the server which is referred to as latency. Latency is the time its takes for a data packet, which is this case contains a viewers data input, to cross the network to the Game Server.

However the time at which the Game Server produces the graphics and the video reaches the Set top box is real time. It is also real time when streaming live MPEG-2 video over a 1500-6000 (kbps) return path in a resolution of 1408x1152 which is more than adequate for even the most hardcore gamers.

It is important to distinguish the difference between video streaming and broadcast in terms of bandwidth usage and the wideband spectrum. As described video streaming is carried over the return path which at resolution of 16CIF MPEG-2 FULL D1 would require a bandwidth of 1500-6000(kbps) using techniques such as Unicasting, whereas a broadcast is transmitted over a wideband signal and requires the set top box to switch to a frequency.

Those skilled in the art will realize that the availability of spectrum in Cable, Satellite or Terrestrial digital TV is not only limited but also expensive and although possible is not the most economical method of providing an individual gaming experience.

Video streaming however presents a more cost affective method of providing an individual gaming experience and helps utilize existing bandwidth for which there are many advantages to broadcasters and channels.

Preferably the games system would be compiled in C and based on Windows or Sun system and held remotely on a middleware server or application server at a TV data center, headend or local hub. The game system middleware software provides the games drivers and user interface functionality and may be situated on a Middleware server, Games server or Proxy server.

The system may also consist of application modules, device drivers, graphics engines, graphics controllers, networking protocal software, emulation software and multiple operating systems.

Each games server consists of a CPU, RAM Memory, a graphics accelerator board typically with S-video out, an audio board with either composite, unbalanced and balanced audio out, one or more UW-SCSI 80GB HDD, dial up interface, one or more DVD/CD drives, USB interface, and a video capture board.

Alternatively the Games server may include a Video Capture card which is operable to provide DV, SDI, RGB or AES/EBU output from which the game video may be captured and encoded in hardware by MPEG encoder in real time.

Preferably the Games Server may consist of multiple CPU's of up to 24 independent processors capable of multi-tasking. In this way the games server may facilitate multiple game applications to run correspondingly enabling up to 48 or more applications to be run at one time.

In this way multiple viewers can access and play games from one server at any one time. It will be appreciated that this server may also be within cluster formation, which can be scaled up to support hundreds of thousands of viewers accessing the games system through a two-way coaxial cable or ADSL via a dial up interface.

The Game Server may also include multiple graphics accelerators each with S-video connector or AV out. The S-video connector enables the Game Server to be directly interfaced with the MPEG encoder, thereby providing a real-time signal between the Game Server and MPEG encoder.

It will be appreciated that an S-video connector is capable of producing a sharper image than an RCA-type or composite connectors that could also be used to interface the Game Server with the MPEG encoder.

An AV (audio & video) connector may also be used to interface the Game Server directly with MPEG encoder.

Alternatively the video output from the Game Server may be connected to the MPEG encoder through optical, USB, Firewire or I-Link interface. Either way video may be captured from the Game Server and encoded in MPEG by the MPEG encoder.

Preferably the Game Server or MPEG encoder may apply anti-aliasing to game video to smooth out jagged edges on the game polygons, texture maps, bitmaps and GUI's.

The sound card in Game Servers may also include a composite or unbalanced/balanced connector from which audio may be captured by the MPEG encoder and synchronized with the games video before being encoded and streamed to a viewers Set top box.

An audio mixer device or software program may also be used for mixing sounds from

several different sources with the audio output streams from the Game Servers. For example other sources may include live audio feeds, CDs, MP3 files, MPEG audio files from other computers which can be combined with the audio and video output stream from the Game Server and encoded in an MPEG stream.

Driver software is used to make the graphics card; sound card and video capture card work with the Game Server.

Preferably the games may be stored on a high speed access UW SCSI hard drive disc and accessed by viewers who are connected to the Game Server via the dial up interface or a two-way coaxial cable used in Cable TV. It will be appreciated that various different storage devices may be used including IDE, EIDE drives or Optical Discs.

The games may also be stored on a DVD, CD or other forms of media storage such as hot swaps RAID. Either way through the UI provided and connected via a dial up interface or two-way coaxial cable viewers may access the games.

According to yet a further aspect of the present invention means may be provided to enable viewers to access games from a transmission channel, which acts as games portal. Whereby the viewer is able to prompt a user interface from which they may access and play games.

The channel may be web based, whereby video is transmitted over IP. Alternatively this may be a transmission channel, whereby video is broadcast on a wideband signal to all viewers with digital receivers at a set frequency.

Preferably, a UI will enable viewers to select and play games from TV programs and adverts, enabling the viewer to play games directly from the TV via Set top box that is connected, via return path, to Game Server. For example a viewer might switch channels to channel 255 MHz, which is broadcasting previews of games.

Whilst the viewer is watching a game preview or review a red icon appears at the top of screen indicating that to play the games press the red button. If the viewer presses the red button an instruction is carried upstream via the return path or carried in the broadcast stream to the Game Server requesting an introductory user interface. The Game Server then transmits the user interface downstream to the Set top box where it is realized in the RAM Memory.

The user interface includes five main components: an introductory listing of new game releases; a list of game categories; a feature permitting the user to search a database for games available by tittle, developer, publisher and keywords; a video preview of games available to play and a video for advertising. The user interface (UI) is defined in HTML primitives and sent over the network by the Game Server, Middleware server or Proxy server to the Set top box that then renders the UI.

Preferably when the viewer highlights a game a corresponding video preview of the game is played within the window parameters of the UI assigned to the video.

The viewer is able to manipulate the buttons on the TV remote control to highlight a feature of interest. The viewer may then press the select key to signal their selection to the Game Server.

For example if the viewer highlights the Action games category and presses select the games system next presents a screen showing all available action games in a list. Again using the remote control the viewer is able to highlight and select a game. For example if the viewer highlights a game and presses select button on the remote control then a signal is transmitted via the return path to the Game Server requesting the selected game to be loaded. The Game Server then loads the game and a connection is then established between the Game Server and Set top box.

Live video output from the Game Server is then encoded in MPEG and streamed to the viewers Set top box where the video is then decoded and the corresponding frames of the game are display on the viewers TV. Through using the remote control the user is able to command the game.

In this way the viewer is not constrained by current the distribution method of games. Whereby they are required physically go to retailer or order through a catalogue, which makes games inaccessible to gamers. Through the present invention the viewer may simply turn on their TV and switch to a TV channel from which they can access games at anytime held remotely on Game Server and without a games console. This is advantageous.

According to yet a further aspect of the present invention the Games server may be located remotely at the local hub or within the last 5 miles of the viewers premises. In this way it shortens the line of communication between the set top box and the Game Servers, which reduces any loss of signal during game play. This is advantageous.

According to yet a further aspect of the present invention, viewers are able to preview and play new games as they launch via a TV channel. Whereby a UI is provided which lists the latest games releases from which the viewer may select using their remote control to play. Those skilled in the art will realize that the user interface is typically realized as an instruction stored in the Set top box RAM memory.

Preferably previews of games may be broadcast on transmission channel as a wideband signal or streamed as an MPEG video stream from which the viewer may prompt a user interface using their remote control to play the current game being previewed. This is advantageous.

Currently console and PC demos of new games are distributed on a CD/DVD and

typically require the gamer to purchase a magazine. Access to games in therefore delayed by may factors, including shipment, hardware and production issues. Currently gamers are required physically go and buy a magazine which has the demo. Although this is useful way of trying new games this does constrain the accessibility to new games and does rely on the retailers distributing the games at significant cost to the games publishers and developers in revenue share.

Through the Internet users are able to download demos however this requires a high specification PC and a high-speed connection. For example with a 28.8 (kbps) modem an 80mb games demo may take up to four or more hours to download which is not practical and can be more expensive than buying a computer magazine or complete game.

Using the present invention users could access and play new game releases from the point they are launched through their TV without delays or buying a magazine, additional hardware and software. This is advantageous.

Preferably means may be provided to play games using the remote control. For example when the viewer presses a button on the remote control this sends infrared signal to the IR Interface on the Set top box which transmits the signal upstream via the dial up interface to Game Server.

The Game Server then renders the games graphics in response to the viewers inputs and the video is transmitted or streamed back to the viewers Set top box which displays the corresponding frames on the TV screen. In this way the viewer is able to command the game whilst the game still remains stored remotely on a Game Server. This is advantageous.

The dial up interface or two-way coaxial cable enables the communication between the Game Server and Set top box, referred to as bi-directional form, which enables the viewer to command the game from the remote control.

According to the present invention the method of providing the video games graphics consists of capturing the graphics created on the Game Server and digitalising the content into MPEG video format which is then streamed or transmitted downstream to the viewers terminal. The digital output is then decoded as an MPEG video stream by the Set top box and displayed on the TV screen.

In this way the set top box is not required to process the games content it is only required to transmit file inputs/outputs and decode video. It will be appreciated that various video formats may be used to stream or transmit rendered graphics from a video game to a Set top box including Motion Joint Photographic Experts Group (M-JPEG) or Audio Video Interleaved (AVI).

Through streaming video to users terminal video games may be played on the user

TV screen at 30 fps in MPEG-2 full D-1 at a resolution of 704x480 4CIF in an NTSC video stream. Within a PAL video stream the frame rate is about 25 fps in MPEG-2 full D-1 at a resolution of 704x576 4CIF. Both formats would provide an equal frame rate and resolution to that available on a games console or PC and significant improvement to that of existing games systems for interactive TV. This is advantageous.

Through streaming video to users terminal video games may also be played on the user TV screen at 30 fps in MPEG-2 full D-1 at a resolution of 1408x1152 16CIF within a bandwidth of 1500-6000 (kbps).

Those skilled in the art will realize that this could be supported by existing HFC or ADSL return pipes used by digital television network providers such as NTL, BSkyB, ITV Digital or Telewest. Thus in practice games of an equivalent quality to that of console games and PC games could be played by viewers with Satellite, Terrestrial and Cable Set top boxes using the present invention as described.

Other video formats supported by the games system include, H.261, H.263, MPEG-4, MPEG-1, MPEG-2 which can be used for various pixel resolutions including SQCIF 128x96, QCIF 176x144, CIF 352x288, 4CIF 704x480 or 16CIF 1408x1152. By varying the format and resolution the bandwidth required can also be adjusted from 28.8 to 6000 (kbps).

Lower resolutions may be suitable for different games. For example Amiga or Atria 8-bit console games were developed for low resolutions which may be suitable for a QCIF or a CIF format. This is advantageous.

Video content may of course be captured at a higher resolution. For example content may be captured at 1600x1400 in 256-bit and encoded into MPEG-2 4CIF or 16CIF format. In this way higher resolutions used by video games can still be played.

Through using graphics accelerators the game system can support various games with graphics from as low as 4-bit up to 512-bit with 16.7 million colours. In contrast current interactive TV games are 8-bit, 256 colours.

Using this method of capturing video, content may be captured by the MPEG encoder as S-video, Composite or RGB inputs from Game Servers graphics accelerator board and output as NTSC, PAL, SECAM or HDTV formats in real time.

Alternatively video may be captured from the Game Server 70 through using a VGA converter which have many different video output connectors. The most typical connectors are S-video and BNC composite video connectors.

For example a PAL or NTSC Coder may be used to convert SVGA or VGA outputs from the Game Server 70 to composite and S-VHS outputs which may interfaced with the

MPEG encoder.

Alternatively the Game Server 70 may be connected via S-video to an RF modulator that is connected to a converter that is connected to the MPEG Encoder via Normal 75 ohm Co-axial cable, that can be used to deliver a signal up to around 30 meters distance. This method is probably the least expensive way to deliver the video signal from Game Server 70 when long cable runs are required. However a loss of colours in the conversion of the video is likely to take place when a RF modulator and converter is used. Whereas with S-video directly interfaced to the MPEG encoder there is no loss of colour. This is advantageous.

According to the present invention the method of providing the video games sound consists of capturing the sound created by the sound board on the Game Server using an MPEG encoder and digitalising synchronizing audio and video inputs into an MPEG format. The MPEG video is then streamed or transmitted downstream to the viewers terminal where it is then decoded by set top box and audio is output through the users TV speakers. With present hardware encoders available this can be achieved in real time.

Alternatively the MPEG encoder may capture the games sound from the Game Server as an S-video, Analogue Composite or RCA input which can be either directly interfaced with the encoder or indirectly using a break out box or break out cable.

Preferably sound quality output from the digital encoder may be provided in Mono, Stereo or in a Dolby Surround Sound format.

According to yet a further aspect of the present invention means may be provided whereby IP streaming over the return path for Cable, Terrestrial or Satellite TV is used to provide live in game graphics on the viewers terminal.

For example live video from a game may be transmitted in IP MPEG stream to a Set top box using User Data Protocol (UDP). Whereby the set top box decodes the IP MPEG stream and corresponding frames to the viewer's inputs on the remote control are displayed on the TV screen. This may be based is based on Transmission Control Protocol/Internet Protocol (TCP/IP) and UDP and requires an IP address for the MPEG video stream and HTML/Java data stream.

Typically streaming software carries out the UDP encapsulation and IP transmission for the MPEG files, however this may be hardware based using a Multiplexer. Those skilled in the art will realize that a number of transport protocols including those within the TCP/IP stack may be used to transport video streaming over a network to a Set top box.

Alternatively the IP streaming can be decoded remotely and then sent as a broadcast MPEG stream to the Set top box thereby not requiring the Set top box to decode an IP

MPEG stream. It is important to distinguish between the three main methods of providing video games using IP streaming:

Unicasting is where the Games Server will stream video to one IP address per session. There may be multiple Unicast sessions streaming from one Games Server. For example there could be four independent Unicastings, each sending different video content from on of the Games Servers to four set top box receivers either simultaneously, or at different times.

Multicasting is where the Games Server will stream video to a range of IP addresses. This may be multiple multicast sessions streaming from one server. Whereby multiple users will receive the same video content simultaneously. For example using multicasting the starting video animation to a game could be streamed to multiple users.

Broadcasting is where the server will stream video to all IP addresses connected to the Games Server. This method may be used for streaming previews of video games to all users who have accessed the game system.

Transmission of live video can be performed through either a standard network protocol like TCP/IP, or protocols such like Real-Time Streaming Protocol (RTSP), Internet Protocol Television (IPTV) and Asynchronous Transfer Mode (ATM).
ATM provides a network independent protocol that operates in a wide range of bit rates such as 6 Mbps over coaxial and more than 155.5 Mbps in OC-3. ATM is used to transmit video over the TV operator's network to the local hub where it is then transmitted to the viewer's receiver.

Through the process of capturing, digitalising and transmitting video it will be appreciated that various formats including Phase Alternative Line (PAL), National Television Standards Committee (NTSC), Sequentiel Couleur avec Memoire (SECAM) and High Definition Television (HDTV) may be used in this process. This is advantageous as a video game may be transmitted or streamed in various video formats depending on device display support whether PAL, NTSC, SECAM or HDTV.

According to yet a further aspect of the present invention the games system is operable of switching between PAL, NTSC, SECAM and HDTV formats in a live environment through real time MPEG encoding and graphics controller program designed to control encoding of video games within live environment. The program provides an automated conversion of formats upon request of a viewer to play a NTSC game on a PAL receiver or SECAM game on NTSC receiver.

The graphics controller is capable of converting game formats in real time thus enabling games formatted in PAL to run on an NTSC device without a loss of colour or scrolling affects as seen on some console games systems when running an NTSC game on a PAL console system. The graphics controller is also operable to convert

game formats from NTSC, SECAM, PAL or HDTV into PAL M or PAL N formats used in Brazil and Argentina. This is advantageous.

According to yet a further aspect of the present invention the games system is operable to render user interfaces on the Game Server in HTML/Java and transmit or stream the UI via the return path in an MPEG-2 stream to a viewer's set top box. The Set top box is then operable to decode the mpeg video and display the user interface within the video frames on the TV Screen. The viewer is then operable to manipulate the user interface using the remote control.

For example the user may highlight games of interest using the up and down buttons on the remote. If the user presses the select button then this will launch the game.

Preferably sound may also be transmitted or streamed with the user interface, thereby enhancing the experience and quality of navigating the user interface. Preferably the user interface may be animated thereby enhancing the viewers experience.

In this way the Set top box is not required to render the user interface in HTML/Java and the interface may be produced in 256-bit in 16.7 million colours as opposed to 8-bit in 256 colours. This is advantageous.

The current method of providing user interface requires a Set top box to process large amounts of HTML/Java using 4mb RAM Memory and a CPU. Although this is useful way of providing a user interface it does limit the user interface to that of Set top boxes capabilities which can only support 256 colours. This is disadvantageous.

According to yet a further aspect of the present invention means may be provided which would enable a viewer to play PC, MAC, Amiga, Atrai, Playstation, X-box, Nintendo games on there existing set-top box without any hardware additions to the set-top box. This is achieved by a number of ways. Firstly the Game Server is operable to switch operating systems on boot up, whereby the Game Server is reset to particular operating system such as the Playstation 2 O/S.

Secondly emulation software maybe used to emulate an operating system whereby an emulation software is run on top an operating system such as Windows, Linux, Unix or Sun. Through the second method operating systems maybe switched without resetting or rebooting the Game Server.

The third method is through software drivers installed on an operating system, which enable the Game Server to interpret game formats from other platforms without emulation or rebooting the Game Server. Through either of the above methods the Game Server is operable to run PC, MAC, Amiga, Atari, Playstation, X-box, Nintendo and Linux games from which the MPEG encoder is operable to capture the video and audio output from the Game Server.

The MPEG encoder is also operable to encode the output into an MPEG video stream, which may then be transmitted or streamed to a Set top box. A decoded in the Set top box is operable to decode the digital output from the MPEG encoder from which successive video frames rendered by the Game Server are displayed on a viewer's TV screen. This is advantageous as the viewer is not constrained by format issues, or required to buy a console to play games.

It is appreciated that through the method described this would also enable viewers to play multi-player or networked games regardless of the format whether PC, Atari, Amiga, Sony, X-box or Nintendo games on a conventional Set top box.

This is achieved by gathering the file inputs from each participating viewers which is interpreted by a Game Server which renders the games graphics. The graphics are then captured by an MPEG encoder which converts the signals from the Game Servers to a digital output that is then multiplexed into single signal and transmitted over a transmission channel or streamed to viewers Set top boxes.

A decoded in the Set top boxes is operable to decode the digital output from the MPEG encoder from which video frames corresponding to each viewer's inputs is displayed on each viewers TV screens. In this way the viewer is able to play multi-player or networked games regardless of the platform. This is advantageous.

According to yet a further aspect of the present invention viewers may pause the game and return to game at the exact point where the game was paused.

Means may be provided whereby whilst the game is paused, switch channel, video stream, adverts, previews of other games, puzzles, quizzes, replays of game, highlights of live multiplayer games.

For example the viewer might have paused the game to make a tea. An instruction is then sent to the Game Server indicating that the viewer has paused the game. The Game Server stops the video feed and sends an instruction downstream to the viewers Set top box to switch channels. The RF tuner then tunes into the required program ID and video previews or adverts are displayed on the TV screen inviting other viewers who may be in the room to play a game or purchase a product.

Without needing to save the game when the viewer has finished making tea and returns to the TV, they may simply press the blue button to continue the game from the point they left off. A video signal is then reestablished between the Set top box and Game Server and the user continues playing the game.

Preferably when viewer pauses the game a signal is sent to games server instructing the video feed to be stopped. In this way bandwidth can be reallocated to other viewers who want to access games may use.

According to yet a further aspect of the present inventions viewers may be able to view video previews of games whereby video is streamed as a live link or broadcast over a channel. Using the remote control viewers may select game and play the game.

For example the viewer may be watching a preview of a car racing game which at the top screen indicates that to play the racing game press the blue button on your remote control.

If the viewer presses the blue button an instruction is then transmitted to the Game Server which then launches the game and either transmits the content over a transmission channel or streams the video via the return path to Set top box which then display the frames from the game. Through manipulating the buttons on the remote control the viewer is able to command the game. This is advantageous.

According to yet a further aspect of the present invention viewers may be able to select guides, cheat modes, walkthroughs that can provide a voice over during game to help the viewer during the game.

According to yet a further aspect of the present invention the Game Server architecture could be PC based system, coded in C, of course this could be Sun Solaris or Linux based system.

According to yet a further aspect of the present invention, means may be provided that would enable a viewer to play games regardless of the format whether PC, Playstation, Nintendo, Amiga or even X-box using a conventional Set top box.

This is achieved through a software program that is designed to run various operating systems in real time on the games server including Windows, Playstation, Nintendo, Atari, Amiga or X-box.

As described the MPEG encoder is operable to capture video from any game being played in any of the operating systems on Game Server from which the video is then transmitted or streamed via the return path to a viewers Set top box. An MPEG decoder then decodes the MPEG stream and the corresponding frames from the game are displayed on the viewer's TV screen.

Generic software drivers held on the Game Server convert the file inputs and outputs from a viewers remote control to PC, Playstation, Nintendo, X-box, Atari or Amiga inputs and outputs which the Game Server then uses to render the games graphics.

In this way the viewer is able to play any game whatever the format and without any additional software or hardware on the Set top box. This is advantageous.

Currently interactive TV games are reformatted and developed specifically for interactive TV, which requires a heavy investment in time and resources. This is

inherently because of the method used for playing games on a Set top box, which is hardware dependent on the users terminal, thus developers are constrained by the limitations of the Set top box and are forced to redevelop games specifically to these limitations. This is disadvantageous.

Through the present invention console and PC games may be integrated on the Game Server without reformatting or development for the interactive TV environment.

This may be achieved through emulation software on the Game Server that may be used emulate different platforms to facilitate access by viewers to games in various formats. For example the Game Server may emulate a Playstation system, enabling viewers to play Playstation games held remotely on the Game Server using a conventional Set top box and remote control.

Of course software on Game Server may however be specifically designed to play Playstation games in a real time environment using hardware. Whereby the frame rates are not affected by emulation. For example the Playstation operating system could be directly run on the Game Server using hardware.

According to yet a further aspect of the present invention means may be provided whereby existing games for consoles and PC's could directly ported to interactive TV, whereby games may simply be installed on the Game Servers and software drivers installed would enable a viewer to command a game.

In this way software held remotely on the Game Server could convert an input from the Set top box to a PC input. For example the user input of 1 on the remote control would equal to the cursor up key on the PC. Alternatively a user input of red button may equal the return key. These inputs would then be used to command a game or UI stored on the Game Server. This is advantageous.

Alternatively means may be provided whereby hardware may convert the inputs, outputs to other formats.

According yet a further aspect of the present invention means may be provided that would enable file inputs from additional hardware connected to an STB to be converted into PC, Playstation, Sega, Nintendo, Atari or Amiga inputs.

For example a viewer may use a joystick, which could be connected to Set top box by a USB port and could have different file inputs and outputs to the remote control. Either way software drivers held on the Game Server would convert the inputs and outputs to PC, Playstation, Nintendo, X-box, Atari or Amiga inputs. Thus enabling the viewer to use alternative controllers such as game pads, joysticks and steering wheels with a Set top box to play games of various formats.

According to yet a further aspect of the present invention the Games server may use

emulation or operating system software to run various different games from different platforms including Windows, DOS, PS1, PS2, Amiga, Atari, Nintendo, X-box, Linux or Sun.

Alternatively the Game Server hardware architecture may be based on console architectures. For example each Game Server may consist of a CPU, RAM Memory, a graphics accelerator board typically with AV multi out connector (integrated audio/s-video input), one or more 9GB HDD, digital out connector (optical), a broadband interface, one or more DVD/CD drives, USB connector, and one or more memory cards.

The AV out could be directly interfaced with the MPEG encoder through S-Video input and composite audio inputs. Alternatively the digital output (OPTICAL) could be configured to connect to MPEG encoder. In this way content may be captured from the Game Server by the MPEG encoder and transmitted or streamed to a viewers Set top box.

A second Server may be assigned as the primary Server providing the user interfaces (UI), whereby the Game Servers would be used purely to generate the games content.

Alternatively the Game Servers with the console architecture may interface directly with the Set top box via the return path whereby the Game Server provides the user interfaces and interprets file inputs and outputs from the remote control.

In this case the games system software may be coded in ASM which is typically used by games developers for consoles.

According to yet a further aspect of the present invention means may be provided that would enable viewers to play multiplayer and networked games on a Set top box. This is achieved by networking multiple Game Servers allowing file inputs and outputs to be exchanged at high speed between servers.

For example an i-link cable that can support transfer rates of up to 400 (mbps) may be used to connect the Game Servers in a network. Alternatively the Games Servers may be connected by USB, Firewire or optical cabling from which file inputs and outputs may be exchanged between corresponding Game Servers during a multi-player networked game.

Alternatively the Game Servers may be networked using a 100mb/s RJ-45 connection. It will be appreciated that multiple of different communication lines may be used including VDSL, HDSL-2, or OC-3 could be used to connect the Game Servers. Through interconnecting Game Servers, multi-player and networked games may be facilitated between viewers whereby file inputs and outputs are exchanged between the corresponding Game Servers in real time.

The Games Servers may also be networked with a Gigabit Ethernet, which operates at 10 times 100 Mbps or within a Baseband network. A Baseband network is a type of local area network in which instructions are exchanged in digital form on a single transmission channel between the Game Server that are connected by coaxial cable or twisted-pair wiring. Through time divisional multiplexing it is possible to enable channel sharing whereby more than two Game Servers can exchange instructions and data inputs between each other.

Alternatively the Game Servers may be networked with a broadband network which has the advantage of being able to carry data, voice, video over multiple transmission channels that are distinguished by frequency. Although data inputs may be exchange a higher bit rate or 20 (mbps) or more during a networked game, broadband is a relatively more expensive medium than a Baseband or Ethernet networks.

According to yet a further aspect of the present invention multiplayer networking may be facilitated across multiple television networks whereby data inputs/outputs are exchanged across networks between Game Servers.

This may be achieved through the Internet over the Public Telephone Switched Telephone Network (PTSN). However performance will be higher over a private ATM network such as that of BT or AT&T which supports data packet switching speeds of up to 155 (mbps).

Alternatively a channel may be used transmit game data from one television network to another. For example channel 218-219 MHz may be assigned to provide a direct feed from one Game Server located in the headend of a satellite television network to a Game Server which located in a cable television network. In this way data may be transmitted within a live video feed that provides real-time exchanging of data inputs and outputs between the Game Servers. In this way viewers play multiplayer networked games with viewers who are not subscribed to the same TV network.

It will be appreciated that the channel may be a Satellite, Cable or Terrestrial feed between the Game Servers. Those skilled in the art will realize that in this way various configurations on multiplayer networked games may take place between Terrestrial, Cable and Satellite viewers regardless of the distance. This is advantageous.

The Game Server may also channel hop to switch repeatedly from one channel to another during various different game sessions, allowing the channel to be used for other tasks.

According to yet a further aspect of the present invention means maybe provided enabling viewers to play multi-player video games on a single Set top box. This is achieved through providing a second controller which may for example be games pad or joystick connected to Set top box. Alternatively viewers may use a single keyboard whereby keys are assigned to each viewer.

Using the either of the above controls instructions are sent in same way as single player games via the dial up interface or a two-way coaxial cable to the Game Server which produces the games graphics using the viewers inputs. The games graphics rendered by the Game Server are then captured by an MPEG encoder which coverts the signal to digital.

The digital output from the MPEG encoder is then transmitted over a transmission channel or streamed via the return path to the viewers Set top box which decoders the MPEG stream and the games frames corresponding to the viewers inputs are displayed on the TV screen. This is advantageous.

According to yet a further aspect of the present invention viewers may also play networked video games with other viewers in different locations whereby data inputs are exchanged between the participating viewers Set top boxes and Game Servers which exchange the data inputs with corresponding Game Servers.

The video output from the Game Servers is then captured by an MPEG encoder and the digital output is then transmitted or streamed downstream to the viewers Set top box. The MPEG video is then decoded by an MPEG decoder and the games frames corresponding to each viewers inputs are displayed on the participating viewers TV screens.

The process of providing video is exactly the same as single player games and is still performed in real time. The only difference is that the data inputs from participating viewers are exchanged between corresponding Game Servers, which are located at the TV operator Head end/Data center or at the local hub and are networked with high speed cables which can support transfer speeds ranging from 20-400 (mbps).

According to yet a further aspect of the present invention means may be provided that would enable a viewer to save games remotely on the Games Server, Middleware Server, Proxy Server or an SQL Server.

For example during any game if the user press green button then an instruction is sent via the broadcast stream or via the return path to the Game Server instructing the Server to save the game. The Game Server then saves the viewers game on a hard disc drive with a user ID or in library file which can only be accessed by the user who saved the game.

According to yet a further aspect of the present invention means may be provided for retrieving and accessing saved games held remotely on the Game Server, Middleware Server, Proxy Server or an SQL Server.

Whereby when a user presses the red button on remote during a televised preview of a game, they are then presented with an introductory UI from which they may select

the option to access saved games. If the viewer selects saved games, the Games Server then authenticates the viewer and the viewer is then presented with a second UI that provides a list of their personnel saved games from which the viewer may select a file.

If the viewer selects a file then the Set top box transmits an instruction via the return path to the Game Server instructing the Server to load the selected saved game file. The Game Server then loads the game file and video is either transmitted or streamed to the viewers Set top box in which an MPEG decoder then decodes the MPEG video and video frames from the point the game was saved are then displayed on the TV Screen. Using the remote control or games pad the viewer can then continue playing the game.

According to yet a further aspect of the present invention there is a software program which allows users to arrange, classify, annotate, and re purpose video content from games to provide enhanced TV functionality specifically to the embodiment of the invention describe herein.

For example, out of a video library made of 20 preview videos and cut sequences these may be classified and grouped together where a given action takes place. For example a games author may select all preview scenes relating to specific game ID and insert an event prompting viewers to vote for a game, play a game or join in a networked game during the broadcast of all the video previews. This is advantageous as authors and developers can integrate transmission channel video with video games quickly and easily.

The software will also enable developers to add new functionality to video content in games which enhances the gaming experience and integrates TV content with video games. For example the developer could insert an event action that switches the viewers terminal to another channel when the game is paused. In this way other viewers who might still be located near the terminal can be targeted with advertising and be prompted to play other games. This is advantageous.

The software provides a graphical user interface, which enables games publishers and developers to drag and drop pre-programmed 'events' on to video frames, which embeds an HTML/Java event in the video. The developer may also use the software program to insert adverts into the Games System user interface or define scheduling for game video sequences. For example the developer may using the drag and drop feature create a line up of video previews, live game coverage of multiplayer networked games and adverts in which events prompting the viewer to play a game may be inserted. This is advantageous.

According to yet a further aspect of the present invention the method and process of capturing and transmitting video corresponding to a viewers inputs could of course be used for providing alternative applications, not just games but word processing,

graphics, home shopping, e-mail and internet access. Whereby a Middleware Server renders all UI and provides the visual graphics via MPEG stream to a Set top box. Thus the Set top box is not required to process any of the applications or render user interfaces.

With present invention as described the Set top box would simply decode the MPEG stream and exchanges file inputs and outputs with the Middleware Server.

This is advantageous as the capabilities to use the Set top box for more advanced applications becomes possible because you are no longer constrained by the hardware limitations of the Set top box.

Current Middleware technology for interactive TV is heavily dependent upon the Set top box hardware and requires a large proportion of the functionality to be processed by the Set top box including HTML/Java instructions, JPEGS, User interfaces and games which can be very slow. Also the Set top box can only display 256 colours therefore providing further limitations.

Through the present invention other applications including e-mail, shopping, internet could be run remotely on a Server. Whereby graphics rendered by the Server may be captured by an MPEG encoder through a video capture board or video card which could be provided to the viewers Set top box at with a channel transmission or a video stream. This is advantageous.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing in which:-

Figure 1 is a block diagram of a home user terminal illustrating a games pad connected to a USB port on a set-top box which may be used to access the games system;

Figure 2 is a block diagram of a home user terminal illustrating a game pad connected via an infrared port to a set-top box which may be used to access the games system.

Figure 3 is a diagram of a home user terminal that may be used to access the games system.

Figure 4 is block diagram cable digital television hardware system that can be used to access the games system;

Figure 5 is block diagram satellite digital television hardware system that can be used to access the games system;

Figure 6 is block diagram terrestrial digital television hardware system that can be used to access the games system;

Figure 7 is block diagram wireless base station hardware system that can be used to access the games system using a mobile phone;

Figure 8 is diagram showing the layout of a user interface that is dedicated to selecting games to play.

Figure 9, is diagram showing the layout of a user interface that is dedicated to selecting to view games, load games, view reviews and view adverts;

Figure 10 is diagram showing the layout of a user interface that is dedicated to viewing and selecting a live multiplayer network game;

Figure 11 is diagram showing the layout of a user interface that is dedicated to viewing and accessing options during a pause of a game;

Figure 12 is diagram showing the layout of a user interface that is dedicated to enabling viewers to vote for a game;

Figure 13 is diagram showing the layout of a user interface that is dedicated to showing viewers scores and game highlights;

Figure 14 is a block diagram for a multiple platforms digital television systems for multi-player games that can used to play other viewers on systems of Figure 4, Figure 5, Figure 6, Figure 7;

Figure 15 is a block diagram of a user Set top box that can be used to connect to the Game Server;

Figure 16 is a block diagram of Games Server connected by S-video connector to MPEG encoder;

Figure 17 is block diagram Games Server connected via AV multi-connector to MPEG encoder;

Figure 18 is a block diagram of a Game Server connected via a break out cable to an MPEG encoder;

Figure 19 is a block diagram of a Game Server connected via a break out box to an MPEG encoder;

Figure 20 is block diagram Cable digital television hardware architecture that can be used to access the games system of Figure 15;

Figure 21 is block diagram Satellite digital television hardware architecture that can be used to access the games system of Figure 15;

Figure 22 is block diagram Terrestrial digital television hardware architecture that can be used to access the games system of Figure 15;

Figure 23 is a user interface that can be used by viewers to view previews of games from which they can load a game;

Figure 24 is a user interface that can be used by viewers to access saved games files;

As will be understood the viewers terminal could includes many different parts. These could be provided via alternative ports connecting devices. Alternatively devices may be built in to a TV set as

Referring to Figure 1 the drawing, the viewer's terminal comprises of a set-top box 22, which is connected to a TV screen 23 by the TV Scart 50. Connected to a USB port 37 is a games pad 42 and Digital Video Disc (DVD) Player 52. Figure 1 illustrates a Digital Terrestrial Television viewer's configuration whereby a telephone line 36 is used as a return path. Figure 1 shows how a viewer may access and play the games through using a conventional games pad 42 and by using a telephone 36 as a return path. It will be appreciated that in practice a plurality of different connections may provide the return path, for example there may be a two way connection via the data input socket 38 to a cable TV content provider.

According to the present invention, means may be provided for using game pads and joysticks through software device drivers, which may be downloaded, installed or embedded on a set top box 22.

For example when a viewer first accesses the games system a request is sent via the remote control to an infrared optical port 54 on the set-top box 22. The set-top box 22 interprets the signal and sends a request upstream via the return path to a middleware server located within the TV operator headend. The middleware server then transmits data downstream to the set-top box 22 providing the viewer with the option to select controls. If the viewer selects controls, a signal is transmitted via a modem in the set top box 22 upstream to the middleware server, which process the request and transmits a signal downstream via the return path to the viewers set top box 22. The viewer is then provided with a menu from which they can select drivers for a games pad or joystick. The viewer may then select a driver from the menu which can then loaded downstream on to the viewers set top box.

Alternatively when a viewer connects a new device whether a joystick, games pad or

steering wheel device drivers may be installed on a smart card which can simply inserted into the set-top box 22 and will facilitate the use of a new device.

Alternatively drivers may be embedded in the device, whereby the games pad can be directly connected to the set-top box via the USB port 37. This way the viewer is not required to insert a smart card or download drivers onto the set-top box.

Referring to Figure 2 the drawing, the viewers terminal comprises of a set-top box 22, that is connected to a TV screen 23 by the TV Scart 50. Figure 2 shows a games pad 42 which is not physically connected by cables. The games pad has an infrared port 43 built in whereby the viewer can transmit radiation at varied frequencies in a electromagnetic spectrum to represent their position within the game. Through an optical port 43 on the viewers set-top box 22 a game controller then converts these waves into a command for controlling a game.

Figure 3 represents an alternative configuration of the viewers terminal which comprises of a set-top box 22, which is connected to a TV screen 23, which in turn is connected to a VCR 45 via an RF Lead. Connected to the set-top box 22 via a USB port is games console 69 which is connected to the TV screen 23 by a AV Multi Out Connector cable to S video input 87, audio input right 88 and audio input left 89. In this way graphics may be transmitted to the set-top box which can transmit content via the USB port to games console enabling viewers to access single and multi-player games on the games system through the games console.

It will be appreciated that in practice a plurality of different connections may used to connect the games console 69 to the TV screen 23 or Set-top box 22. For example the games console 69 may be connected by an AV cable to the VCR 45, which is connected to the TV screen 23 by TV scart lead. Alternatively simply the aerial input 91 and the telephone line 85, which would enable content on the games system to be accessed, could connect the games console 69. This would also enable viewers with games consoles to play multi-player networked games with subscribers on other networks. Games consoles could have an analogue to digital convertor enabling them to decode broadcast signals and display content

Figure 3 also illustrates a console with an infrared port 86, which enables an infrared games pad 42 to be used to play games on the games console 69.

As will be understood the games system includes many different parts. These could be provided in central location or may form part of distributed network of parts that are geographically separate. Indeed part of the games system may be located within one of the content providers facilities or shared across multiple points along a network. Figure 4 shows an example of this whereby the games system software is located on servers within a television broadcast facility.

Figure 4 shows a more detailed example of the games system architecture and

infrastructure, in which the main software is installed on a middleware server 1 at the headend of a cable TV operator that supports bi-directional or one-way games.

It will be appreciated that in practice a plurality of different television providers could be connected, for example satellite or terrestrial content providers. The software on the middleware server 1 controls many aspects of the overall games system functionality and particularly upstream requests from viewers, e.g. request to play a game, access games, access options, load a game or save a game.

Connected to the middleware servers 1 is a high-speed optical cable attaches the middleware server to a catalysts 2 whereby instructions can be transmitted to cache engine 9 for providing graphics and data at high transmission speeds. Also connected to the middleware servers 1 is a database server 7, which can be used for storing data files and viewers information. Connected to the middleware server 1 there is a graphics controller 8 which can be used for controlling the transmission of high speed graphics and data to viewers terminals. Also connected to the middleware server 1 there is graphics accelerator 34, which can be used to update and process graphics.

Connected to the middleware server 1 there is a catalysts 2, which is connected to a billing server 10 for payment processing, which is connected to a mail server 11 used for e-mail services, a cable manager server 12 used to manage bandwidth usage and an authentication server 13 that is used for authentication of viewers. Also connected to the catalysts 2 is a universal broadband router 14 that is operable to direct all incoming requests and communications. Connected to the universal broadband router 14 is a multiplexer 6, which combines digital programming from multiple signals into a single, multiplexed MPEG transport stream for transmitting over a TV network.

Connected to the multiplexer 6 is a video-on-demand server 4 that contains a database of video games available on demand, a local advert insertion 5 that is able to place regional adverts that provide relevant advertising for games. Also connected to the Multiplexer 6 is an MPEG encoder/decoder 3 that is used for compressing incoming signals.

Connected to the headend system of figure 4 is a viewers terminal 23 that has equipment capable of receiving cable TV signals. Of course in practice thousands of cable viewers would be connected. As shown at the cable viewers premises there is a Cable Modem 25, which is connected to a PC 24 and a games console 19 which provides access to the return path. Connected to the viewers terminal 23 is Set-top box 22 which has a television receiver, modem and MPEG decoder for receiving and decoding television signals to the viewers terminal 23.

Also connected to the viewers terminal 23 is a games console 21 which in turn is connected to the set-top box 22, which has a television receiver, modem and MPEG

decoder for receiving and decoding television signals to the viewers terminal 23.

Located on viewers set-top box 22, games console 19 and PC 24 is software for accessing the games system, device drives and game drivers for playing games. Alternatively access software and drives may instead be stored at a remote location, for example, in the middleware servers. The user terminals are each connected to a cable modem 25, which is in turn connected via hybrid fibre coaxial (HFC) cable to a local hub that has a multiplexer 18 and a router 17. In this way, signals from each cable user terminal can be sent via the cable modem 25 to the local hub.

Connected to the hub router 17 is a gigabit optical switch 16 that is selectively operable to connect each user terminal, typically via high bandwidth optical cable to the TV operator headend. The headend router 14 is operable to interpret the user originating signals and direct them to the game systems middleware servers 1. In this way, each of the users terminals can be connected to the games system.

According to one aspect of the present invention there is a system comprising a TV screen 72, a receiver, an encoder/decoder, a USB port, a games pad or remote control for sending commands to a middleware server 1 located in a TV data center. Means may be provided within a remote location for hosting, processing and transmitting game graphics within broadcast signal to a TV screen 72. The return path will facilitate means for interacting and playing a game, which will now be explained by way of example.

According to yet further aspect of the present invention, there is provided a games system, which enables viewers to select and play games via a dedicated TV Channel. Whereby graphics are transmitted to the set-top box 22 or in-built Digital TV via a wideband or narrowband broadcast signal and a graphics engine is located remotely, for example on a middleware server 1, process all of the game graphics. This would mean that the set-top box 22 would only being required to transmit requests via the return path to the middleware server 1 which then processes and transmits graphics back to the set-top box 22. This is advantageous.

During a televised program or TV commercial a viewer may be prompted to play a game. The viewer may respond to the prompt by pressing the red button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub which redirects the signal to a gigabit switch 16 situated on a high speed broadband network.

The gigabit switch 16 is operable to redirect the request across a high-speed broadband network to a broadband router 14 located within the headend or data

centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1, which processes the request. The middleware server 1 then sends an instruction to the billing server 10 for payment authorisation. Verification is the transmitted to middleware server 1 by a billing server 10. A signal is then transmitted by the middleware server 1 to the game data server 8, games controller, cache engine 9 and graphics accelerator 35 to begin a session. A signal is then transmitted downstream by the middleware server 1 to the viewers set-top box 22 to change channel to the required (PID) for the game. Content is then transmitted via a broadcast signal over wideband transmission signal which is then received by a receiver in the set-top box 22 which sends the signal to a decoder which translates the content from digital to analogue which is then displayed directly on the viewers screen.

Alternatively Content may be transmitted via a broadcast signal over narrowband transmission signal, which is then received by a receiver in the set-top box 22 which sends the signal to a decoder which translates the content from digital to analogue which is then displayed directly on the viewers screen.

Device drivers are then downloaded or transmitted to the set-top box 22 providing the facility for the use of USB, serial and infrared game pads and joysticks for the game.

Using the remote control or games pad 42 the viewer is able to send commands upstream via the return path to the middleware server 1 where the games engine processes graphics using the graphics accelerator 35, graphics controller 8, cache engine 9 and database 7.

The graphics engine located on the middleware server 1 then produces images using various 3D rendering techniques such as wire-frame, shaded perspective texture mapping, mip mapping, bump mapping, linear correction, environment mapping, multi-pass rendering, fogging, deformable meshes, key framed animation, multi-textured, perspective mapping, atmospheric effects, texture filtering and transparency. This is then filtered by the games controller 8 and then cached on the cache engine 9. In this way content may be accessed by the middleware server 1 from the cache engine 9 and transmitted to a catalysts 2 which redirects the signal to an router 14 which operable to direct the signal to an mpeg encoder 3.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted downstream via the return path or as a wideband broadcast signal whereby the set-top box 22 receiver decodes content which is then displayed on the viewers TV 23. In this way the set-top box 22 is not required to process the games graphics, it is only required to transmit commands upstream to the middleware server 1 and decode signals. This is advantageous.

According to one aspect of the present invention, means would be provided which would enable viewers to instantly access games by switching channel via a TV terminal using their remote control. For example in context of the present invention viewers may access the games system from a TV channel whereby content is transmitted over a wideband signal. If a viewer were to switch channels to a channel, which viewers are currently playing a game on, the viewer would see live content of the game currently being played.

The viewer may play the game by pressing the red button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub which redirects the signal to a gigabit switch 16 situated on a high speed broadband network.

The gigabit switch 16 is operable to redirect the request across a high-speed broadband network to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1, which processes the request. The middleware server 1 then sends an instruction to the billing server 10 for payment authorisation. Verification is the transmitted to middleware server 1 by a billing server 10. An signal is then transmitted by the middleware server 1 to the games data server 8, games controller 8, cache engine 9 and graphics accelerator 35 to begin a session.

The games, data is then extracted from the data server 112 and the graphics engine located on the middleware server 1 then produces the games images using the graphics accelerator 35. This is then filtered by the games controller 8 and then cached on the cache engine 9. In this way content may be accessed by the middleware server 1 from the cache engine 9 and transmitted to a catalysts 2 which redirects the signal to an router 14 which operable to direct the signal to an mpeg encoder 3.

The mpeg encoder 3 then compresses the content which is then multiplexed by the rate mux 6 and transmitted via a broadcast signal over wideband transmission signal which is then received by a receiver in the set-top box 22 which sends the signal to a decoder which translates the content from digital to analogue which is then displayed directly on the viewers screen.

In this way a viewer may switch between games just as they would if they were to switch through TV channels to view current TV programs being broadcast. This is

advantageous, as viewers would be able to switch between games in a near real-time environment. Whereas with current games systems to change a game, users would have to physically remove a CD/DVD and restart a new game whereas with the present view could simply change games as quickly as it would take to change channel on a TV.

According to one aspect of the present invention, means would be provided which would enable viewers to select games by voting via a TV terminal using their remote control. For example viewers may be provided the option to play one of four games and the game that receives the largest vote is then broadcast.

During a TV program a signal may be sent downstream by the middleware server 1 in the wideband or narrowband transmission to the viewers set-top box 22, which interprets the data and displays a prompt on the TV screen 23 for viewers to vote to play a game. The viewer may select a game by pressing select using their remote control or by pressing a number or colour button relating to the game of their choice. The viewer then to selects a game by pressing the appropriate button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high speed broadband network to a gigabit switch 16. The gigabit switch redirects the signal across the high-speed broadband network to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1. The middleware server 1 then interprets the data, which is then placed in the database 7 from which results are calculated and transmitted on wideband or narrowband signal to the viewers set-top box 22. The broadcast signal is then intercepted by a receiver in the set-top box 22 which translates the signal from digital to analogue to be displayed on the viewers TV screen 23.

Once all votes have been collected from viewers set-top box 22 the middleware Server 1 then loads the data relating to the game and transmits a signal to the broadband router 14 located in the headend. The router 14 is operable to redirect the signal to an gigabit optical switch 16 on the broadband network which redirects the signal to a router 17 situated at the local hub. The router 17 then directs over a hybrid fibre optic cable to the viewers set-top box 22 instructing the the set-top box 22 to switch channels to required program ID for the game with the most votes.

The graphics engine located on the middleware server 1 then produces images using various 3D rendering techniques such as wire-frame, shaded perspective

texture mapping, mip mapping, bump mapping, linear correction, environment mapping, multi-pass rendering, fogging, deformable meshes, key framed animation, multi-textured, perspective mapping, atmospheric effects, texture filtering and transparency.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted downstream via the return path and as a wideband or narrowband broadcast signal whereby the set-top box 22 receiver decodes content which is then displayed on the viewers TV 23.

This of course could be used for voting for TV programs and adverts.

According to yet further aspect of the present invention, there is provided a games system, which enables viewers to save games. Although most 1st generation and 2nd generation set-top boxes do not have a hard disc the viewer may still save games, through a middleware server 1 located at the headend of a TV operator.

The viewer is able to save a game at any point during a game by pressing the blue button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high speed broadband network to a gigabit switch 16 which redirects the signal to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1.

The middleware server 1 then interprets the requests and creates a data file containing information of the viewers game which is then stored remotely on the database 7.

To access data files of saved games a user may prompt a menu from which they can then press the red button to view saved games, which transmits a signal to the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high speed broadband network to a gigabit switch which redirects the signal to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-

directs the signal via the catalysts 2 to the middleware server 1.

The middleware server 1 then sends a request to the database for all game files of the viewer to be sent to the middleware server 1. A search is then performed on the database 7 and files are transmitted back to the middleware server 1 which then processes the files and transmits the content and data downstream to across the broadband network to a gigabit optical switch 16. The gigabit switch 16 then redirects the signal to a router 17, which is operable to redirect the signal over a hybrid fibre optic cable to a set-top box 22.

The set-top box 22 interprets the data and content, which is then displayed on the viewers TV 23 as menu of saved games.

The viewer may then use the remote control to scroll down or up to select saved games. To select a game viewer may either press number relating to the game file, or press select. Once the viewer has selected a signal is sent to the set-top box 22.

The set-top box 22 then interprets the signal, which is then sent via a modem, that is connected to a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to then redirect the request across a high speed broadband network to a gigabit switch which redirects the signal to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is interpreted by a broadband router 14 which redirects the signal via a catalyst 2 to the middleware server 1, which processes the request and loads the graphics for the saved game. A request is then transmitted downstream to the receiver in the set-top box 22 to switch channels to the required program ID for the game. The receiver then switches channel to required PID and content is then transmitted over a broadcast signal to the viewers set-top box 22, which is then displayed on the viewers TV screen 72.

The graphics engine located on the middleware server 1 then produces images which are then transmitted to the broadband router 14 which then redirects the data to mpeg encoder 3 which compresses the graphics before being multiplexed and transmitted as wideband or narrowband signal. The broadcast signal is then intercepted by a receiver in the set-top box 22 which translates the signal from digital to analogue to be displayed on the viewers TV screen 23.

In practice hundreds of thousands of cable viewers if not millions would be able to receive game content via the broadcast signal and transmit requests upstream to the middleware server 1 via a two-way return path thus facilitating the game play.

Means may be provided to store details on the viewer's game within a remotely located database, whereby when the viewer returns to play, they are then able to continue from the point at which they left the game.

During games viewers may pause play and go to options menu, or to switch over to a TV channel. The viewer may at any time during a game pause a game by pressing the pause or stop button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high speed broadband network to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1. The middleware server 1 which then interprets the requests and creates a data file containing information of the viewers game which is stored remotely on the database 7. When the viewer returns to play, they are then able to continue from the point at which they left the game by pressing play on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high speed broadband network to a gigabit switch 16 which redirects the signal to a
broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1. The graphics engine located on the middleware server 1 then continues to produce images of the game from the point the viewer pressed the pause button.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted downstream via the return path and as a wideband broadcast signal whereby the set-top box 22 receiver decodes content which is then displayed on the viewers TV 23.

Using the remote control the viewer is able to transmit commands via the set-top box 22 and modem upstream to the middleware server 1 and continue play.

According to yet further aspect of the present invention, means may be provided that would allow the viewer to pay to play a game on-demand at any time regardless of whether it is being broadcast. The viewer may access a game to play immediately by selecting a game from an interactive listing by pressing the select button on their remote control, which transmits a signal via infrared radiation to an optical port 54

located in the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high speed broadband network to a gigabit switch which redirects the request to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1. The middleware server then processes the request and transmits a signal via the catalysts 2 to the billing server 10 for payment authorisation.

Upon credit verification from the billing server 10 an instruction would be sent by the middleware server 1 via the return path to the set-top box 22 to switch channels to require program ID (PID) for the games content. The middleware server 1 then send a request via the catalyst 2 to the broadband router which then redirects the signal to a VOD/NVOD server 4 to transmit content relating to the program ID of game requested by the viewer.

Content is then streamed by the VOD/NVOD to a multiplexer 6, which combines the signal with a number of separate signals to be transmitted simultaneously over a single channel. Content is then transmitted downstream via the broadband network on a narrowband channel, which the set-top box 22 receiver decodes and displays content on the viewers TV 23. A two-way communication path is opened between the middleware server and the viewer's set-top box 22 enabling the viewer to command the game through a remote control or games pad.

In this way games can be provided on demand which utilises the return path and does not affect wideband transmissions for scheduled broadcast.

According to yet a further aspect of the present invention, means may be provided that would allow viewers to play multi-player games, whereby viewers using the same device are able to play against each other within a split screen mode.

The method for facilitating a multi-player games on cable digital television, according to the present invention comprises of a means to gathering file inputs and outputs from each controller and transmitting graphics in a split screen mode whereby 4 or more player's each using identifiable controllers can play. The middleware server 1 then processes the collected game data into game graphics, which are then transmitted over a wideband or narrowband signal to viewers terminals.

When viewers plays a multi-player game on single device commands are transmitted from the controllers via a USB port or an optical port 54 located in the set-top box 22.

A controller in the set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high-speed broadband network to a gigabit switch 16. The gigabit switch 16 redirects the signal to a broadband router 14 located in the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1. The middleware server 1 then interprets and processes the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9, games data server 7 and graphics controller 8.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted via a wideband or narrowband broadcast signal whereby a receiver in set-top box 22 feeds the signal to a decoder. The decoder then decodes content before being translated from digital to analogue to be displayed on the viewer's TV screen 23.

In this way viewers can play games within a multi-player environment on one TV whereby the middleware server 1 gathers data via return path from the viewer's controllers to generate the games graphics.

According to yet a further aspect of the present invention, means may be provided that would allow viewers to play multi-player networked games, whereby viewers are able to play against each other.

The method for facilitating a multi-player networked game on cable digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between player's set-top boxes to a middleware server 1. The middleware server 1 then processes the collected game data into game graphics, which are then transmitted over a wideband or narrowband signal to viewers terminals.

When a viewer plays a multi-player networked game commands are transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 22.

A controller in the set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high-speed broadband network to a gigabit switch, which redirects the signal to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1. The middleware

server 1 which then interprets and processes the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9, games data server 7 and graphics controller 8.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted via a wideband or narrowband broadcast signal whereby the set-top box 22 and set-top box 32 receiver decodes content which is then displayed on the viewers TV screen.

In this way viewers can play games within a multi-player networked environment whereby the middleware server 1 exchanges data via return path between the viewer's terminals. Because the HFC return path has the capacity of 2-4mb/s this allows multi-player networked games to be played at a higher performance than any current Internet system, which even with a high-speed broadband internet connection peak at a 512kb/s download and 128kb/s upload. This is advantageous.

According to yet further aspect of the present invention, means may be provided that would allow viewers to play multi-player networked games using alternative devices such as a games console, a PC, a Mac or set-top box.

The method for facilitating a multi-player networked game on cable digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between player's games consoles 21/19, PCs 24 and set-top boxes 22 to a middleware server 1. The middleware server 1 then processes the collected game data into game graphics, which are then transmitted over a wideband or narrowband signal to viewers terminals.

When a viewer plays a multi-player networked game commands are transmitted from the games pad via a cable to the games console 21.

A controller in the games console 21 then interprets the signal, which is then transmitted via a cable modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high-speed broadband network to a gigabit switch, which redirects the signal to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1. The middleware server 1 which then interprets and processes the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9, games data server 7 and graphics controller 8.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted via a wideband or narrowband broadcast signal whereby a

receiver built in the TV screen 23 or games console 21 decodes content from digital to analogue, which is then displayed on the viewers TV screen 23.

Alternatively the games console 19 may simply be connected to cable modem 25 which is operable to transmit signals over a HFC cable to a router 17 located at the local hub which redirects the signal to a gigabit switch 16 which is operable to direct the signal to a router 14 situated at the headend or data centre of a TV operator. The router 14 then directs the signal via a catalyst 2 to a middleware server 1, which processes the file inputs and outputs of views. The middleware server 1 then transmits a signal via the return path directly to games console 19, which processes the data of players file inputs and outputs using a graphics engine stored on a DVD. In this way users without digital TV may still participate in multiplayer networked games using a conventional games console 19 and play with viewers using a set-top box 22 who do not have a games console. This is advantageous.

It will be appreciated that with a conventional 128 kb/s Internet link users may join in multiplayer networked games using a games console 19 or PC 24 whereby graphics are processed by the device. For example data including file inputs and outputs may be transmitted via a 128 kb/s link to the middleware server 1, which processes the data. The middleware server 1 may then process and transmit content to viewers who a playing with a set-top boxes and exchange data between games consoles 19 and PCs 24 in which a graphics engine then processes the file inputs and outputs from other users terminal including cable TV set-top boxes and displays content on the users screen.

In this way viewers using a games console 19 can play games within a multi-player networked environment with viewers using a set-top box 22 or PC 24 whereby the middleware server 1 exchanges data via return path between the viewer's terminals.

According to yet further aspect of the present invention, means may be provided to enable a viewer using remote control or key broad to type in messages during a multi-player networked game and send messages to another viewer or group of viewers who are playing the game.

During play by pressing the green button on their remote control, an instant messaging window may be loaded providing the viewer with ability to type in a message, which is displayed on screen. The viewer may select send, whereby they are required to select the players they require to send the message to by either pressing select next to the players name or by pressing a number.

When user is satisfied they can then press the green button to send which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub.

The router 17 is operable to redirect the request across a high speed broadband network to a gigabit switch 16 which redirects the request to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1.

The middleware server 1 is then operable to gather and transmit the text messages to other viewers during a game, over a wideband signal to a broadband router which is operable to redirect data relating to the game and transmits a signal to the broadband router 14 located in the headend. The router 14 is operable to redirect the signal to an gigabit optical switch 16 on the broadband network which redirects the signal to a router 17 situated at the local hub. The router 17 then directs over a hybrid fibre optic cable to the viewers set-top box 22 which processes the text content which is then displayed on the viewers TV screen.

In this way viewers can send instant text messages during a multi-player networked game on cable TV whereby text is transmitted upstream to the middleware server 1 which intercepts the message and transmits the text message downstream to the specified recipients set-top boxes. The text message is then displayed on their TV screen in conjunction with the game graphics. This is advantageous as viewers may communicate with other viewers in a game, for example they might share tips or coordinate their efforts as a team to during a game.

According to yet further aspect of the present invention, means may be provided to enable a viewer using telephone and modem to talk with other viewers during a multi-player game. Whereby through using voice over IP technology, data and voice requests may be transmitted upstream to a middleware server 1, which is operable control the transmission of voice and data across a HFC cable between viewers during a game play.

Preferably means would be provided whereby viewers may switch communication channels to communicate players by pressing number keys and on the remote control to communicate with players.

Means may also be provided through a menu during a multi-player networked game to enable views to create a team file, whereby through pressing yellow button during play a communications channel is the opened from a viewers set-top box 22 to multiple viewers devices whereby a conference call is initiated. This is advantageous, as this will enable viewers to communicate with fellow players during a multi-player network game, thus enhancing the game play experience.

During play by pressing the blue button on their remote control, a window may be loaded providing the viewer with list of all players, which is displayed on screen. The viewer may then scroll down to select viewers by pressing the select button to initiate

the communication call during play the viewer can then press the green button which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high speed broadband network to a gigabit switch 16 which redirects the request to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1.

The middleware server 1 then interprets the request and the audio digitalised in packet forms which is then transmitted from the viewers set-top box 22 to a router 17 located at local hub. The router 17 then directs the signal to a gigabit optical switch 16 which is operable to redirect the signal voice a broadband network to a router 28 located on a second local hub. The router 28 then redirects the signal over a HFC cable to a set-top box 32. The set-top box then decodes the audio packets. In this way a communication line is then established between set-top box 22 to set-top box 32 enabling viewers to communicate with others during a game.

It will be appreciated that through using a two-way return path with VoIP this provides the means for communication for set-top box 22 to set-top box 32 or PC 21 to games console 29 or even games console 19 to set-top box 32. VoIP could be used to enable viewers to communicate during a game or whilst accessing other interactive services, such a shopping, banking and e-mail. This is advantageous.

According to yet further aspect of the present invention, means may be provided that would allow the viewer to input text details, via a remote or games pad, of their name, location and e-mail address. This information is then stored in a database which is transmitted on a score table which can be accessed by viewers who switch to a channel which is operating the games system. Viewers can then see details of other viewers scores. This may relate to multi-player or single player games

During a multi-player game the middleware server 1 processes game data and results are held within a database 7. On completion of the game, a signal is sent by the middleware server downstream via a narrowband or wideband signal to a router 14 which is operable to redirect the signal across the broadband network to a gigabit optical switch 16 which directs the signal to a router 17 located on the local hub. The router 17 then directs the signal across a hybrid fibre optic cable to a set-top box 22. The set-top box 22 receiver decodes content, which is then displayed on the viewers TV 23 prompting the viewer to input their details using the remote control. The viewer types in their details, for example they may use the numerical buttons on the remote or a keyboard to type in their name. A signal is then transmitted from the remote

control via infrared radiation to an optical port 54 located in the set-top box 22.

A controller in the set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high-speed broadband network to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1. The middleware server 1 which then interprets and processes the data and extracts viewers results from a database 7. The middleware server 1 then combines the data and creates a graphic table of the results with text details of all players including name, statistic, performance and scores. The middleware server 1 then transmits the data over a wideband signal, which is then presented on the TV channel, where viewers are able to see the winners of the last games, including details of name, performance and statistics.

According to yet a further aspect of the present invention, means may be provided allowing viewers to play back game footage of a game they have just completed.

Through the games system when a viewer completes a game they are provided four main options including reply game, continue, save and exit.

Using the remote control, viewers may press the yellow button to playback footage of game they have just played. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 22.

A controller in the set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high-speed broadband network to a gigabit switch 16 which directs the signal to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then redirected by the broadband router 17, via the catalysts 2 to the middleware server 1. Using the file inputs and outputs of the viewer, the graphics engine located on the middleware server 1 reproduces the game graphics.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted downstream as a wideband, or narrowband broadcast signal whereby the set-top box 22 receiver decodes content, which is then displayed on the viewers TV 23.

During playback the viewer may also select a second options menu from which they

may also select an individual player to view by scrolling down a menu to the required player and pressing the select button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 22.

A controller in the set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high-speed broadband network to a gigabit switch 16 which directs the signal to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then redirected by the broadband router 17, via the catalysts 2 to the middleware server 1. Using the file inputs and outputs of players the graphics engine located on the middleware server 1 is able to reproduce playbacks of each player.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted downstream as a wideband, or narrowband broadcast signal whereby the set-top box 22 receiver decodes content, which is then displayed on the viewers TV 23.

According to a yet further aspect of the present invention, viewers may select not only individual players to view playbacks of a game but also the camera angle.

Viewers may select an angle to view a playback of a game by scrolling down a menu to the required angle and pressing the select button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 22.

A controller in the set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high-speed broadband network to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then redirected by the broadband router 17, via the catalysts 2 to the middleware server 1. Using the file inputs and outputs of players the graphics engine located on the middleware server 1 is able to reproduce playbacks of the game at the required angle.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted downstream as a wideband, or narrowband broadcast signal whereby the set-top box 22 receiver decodes content, which is then displayed on the viewers TV 23.

In addition to the option to select camera angles and players viewers according to a

yet further aspect of the present invention, viewers may adjust the speed of playback, fast forward, rewind, zoom and view multiple cameras of the game.

Viewers may select additional cameras to view a playback of a game from by scrolling down a menu to the required cameras and pressing the select button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 22.

A controller in the set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high-speed broadband network to a gigabit switch 16, which directs the signal to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then redirected by the broadband router 17, via the catalysts 2 to the middleware server 1. Using the file inputs and outputs of players the graphics engine located on the middleware server 1 is able to reproduce several playbacks of the game all at different camera angles, positions and zoom.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted downstream as a wideband, or narrowband broadcast signal whereby the set-top box 22 receiver decodes content, which is then displayed on the viewers TV 23 in grid format.

Content may also be streamed using webcasting techniques for internet pages whereby viewers may see live footage of multiplayer games on a web site using a conventional PC 24 or games console 19 connected to a 128 kb/s internet link.

In this way users may interact and select options whereby the middleware 1, using the file inputs and outputs of users using games console 19 or PC 24 can produce images of a multiplayer networked game which is then streamed on a web site. This allows users without digital TV to view playbacks of multi-player games. However this will be inferior to using a digital TV in which playbacks are transmitted in real-time on a wideband television signal and as such the quality will not be the same.

According to yet a further aspect of the present invention, means may be provided to enable a viewer to rewind a game to earlier point of play whereby the user is able to continue playing. This is achieved by remotely storing file data relating to controller inputs, outputs and history of a user on a middleware server 1.

When a viewer loses a game, a signal is then transmitted by the middleware server 1 downstream to set-top box 22 which processes the signal and decodes content on to the viewers screen presenting a menu whereby the viewer has the option to rewind, continue, load game, exit game.

The viewer may then select rewind by pressing the blue button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 22.

A controller in the set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high-speed broadband network to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then redirected by the broadband router 17, via the catalysts 2 to the middleware server 1. Using the file inputs and outputs of players the graphics engine located on the middleware server 1 is able to reproduce playbacks of the game that is in reverse order.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted downstream as a wideband, or narrowband broadcast signal whereby the set-top box 22 receiver decodes content, which is then displayed on the viewers TV 23. The viewer then sees the game rewinding on screen. To stop the game rewinding at any point the viewer may press the blue button followed by the red button to play.

Through a TV channel viewers may access the games system main options whereby through selecting "live games" on the menu, viewers may view live footage of multi-player networked games and information on players names, performance, duration of play and numbers of players. From this the viewer may select a multi-player game and join in.

From a TV channel a viewer may be prompted to access the games system by a colour icon on the top of the screen. Using a remote control viewers may press the red button to access the games system, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 22.

The set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high speed broadband network to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then interpreted by the broadband router 17, which re-directs the signal via the catalysts 2 to the middleware server 1 which processes the request. Content is then transmitted via a broadcast signal over wideband transmission signal which is then received by a receiver in the set-top box 22 which sends the signal to a decoder which translates the content from digital to analogue which is then displayed directly on the viewers screen.

Using the remote control viewers may select "live games" a signal is then sent middleware server 1 which interprets the request and sends the required data downstream via a wideband signal which is then received by a receiver in the set-top box 22 which sends the signal to a decoder which translates the content from digital to analogue which is then displayed directly on the viewers TV screen 23.

The viewer is then presented with a menu of categories of games, which includes details of multi-player networked games, live footage, player names, performance, duration of game and number of players. Using the remote control the viewer can scroll down the menu, and press the select button to join in a live multi-player game. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 22.

A controller in the set-top box 22 then interprets the signal, which is then transmitted via a modem that is connected by a hybrid fibre optic cable to a router 17 located at the local hub. The router 17 is operable to redirect the request across a high-speed broadband network to a broadband router 14 located within the headend or data centre of the cable TV operator.

At the headend the signal is then redirected by the broadband router 17, via the catalysts 2 to the middleware server 1 which processes the request. The middleware server 1 then sends an instruction to the billing server 10 for payment authorisation. Verification is the transmitted to middleware server 1 by a billing server 10.

A signal is then transmitted by the middleware server 1 to the games data server 8, games controller, cache engine 9 and graphics accelerator 35 to begin a session. Using the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9, games data server 7 and graphics controller 8.

A signal is then transmitted downstream by the middleware server 1 to the viewers set-top box 22 to change channel to the required (PID) for the game.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted downstream as a wideband, or narrowband broadcast signal whereby the set-top box 22 receiver decodes content from digital to analogue, which is then displayed directly on the viewers screen 23.

Using the remote control or games pad 42 the viewer is able to send commands upstream via the return path to the middleware server 1 where using the file inputs and outputs of each viewer the games engine processes graphics which is then transmitted as a a wideband, or narrowband broadcast signal to the viewers set-top box 22, which is then displayed on the viewers TV screen. In this way the viewer may visually select and join in a live multi-player networked game at any time during the

game.

Viewers are also able to select via remote control or game pad 42 other viewers and challenge to a multi-player networked game. When a viewer challenges another viewer a signal is sent via a remote control or games pad 42 to a game controller in the set-top box 22 which converts these levels to numbers using an analogue to digital converter (ADC) which is also installed on a Set-top box 22.

The signal is then processed by the set-top box 22 which using a cable modem then transmits a request upstream along a HFC cable, referred to as the return path, to a router 17 in the local hub. The router 17 then redirects the request to an optical switch 16 which directs the request to across the broadband network to a router 14 in located in the headend of the cable TV operator. The router 14 then directs the request via the catalysts 2 to the middleware server 1 which processes the request and transmits data back via the broadband network to the viewers set-top box notifying the challenged viewer of the other viewers challenge on their TV screen 33.

The challenged viewer is then provided the option to play a multi-player networked game. Using their remote control the viewer presses a green key to accept. A request is then sent via the viewers set-top box 32 to a router 28 located on the local hub, which redirects the request over the broadband network to a optical switch 26. The optical switch 26 then directs the request to across the broadband network to a router 14 in located in the headend of the cable TV operator.

The router 14 then directs the request via the catalysts 2 to the middleware server 1 which processes the request and transmits data downstream over the broadband network to the original viewers set-top box 22. The set-top box 22 interprets the data and displays a notification of acceptance of challenged viewer to play a multi-player networked game on the TV screen 23. An instruction is then sent to both viewers receivers to switch channels to the correct program ID.

The graphics engine located on the middleware server 1 then produces images using various 3D rendering techniques such as wire-frame, shaded perspective texture mapping, mip mapping, bump mapping, linear correction, environment mapping, multi-pass rendering, fogging, deformable meshes, key framed animation, multi-textured, perspective mapping, atmospheric effects, texture filtering and transparency.

Content is then compressed and encoded into a mpeg format using the mpeg encoder 3 and is transmitted downstream via the return path and as a wideband broadcast signal. A receiver in the set-top box 22 and set-top box 32 then decodes the content, which is then displayed on the viewers TV screen 23 and TV screen 33.

Using the remote control or games pad 42 both viewers are able to send commands upstream via the return path to the middleware server 1 where the games engine

processes graphics using the graphics accelerator 35, graphics controller 8, cache engine 9 and database 7.

In addition to cable TV users be able to access the games system, Figure 5 shows examples of how a satellite home user would be able to access the games system. In this case the users equipment includes a satellite set-top box 70 with a satellite dish 87 that can receive satellite TV signals, a telephone 75 for the return path, a games console 69, a PC 88 and a Personal Video Recorder (PVR) 74.

The user terminals are each connected to a ADSL modem, which is in turn connected via a telephone 75 to the ADSL loop 82. Connected to ADSL loop 82 is a gigabit switch 81 and a boot server 80, which are situated at the local hub. In this way, signals from each satellite user terminals can be sent via the ADSL modem 25 to the local hub.

Connected to the gigabit switch 81 is an ATM switch 68 with DSLAM that is selectively operable to connect each users terminals, typically via high band width ATM cable to the headend of the TV operator. An ATM switch 68 located at the headend, is operable to interpret the user originating signals and direct them to the games systems middleware servers 1. In this way, each of the users terminals can be connected to the games system.

According to one aspect of the present invention there is a system comprising
a TV screen 72, a satellite dish 87, a set-top box 70 with a receiver and an encoder/decoder, a USB port, a games pad or remote control for sending commands to a middleware server 1 located in a TV data center. Means may be provided within a remote location for hosting, processing and transmitting game graphics within broadcast signal to a TV screen 72. A telephone 75 by which is connected to asymmetric digital subscriber line ADSL which provides the return path that will facilitate means for interacting and playing a game, which will now be explained by way of example.

According to yet further aspect of the present invention, there is provided a games system, which enables viewers to select and play games via a dedicated TV Channel. Whereby graphics are transmitted to the set-top box 70 or integrated digital TV 94 via a broadcast stream and a graphics engine which is located remotely, for example on a middleware server 1, whereby the middleware server 1 is able to process all of the game graphics. This would mean that the set-top box 70 would only be required to transmit requests via the return path to the middleware server 1 which then processes and transmits graphics back to the set-top box 70. This is advantageous.

During a televised program or TV commercial a viewer may be prompted to play a game. The viewer may respond to the prompt by pressing the red button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 70.

The set-top box 70 then interprets the signal, which is then sent via a modem that is connected to the telephone 75. The signal is then carried across the ADSL loop 82 to a gigabit switch 81 located at the hub. The gigabit switch 81 is operable to then redirect the request across a high speed ATM network to an ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by an ATM switch 105, which re-directs the signal to the middleware server 1 which processes the request. The middleware server 1 then sends an instruction to the billing server for payment authorisation. Verification is the sent to middleware server 1. An instruction is then sent by the middleware server to the games database 7, games controller 8, graphics accelerator 35 and cache engine 7 to begin a session. A signal is then transmitted to the viewers set-top box 70 to change channel to the required (PID) for the game. Content is then transmitted via a broadcast signal over the digital satellite broadcast which is received by an 18-inch receiver dish 87 which feeds the signal to a decoder in the set-top box 70. The decoder translates the content from digital to analogue and the games graphics are then displayed directly on the viewers TV screen 72. Device drivers are then downloaded or transmitted to the set-top box providing the facility for the use of USB, serial and infrared game pads and joysticks.

Using the remote control or games pad 42 the viewer is able to send commands upstream via the return path to the middleware server 1 where the games engine processes graphics using the graphics accelerator 35, graphics controller 8, cache engine 9 and database 7.

The graphics engine located on the middleware server 1 then produces images using various 3D rendering techniques such as wire-frame, shaded perspective texture mapping, mip mapping, bump mapping, linear correction, environment mapping, multi-pass rendering, fogging, deformable meshes, key framed animation, multi-textured, perspective mapping, atmospheric effects, texture filtering and transparency. This is then filtered by the games controller 8 and then cached on the cache engine 9. In this way content may be accessed by the middleware server 1 from the cache engine 9 and transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder 60.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted downstream via the return path or via a satellite broadcast signal whereby the set-top box 70 receiver decodes content which is then displayed on the viewers TV 72. In this way the set-top box 70 is not required to process the games graphics, it is only required to transmit commands upstream to the middleware server 1 and decode signals. This is advantageous.

Alternatively the viewer may access a TV channel whereby the viewer can prompt a menu to be loaded from which they can select to view single and multi-player games,

tips & hints, live games, saved games, etc.

Preferably game menus can be overlaid on direct broadcast thus the viewer is able to select options whilst the background, graphics, video and music are being broadcast. This is advantageous as it does not require the set-top box 70 to process and draw background graphics or process sound as this is already being broadcast. Thus the set-top box 70 is only required to transmit requests to the middleware server 1 for content to be processed which is made possible by the return path.

This is achieved through using a remote control, games or joystick, which is operable to transmit a signal to the set-top box 70. The set-top box 70 then interprets the signal which is then sent via a modem, that is connected to the telephone 75, across the ADSL loop 82 to an ATM switch 81 located at the hub. The ATM switch 81 is operable to then redirect the request across a high speed ATM network to a switch located within the headend or data centre of the satellite TV operator.

At the headend the signal is interpreted by an ATM switch 105, which re-directs the signal to the middleware server 1 which processes the request. Content is then transmitted downstream to across the ATM backbone to an ATM switch 81 which redirects the signal over the ADSL loop 82 to a set-top box 70, via the telephone 75. The set-top box 70 interprets the data, which is then displayed on the viewers TV 72 as a menu over video being transmitted over a wideband signal providing background graphics and sound. The viewer is then able to press the blue button to view single or multiple games, press the green button to view hints & tips, press yellow button to view live games, press red button to view saved games or press backup to return to the channel. Using a remote control or games pad the viewer may then press the red button to view saved games, which transmits a signal to the set-top box 70.

The set-top box 70 then interprets the signal which is then sent via a modem, that is connected to the telephone 75, across the ADSL loop 82 to an ATM switch 81 located at the hub. The ATM switch 81 is operable to then redirect the request across a high speed ATM network to a switch located within the headend or data centre of the satellite TV operator.

At the headend the signal is interpreted by an ATM switch 105, which re-directs the signal to the middleware server 1 which processes the request. The middleware server 1 then sends a request to the database for all game files of the viewer to be sent to the middleware server 1. A search is then performed on the database 7 and files are transmitted back to the middleware server 1 which the processes the files and transmits the content and data downstream to across the ATM backbone to an ATM switch 81. The ATM switch then redirects the signal over the ADSL loop 82 to a set-top box 70, via the telephone 75 to the set-top box 77 which interprets the data and content which is then displayed on the viewers TV 72 as menu of saved games. The viewer may then use the remote control to scroll down or up to select saved games. To select a game viewer may either press number relating to the game file, or press

select. Once the viewer has selected a signal is sent to the set-top box 70.

The set-top box 70 then interprets the signal which is then sent via a modem, that is connected to the telephone 75, across the ADSL loop 82 to an gigabit switch 81 located at the hub. The gigabit switch 81 is operable to then redirect the request across a high speed ATM network to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is interpreted by an ATM switch 105 which re-directs the signal to the middleware server 1 which processes the request and loads the graphics for the saved game.

The games, data is then extracted from the data server 112 and the graphics engine located on the middleware server 1 then produces the games images using the graphics accelerator 35. This is then filtered by the games controller 8 and then cached on the cache engine 9. In this way content may be accessed by the middleware server 1 from the cache engine 9 and transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder 60.

Content is then multiplexed by the multiplexer 4 and transmitted by the satellite transmitter 67 over a wide swath. The broadcast signal is then intercepted by the satellite dish 87 which is connected to the set-top box 70, in which a receiver then translates the signal from digital to analogue to be displayed on the viewers TV screen 72. A request is then transmitted downstream to the receiver in the set-top box 70 to switch channels to the required program ID for the game. The receiver then switches channel to required PID and content is then transmitted over a broadcast signal to the viewers set-top box 70, which is then displayed on the viewers TV screen 72.

In practice hundreds of thousands of satellite viewers if not millions would be able to receive game content via the broadcast signal and transmit requests upstream to the middleware server 1 via the return path through the telephone thus facilitating the game play.

According to one aspect of the present invention, means would be provided which would enable viewers to instantly access games by switching channel via a TV terminal using their remote control. For example in context of the present invention viewers may access the games system from a TV channel whereby content is transmitted over a wideband signal. If a viewer were to switch channels to a channel, which viewers are currently playing a game on, the viewer would see live content of the game currently being played.

The viewer may play the game by pressing the red button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-

top box 70.

The set-top box 70 then interprets the signal, which is then transmitted via a modem that is connected by a telephone 75 to the ADSL loop. Connected to the ADSL loop is a gigabit switch 81 located at the local hub which redirects the signal to a ATM switch 68 situated on a high speed ATM network.

The ATM switch 68 is operable to redirect the request across a high-speed ATM network to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to a middleware server 1, which processes the request. The middleware server 1 then sends an instruction to the billing server 10 for payment authorisation. Verification is the transmitted to middleware server 1 by a billing server 10. A signal is then transmitted by the middleware server 1 to the games data server 8, games controller 8, cache engine 9 and graphics accelerator 35 to begin a session.

The games, data is then extracted from the data server 112 and the graphics engine located on the middleware server 1 then produces the games images using the graphics accelerator 35. This is then filtered by the games controller 8 and then cached on the cache engine 9. In this way content may be accessed by the middleware server 1 from the cache engine 9 and transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder 60.

Content is then compressed by an mpeg encoder 60 and transmitted via a broadcast signal over wideband transmission signal which is then received by a receiver in the set-top box 70 which sends the signal to a decoder which translates the content from digital to analogue which is then displayed directly on the viewers TV screen 72.

In this way a viewer may switch between games just as they would if they were to switch through TV channels to view current TV programs being broadcast. This is advantageous, as viewers would be able to switch between games in a near real-time environment. Whereas with current games systems to change a game, users would have to physically remove a CD/DVD and restart a new game whereas with the present view could simply change games as quickly as it would take to change channel on a TV.

According to one aspect of the present invention, means would be provided which would enable viewers to select games by voting via a TV terminal using their remote control. For example viewers may be provided the option to play one of four games and the game that receives the largest vote is then broadcast.

During a TV program a signal may be sent downstream by the middleware server 1 in

the wideband or narrowband transmission to the viewers set-top box 70, which interprets the data and displays a prompt on the TV screen 72 for viewers to vote to play a game. The viewer may select a game by pressing select using their remote control or by pressing a number or colour button relating to the game of their choice. The viewer then to selects a game by pressing the appropriate button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 70.

The set-top box 70 then interprets the signal, a modem then transmits the signal via a telephone 75 that is connected by a ADSL cable 82 to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. The middleware server 1 then interprets the data, which is then placed in the database 7 from which results are calculated and transmitted on wideband or narrowband signal to the viewers set-top box 70. The broadcast signal is then intercepted by a 18 inch dish receiver 87 which is feed into the set-top box 70 in which a decoder translates the signal from digital to analogue to be displayed on the viewers TV screen 72.

Once all votes have been collected from viewers set-top box 70 the middleware Server 1 then loads the data relating to the game and transmits a signal to the ATM switch 105 located in the headend. The ATM switch 105 is operable to redirect the signal to an ATM switch 68 located on the ATM network which redirects the signal to a gigabit switch 81 situated at the local hub. The switch 81 then directs over a ADSL cable to the viewers set-top box 70 instructing the set-top box 70 to switch channels to required program ID for the game with the most votes.

The graphics engine located on the middleware server 1 then produces images using various 3D rendering techniques such as wire-frame, shaded perspective texture mapping, mip mapping, bump mapping, linear correction, environment mapping, multi-pass rendering, fogging, deformable meshes, key framed animation, multi-textured, perspective mapping, atmospheric effects, texture filtering and transparency.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted downstream via the return path and as a wideband or narrowband broadcast signal whereby a satellite dish 87 intercepts the signal which is feed into the set-top box 70. A decoder in the set-top box 70 decodes the signal from analogue to digital. content is then displayed on the viewers TV 72.

This of course could be used for voting for TV programs and adverts.

According to yet further aspect of the present invention, there is provided a games system, which enables viewers to save games. Although most 1st generation and 2nd generation set-top boxes do not have a hard disc the viewer may still save games, through a middleware server 1 located at the headend of a TV operator.

The viewer is able to save a game at any point during a game by pressing the blue button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 70.

The set-top box 70 then interprets the signal, a modem then transmits the signal via a telephone 75 that is connected by a ADSL cable 82 to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. The middleware server 1 then interprets the requests and creates a data file containing information of the viewers game which is then stored remotely on the database 7.

To access data files of saved games a user may prompt a menu from which they can then press the red button to view saved games, which transmits a signal to the set-top box 70.

The set-top box 70 then interprets the signal, a modem then transmits the signal via a telephone 75 that is connected by a ADSL cable 82 to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the middleware server 1.
The middleware server 1 then sends a request to the database for all game files of the viewer to be sent to the middleware server 1. A search is then performed on the database 7 and files are transmitted back to the middleware server 1 which then processes the files and transmits the content and data downstream to across the ATM network to a ATM switch 68. The ATM switch 68 then redirects the signal to a gigabit switch 81 located in local hub, which is operable to redirect the signal over a ADSL cable to a set-top box 70.

The set-top box 70 interprets the data and content, which is then displayed on the viewers TV 72 as menu of saved games.

The viewer may then use the remote control to scroll down or up to select saved games. To select a game viewer may either press number relating to the game file, or press select. Once the viewer has selected a signal is transmitted via the remote control to an optical port where controller in the set-top box 70 converts the signal to numbers.

The set-top box 70 then interprets the data, and signal is then transmitted by a modem via the telephone 75, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the middleware server 1, which processes the request and loads the graphics for the saved game. A request is then transmitted downstream to the receiver in the set-top box 70 to switch channels to the required program ID for the game. The receiver then switches channel to required PID and content is then transmitted over a broadcast signal to the viewers set-top box 70, which is then decoded and converted from digital to analogue before being displayed on the viewers TV screen 72.

The graphics engine located on the middleware server 1 then produces images which are then transmitted to an ATM switch 105 which then redirects the data via a second ATM switch 65 to an mpeg encoder 60 which compresses the graphics. The data is then multiplexed and transmitted as a wideband or narrowband signal over a satellite link. The broadcast signal is then intercepted by the viewers satellite receiver dish which is then feed into the set-top box 70 which translates the signal from digital to analogue to be displayed on the viewers TV screen 72.

In practice hundreds of thousands of satellite viewers if not millions would be able to receive game content via the broadcast signal and transmit requests upstream to the middleware server 1 via a ADSL return path thus facilitating the game play.

Means may be provided to store details on the viewer's game within a remotely located database 7, whereby when the viewer returns to play, they are then able to continue from the point at which they left the game.

During games viewers may pause play and go to options menu, or to switch over to a TV channel. The viewer may at any time during a game pause a game by pressing the pause or stop button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 70.

The set-top box 70 then interprets the data, and signal is then transmitted by a modem via the telephone 75, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request

across a high speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 68 located within the headend or data centre of the satellite TV operator.

The ATM switch 68 then redirects the signal to the middleware server 1 which then interprets the requests and creates a data file containing information of the viewers game which is stored remotely on the database 7. When the viewer returns to play, they are then able to continue from the point at which they left the game by pressing play on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 70.

The set-top box 70 then interprets the data, and signal is then transmitted by a modem via the telephone 75, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. A graphics engine located on the middleware server 1 then produces images of the game from the point the viewer pressed the pause button using the data file stored in the database 7.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted downstream via the return path or via a satellite as a broadcast signal whereby a satellite dish receiver 87 intercepts the signal which is feed into the set-top box 70. A decoder in the set-top box 70 then decodes content which is then displayed on the viewers TV screen 72.

Using the remote control the viewer is able to transmit commands via the set-top box 70 and modem upstream to the middleware server 1 and continue play.

According to yet further aspect of the present invention, means may be provided that would allow the viewer to pay to play a game on-demand at any time regardless of whether it is being broadcast. The viewer may access a game to play immediately by selecting a game from an interactive listing by pressing the select button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 70.

The set-top box 70 then interprets the data, and signal is then transmitted by a modem via the telephone 75, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the middleware server which then processes the request and transmits a signal via the ATM switch 68 to the billing server 10 for payment authorisation.

Upon credit verification from the billing server 10 an instruction would be sent by the middleware server 1 via the return path to the set-top box 70 to switch channels to require program ID (PID) for the games content. The middleware server 1 then transmits a request via the ATM switch 105 to another ATM switch 65 which then redirects the signal to a VOD/NVOD server 4 to transmit content relating to the program ID of game requested by the viewer.

Content is then streamed by the VOD/NVOD to a multiplexer 6, which combines the signal with a number of separate signals to be transmitted simultaneously over a single channel. Content is then transmitted downstream via the ATM network on a narrowband channel, which the set-top box 70 decodes and displays content on the viewers TV screen 72. A two-way bi-directional communication path is opened between the middleware server 1 and the viewer's set-top box 70 enabling the viewer to command the game through a remote control or games pad.

In this way games can be provided on demand which utilises the return path and does not affect wideband transmissions for scheduled broadcasts.

According to yet a further aspect of the present invention, means may be provided that would allow digital satellite viewers to play multi-player games, whereby viewers using the same device are able to play against each other within a split screen mode.

The method for facilitating a multi-player games on satellite digital television, according to the present invention comprises of a means to gathering file inputs and outputs from each controller and transmitting graphics in a split screen mode whereby 4 or more player's each using identifiable controllers can play. The middleware server 1 then processes the collected game data into game graphics, which are then transmitted over a wideband or narrowband signal to viewers terminals.

When viewers plays a multi-player game on single device commands are transmitted from the controllers via a USB port or an optical port 54 located in the set-top box 70.

A controller in the set-top box 70 then interprets the data, and signal is then transmitted by a modem via the telephone 75, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high-speed ATM network to an ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the satellite TV operator.

The ATM switch 68 redirects the signal to the middleware server 1, which then interprets and processes the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9, games data server 7 and graphics controller 8.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted via a satellite broadcast signal whereby a satellite dish receiver intercepts the signal which is feed into the set-top box 70. A decoder in the set-top box decodes the content from which is then translated from digital to analogue before being displayed on the viewers TV screen 73.

In this way viewers can play games within a multi-player environment on one TV whereby the middleware server 1 gathers data via return path from the viewer's controllers to generate the games graphics.

According to yet a further aspect of the present invention, means may be provided that would allow satellite viewers to play multi-player networked games, whereby viewers are able to play against each other.

The method for facilitating a multi-player networked game on satellite digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between player's set-top boxes to a middleware server 1. The middleware server 1 then processes the collected game data into game graphics, which are then transmitted over a broadcast signal to viewers terminals.

When a viewer plays a multi-player networked game commands are transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

A controller in the set-top box 70 then interprets the data, and signal is then transmitted by a modem via the telephone 75, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high-speed ATM network to an ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the satellite TV operator.

The ATM switch 105 redirects the signal to the middleware server 1, which then interprets and processes the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9, games data server 7 and graphics controller 8.

The games, data is then extracted from the data server 112 and the graphics engine located on the middleware server 1 then produces the games images using the graphics accelerator 35. This is then filtered by the games controller 8 and then

cached on the cache engine 9. In this way content may be accessed by the middleware server 1 from the cache engine 9 and transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder 60.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted via a satellite over a broadcast signal whereby the participating viewers satellite dish receivers 87, 101 are operable to intercept the signal. The signal is then feed into set-top box 70 and set-top box 100. A decoder in the set-top box decodes the content from which is then translated from digital to analogue before being displayed on participating viewers TV screens 73, 102.

In this way viewers can play games within a multi-player networked environment whereby the middleware server 1 exchanges data via return path between the viewer's terminals. Because the ADSL return path has the capacity of 2mb/s this allows multi-player networked games to be played at a higher performance than any current Internet system, which even with a high-speed broadband internet connection peak at a 512kb/s download and 128kb/s upload. This is advantageous.

According to yet further aspect of the present invention, means may be provided that would allow viewers to play multi-player networked games on a digital satellite network using alternative devices such as a games console, a PC, a Mac or a set-top box.

The method for facilitating a multi-player networked game on satellite digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between player's games consoles 69 and 76, PCs 78, set-top boxes 70 and 100 to a middleware server 1. The middleware server 1 then processes the collected game data into game graphics, which are then transmitted via a satellite as a broadcast signal to viewers terminals.

In the instance of a games console, when a viewer plays a multi-player networked game commands are transmitted from the games pad via a cable to the games console 76.

A controller in the games console 76 then interprets the signal, which is then transmitted by a modem via a telephone 75, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high-speed ATM network to an ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the satellite TV operator.

The ATM switch 105 redirects the signal to the middleware server 1, which then interprets and processes the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache

engine 9, games data server 7 and graphics controller 8.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 3 and transmitted via a satellite as a broadcast signal. A receiver built in the TV screen 102 or games console 76 decodes content from digital to analogue, which is then displayed on the viewer's TV screen 102.

Alternatively the games console 76 may simply be connected to modem which connected to a telephone 25 which is operable to transmit signals over a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to direct the signal to across a high-speed ATM network to an ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the satellite TV operator.

The ATM switch 105 redirects the signal to the middleware server 1, which processes the file inputs and outputs of views. The middleware server 1 then transmits a signal via the return path directly to games console 76, which processes the data of players file inputs and outputs using a graphics engine stored on a DVD. In this way, users without digital TV may still participate in multi-player networked games using a conventional games console 76 and play with viewers using a satellite set-top box 102 who do not have a games console. This is advantageous.

It will be appreciated that with a conventional 128 kb/s Internet link users may join in multiplayer networked games on satellite TV using a games console 102 or PC 78 whereby graphics are processed by the device. For example data including file inputs and outputs may be transmitted via a 128 kb/s link to the middleware server 1, which processes the data. The middleware server 1 may then process and transmit content to viewers who a playing with a set-top boxes and exchange data between games consoles 102 and PCs 78. In the games consoles 76 and PC 78 a graphics engine then processes the file inputs and outputs from other users terminal including satellite TV set-top boxes and display content on the users screen.

In this way viewers using a games console 102 can play games within a multi-player networked environment with viewers using a satellite set-top box 70 or PC 78 whereby the middleware server 1 exchanges data via return path between the viewer's terminals. This is advantageous.

According to yet further aspect of the present invention, means may be provided to enable a viewer using remote control or key broad to type in messages during a multi-player networked game and send messages to another viewer or group of viewers who are playing the game.

During play by pressing the green button on their remote control, an instant messaging window may be loaded providing the viewer with ability to type in a message, which is displayed on screen. The viewer may select send, whereby they

are required to select the players they require to send the message to by either pressing select next to the players name or by pressing a number.

When user is satisfied they can then press the green button to send which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 70.

The set-top box 70 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. The middleware server 1 is then operable to gather and transmit the text messages to other viewers during a game, via a broadcast signal back to the ATM switch 105. The ATM switch 105 is operable to redirect the signal to an ATM switch 68 on the ATM network which redirects the signal to a gigabit switch 81 situated at the local hub. The switch 81 then directs over a ADSL cable to the viewers set-top box 70 which processes the text content which is then displayed on the viewers TV screen.

In this way viewers can send instant text messages during a multi-player networked game on satellite TV whereby text is transmitted upstream to the middleware server 1 which intercepts the message and transmits the text message downstream to the specified recipients set-top boxes. The text message is then displayed on their TV screen in conjunction with the game graphics. This is advantageous as viewers may communicate with other viewers in a game, for example they might share tips or coordinate their efforts as a team to during a game.

Alternatively text may be transmitted via a satellite transmission using transponder bandwidth to carry data and video in a two-way satellite transmission. However this is more costly than using a DSL cable as the return path as this requires transponder bandwidth on digital broadcasting satellites systems.

According to yet further aspect of the present invention, means may be provided to enable a viewer using telephone 75 and modem to talk with other viewers during a multi-player game on digital satellite television. Whereby through using voice over IP technology, data and voice requests may be transmitted upstream to a middleware server 1, which is operable control the transmission of voice and data across a DSL cable between viewers during a game play.

Preferably means would be provided whereby viewers may switch communication channels to communicate players by pressing number keys and on the remote control to communicate with players.

Means may also be provided through a menu during a multi-player networked game to enable views to create a team file, whereby through pressing yellow button during play a communications channel is the opened from a viewers set-top box 70 to multiple viewers devices whereby a conference call is initiated. This is advantageous, as this will enable viewers to communicate with fellow players during a multi-player network game, thus enhancing the game play experience.

During play by pressing the blue button on their remote control, a window may be loaded providing the viewer with list of all players, which is displayed on screen. The viewer may then scroll down to select viewers by pressing the select button to initiate the communication call during play the viewer can then press the green button which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 70.

The set-top box 70 then interprets the signal, which is then transmitted by a modem that is connected to telephone. The signal is then carried over the ADSL loop 82 to a gigabit switch 81 located at the local hub. The switch 81 is operable to redirect the request across a high-speed ATM network to a ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1.

The middleware server 1 then interprets the request and opens up a IP communication line between the specified viewers.

Using VoIP audio is digitalised in packet forms which is then transmitted from the viewers set-top box 70 to a switch 81 located at local hub. The switch 81 then directs the signal to over the ADSL loop specified viewers set-top box 32. The set-top box then decodes the audio packets. In this way a communication line is then established between set-top box 70 to set-top box 100 enabling viewers to communicate with others during a game.

It will be appreciated that through using a return path with VoIP this provides the means for communication for set-top box 70 to set-top box 100 or PC 78 to games console 69 or even games console 76 to set-top box 70. VoIP could be used on satellite digital television to enable viewers to communicate during a game or whilst accessing other interactive services, such a shopping, banking and e-mail. This is advantageous.

According to yet further aspect of the present invention, means may be provided that would allow the viewer to input text details, via a remote or games pad, of their name, location and e-mail address. This information is then stored in a database which is transmitted on a score table which can be accessed by viewers who switch to a

channel which is operating the games system. Viewers can then see details of other viewers scores. This may relate to multi-player or single player games

During a multi-player game the middleware server 1 processes game data and results are held within a database 7. On completion of the game, the middleware server 1 sends a signal downstream via a broadcast signal to an ATM switch 105. The ATM switch 105 is operable to redirect the signal across the ATM network to a ATM switch 68 which directs the signal to a ATM switch 81 located on the local hub. The switch 81 then directs the signal across a ADSL loop to a set-top box 70. The set-top box 70 then interprets the data, which is then displayed on the viewer's TV screen 72 prompting the viewer to input their details using the remote control. The viewer types in their details, for example they may use the numerical buttons on the remote or a keyboard to type in their name. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

Through a controller the set-top box 70 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1.

The middleware server 1 then interprets and processes the data and extracts all the viewers results from a database 7. The middleware server 1 then combines the data and creates a graphic table of the results with text details of all players including name, statistic, performance and scores. The middleware server 1 then transmits the data via the return path or via a satellite as a broadcast signal, which is then presented on the TV screen 72, where viewers are able to see the winners of the last games, including details of name, performance and statistics.

According to yet a further aspect of the present invention, means may be provided allowing viewers to play back game footage of a game they have just completed.

Through the games system when a viewer completes a game they are provided four main options including reply game, continue, save and exit.

Using the remote control, viewers may press the yellow button to playback footage of game they have just played. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

A controller in the set-top box 22 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit

switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. Using the file inputs and outputs of the viewer, the graphics engine located on the middleware server 1 reproduces the game graphics.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted via the return path or via a satellite as a broadcast signal whereby the set-top box 70 receiver decodes content, which is then displayed on the viewers TV 72.

During playback the viewer may also select a second options menu from which they may also select an individual player to view by scrolling down a menu to the required player and pressing the select button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

A controller in the set-top box 70 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. Using the file inputs and outputs of players gathered during play by the middleware server 1, the graphics engine is then able to reproduce playbacks of each player.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted downstream via the return path or via satellite as a broadcast signal whereby the set-top box 70 receiver decodes content, which is then displayed on the viewers TV 72.

According to a yet further aspect of the present invention, viewers may select not only individual players to view playbacks of a game but also the camera angle.

Viewers may select an angle to view a playback of a game by scrolling down a menu to the required angle and pressing the select button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

A controller in the set-top box 70 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. Using the file inputs and outputs of players, the graphics engine located on the middleware server 1 is able to reproduce playbacks of the game at the required angle.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted downstream via the return path or via satellite as a broadcast signal whereby the set-top box 70 receiver decodes content, which is then displayed on the viewers TV 72.

In addition to the option to select camera angles and players viewers according to a yet further aspect of the present invention, viewers may adjust the speed of playback, fast forward, rewind, zoom and view multiple cameras of the game.

Viewers may select additional cameras to view a playback of a game from by scrolling down a menu to the required cameras and pressing the select button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

A controller in the set-top box 22 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. Using the file inputs and outputs of players the graphics engine located on the middleware server 1 is able to reproduce several playbacks of the game all at different camera angles, positions and zoom.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted downstream via the return path or via satellite as a broadcast signal whereby the set-top box 70 receiver decodes content, which is then displayed on the viewers TV 72 in a grid format.

According to yet a further aspect of the present invention, means may be provided to enable a viewer to rewind a game to earlier point of play whereby the user is able to continue playing. This is achieved by remotely storing file data relating to controller inputs, outputs and history of a user on a middleware server 1.

When a viewer loses a game, a signal is then transmitted by the middleware server 1 downstream to set-top box 70 which processes the signal and decodes content on to the viewers screen 72 presenting a menu whereby the viewer has the option to rewind, continue, load game, exit game.

The viewer may then select rewind by pressing the blue button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

A controller in the set-top box 22 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. Using the file inputs and outputs of players the graphics engine located on the middleware server 1 is able to reproduce playbacks of the game that is in reverse order.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted downstream via the return path or via satellite as a broadcast signal whereby the set-top box 70 receiver decodes content, which is then displayed on the viewers TV 72. The viewer then sees the game rewinding on screen. To stop the game rewinding at any point the viewer may press the blue button followed by the red button to play.

Through a TV channel viewers may access the games system main options whereby through selecting "live games" on the menu, viewers may view live footage of multi-player networked games and information on players names, performance, duration of play and numbers of players. From this the viewer may select a multi-player game and join in.

From a TV channel a viewer may be prompted to access the games system by a colour icon on the top of the screen. Using a remote control viewers may press the red button to access the games system, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 70.

A controller in the set-top box 22 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1, which processes the request. Content is then transmitted via a broadcast signal over wideband transmission signal which is then received by a satellite dish receiver which feed the signal to the set-top box 70. A decoder translates the signal from digital to analogue, which is then displayed directly on the viewer's screen TV 72.

The viewer is then presented with a menu whereby through using the remote control the viewer may select "live games" a signal is then sent middleware server 1 which interprets the request and transmits the required data downstream via the return path or via a satellite on a broadcast signal. Whereby the signal is intercepted by a satellite dish receiver 87 which passes the signal to the set-top box 70 which interprets the data in the broadcast signal and displays the graphics in combination with live game footage on the viewers TV screen 72.

The viewer is then presented with a menu of categories of games, which includes details of multi-player networked games, live footage, player names, performance, duration of game and number of players. Using the remote control the viewer can scroll down the menu, and press the select button to join in a live multi-player game. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

A controller in the set-top box 22 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1, which processes the request. The middleware server 1 then sends an instruction to the billing server 10 for payment authorisation. Verification is the transmitted to middleware server 1 by a billing server 10.

A signal is then transmitted by the middleware server 1 to the games database server 7, graphics controller 8, cache engine 9 and graphics accelerator 35 to begin a session. Using the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9,

games data server 7 and graphics controller 8.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted downstream via the return path or via satellite as a broadcast signal whereby the set-top box 70 receiver decodes content, which is then displayed on the viewers TV 72.

Using the remote control or games pad 42 the viewer is able to send commands upstream via the return path to the middleware server 1, which using the file inputs and outputs of each viewer the games engine processes graphics. Which are then transmitted to the viewer's set-top box 70, which is then displayed on the viewer's TV screen 73. In this way the viewer may visually select and join in a live multi-player networked game at any time during the game.

Viewers are also able to select via remote control or game pad 42 other viewers and challenge to a multi-player networked game. When a viewer challenges another viewer a signal is sent via a remote control or games pad 42 to a game controller 217 in the set-top box 22 which converts these levels to numbers using an analogue to digital converter (ADC) 218 which is also installed on a Set-top box 70.

A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

A controller in the set-top box 22 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. The middleware server 1 then processes the request and transmits data back via the ATM network to the viewers set-top box 70 notifying the challenged viewer of the other viewers challenge on their TV screen 72.

The challenged viewer is then provided the option to play a multi-player networked game. Using their remote control the viewer presses a green key to accept. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 70.

A controller in the set-top box 22 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the satellite

TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1, which processes the request and transmits data downstream over the ATM network to the original viewers set-top box 70. The set-top box 70 interprets the data and displays a notification of acceptance of challenged viewer to play a multi-player networked game on the TV screen 72. An instruction is then sent to both viewers receivers to switch channels to the correct program ID.

The graphics engine located on the middleware server 1 then produces images using various 3D rendering techniques such as wire-frame, shaded perspective texture mapping, mip mapping, bump mapping, linear correction, environment mapping, multi-pass rendering, fogging, deformable meshes, key framed animation, multi-textured, perspective mapping, atmospheric effects, texture filtering and transparency.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted downstream via the return path or via satellite as a broadcast signal whereby the set-top box 70 receiver decodes content, which is then displayed on the viewers TV 72.

Using the remote control or games pad 42 both viewers are able to send commands upstream via the return path to the middleware server 1 where the games engine processes graphics using the graphics accelerator 35, graphics controller 8, cache engine 9 and database 7.

In addition to cable TV and satellite TV users being able to access the games system, Figure 6 shows examples of how a terrestrial digital TV home user would be able to access the games system. In this case the users equipment includes a terrestrial set-top box 97 with a UHF antenna 92 that can receive terrestrial TV signals, a telephone 107 connected to the ADSL loop for the return path, a games console 106 and a VCR 108.

The set-top box 97 is equipped with to a modem, which is in turn connected via a telephone 107 to the ADSL loop 82 and in turn the local hub that has a boot server 80, a gigabit switch 81, a multiplexer 89 and a UHF masthead amplifier 90. In this way, signals from each terrestrial views set-top box 95 can be sent via the modem 25 through the telephone 107 to the local hub.

Connected to the gigabit switch 81 is an ATM switch 68 that is selectively operable to connect each users terminals, typically via high bandwidth ATM network to the headend of the TV operator. An ATM switch 105 located at the headend, is operable to interpret the user originating signals and direct them to the games systems middleware servers 1. In this way, each of the users terminals can be connected to the games system.

According to one aspect of the present invention there is a system comprising a TV screen 99, a UHF terrestrial antenna 92, a telephone 107, a VCR 108 and a set-top box 97 which has a receiver and an encoder/decoder, a USB port, a games pad or remote control for sending commands to a middleware server 1 located in at the terrestrial TV data center. Means may be provided within a remote location for hosting, processing and transmitting game graphics within broadcast signal to a TV screen 99. The telephone 107 is connected to asymmetric digital subscriber line ADSL which provides the return path that will facilitate means for interacting and playing a game, which will now be explained by way of example.

According to yet further aspect of the present invention, there is provided a games system, which enables viewers to select and play games via a dedicated TV Channel. Whereby graphics are transmitted to the set-top box 97 or integrated digital TV 94 via a broadcast stream and a graphics engine which is located remotely, for example on a middleware server 1, whereby the middleware server 1 is able to process all of the game graphics. This would mean that the set-top box 97 would only be required to transmit requests via the return path to the middleware server 1 which then processes and transmits graphics back to the set-top box 97. This is advantageous.

During a televised program or TV commercial a viewer may be prompted to play a game. The viewer may respond to the prompt by pressing the red button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

The set-top box 97 then interprets the signal, which is then sent via a modem that is connected to the telephone 107. The signal is then carried across the ADSL loop 82 to a gigabit switch 81 located at the hub. The gigabit switch 81 is operable to then redirect the request across a high speed ATM network to an ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by an ATM switch 105, which re-directs the signal to the middleware server 1, which processes the request. The middleware server 1 then sends an instruction to the billing server for payment authorisation. Verification is the sent to middleware server 1.

A signal is then transmitted to the viewers set-top box 97 to change channel to the required (PID) for the game. Whilst the game data is processed and loaded by the middleware server 1 adverts within the local ad insertion server 5 are multiplexed and transmitted via the UHF terrestrial antenna over the wideband signal of the channel (PID) for the game to the viewers terminal.

An instruction is then sent by the middleware server to the games database 7, games controller 8, graphics accelerator 35 and cache engine 9 to begin a session. The games, data is then extracted from the data server 112 and processed by the

graphics accelerator 35, which is then filtered by the graphic controller 8 before being processed by the middleware server 1 central processors. Content is then cached on the cache engine 9 which is then transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder.

Content is then compress into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, which contains a decoder. The decoder then feeds its RGB signal to the TV screen 99 via a TV scart cable and the games video starting sequence is displayed on the viewers TV screen 99.

Device drivers are then downloaded or transmitted to the set-top box 97 via the wideband signal or via the return path which enables the use of USB, serial and infrared game pads and joysticks.

Using the remote control or games pad 42 the viewer is then able to send commands upstream via the return path to the middleware server 1 where the games engine processes graphics using the graphics accelerator 35, graphics controller 8, cache engine 9 and database 7.

The graphics engine located on the middleware server 1 then produces games images using various 3D rendering techniques such as wire-frame, shaded perspective texture mapping, mip mapping, bump mapping, linear correction, environment mapping, multi-pass rendering, fogging, deformable meshes, key framed animation, multi-textured, perspective mapping, atmospheric effects, texture filtering and transparency.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted downstream via the return path or via terrestrial antenna 91 as a wideband signal to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, which contains a decoder. The decoder then feeds its RGB signal to the TV screen 99 via a TV scart cable and in game graphics are then displayed on the viewers screen 99.

In this way the set-top box 97 is not required to process the games graphics, it is only required to transmit commands upstream to the middleware server 1 and decode signals. This is advantageous.

Alternatively the viewer may access a TV channel which is being broadcast on a wideband signal from which the viewer can prompt a menu to be loaded from which they can select to view single and multi-player games, tips & hints, live games, saved games, etc.

Preferably game menus can be overlaid on video in the wideband broadcast signal thus the viewer is able to select options whilst the background, graphics, video and music are being broadcast. This is advantageous as it does not require the set-top box 97 to process and draw background graphics or process sound as this is already being broadcast. Thus the set-top box 70 is only required to transmit requests to the middleware server 1 for content to be processed which is made possible by the return path.

This is achieved through using a remote control, games or joystick, which is operable to transmit a signal to the set-top box 97. The set-top box 97 then interprets the signal which is then sent via a modem, that is connected to the telephone 107, across the ADSL loop 82 to an ATM switch 81 located at the hub. The ATM switch 81 is operable to then redirect the request across a high speed ATM network to a switch located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is interpreted by an ATM switch 105, which re-directs the signal to the middleware server 1 which processes the request. Content is then transmitted downstream to across the ATM backbone to an ATM switch 81 which redirects the signal over the ADSL loop 82 to a set-top box 97, via the telephone 107. The set-top box 97 interprets the data, which is then displayed on the viewers TV 99 as a menu over video being transmitted over a wideband signal providing background graphics and sound. The viewer is then able to press the blue button to view single or multiple games, press the green button to view hints & tips, press yellow button to view live games, press red button to view saved games or press backup to return to the channel. Using a remote control or games pad the viewer may then press the red button to view saved games, which transmits a signal to the set-top box 97.

The set-top box 97 then interprets the signal which is then sent via a modem, that is connected to the telephone 107, across the ADSL loop 82 to an ATM switch 81 located at the hub. The ATM switch 81 is operable to then redirect the request across a high speed ATM network to a switch located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is interpreted by an ATM switch 105, which re-directs the signal to the middleware server 1 which processes the request. The middleware

server 1 then sends a request to the database for all game files of the viewer to be sent to the middleware server 1. A search is then performed on the database 7 and files are transmitted back to the middleware server 1 which the processes the files and transmits the content and data downstream to across the ATM backbone to an ATM switch 81. The ATM switch then redirects the signal over the ADSL loop 82 to a set-top box 97, via the telephone 107 to the set-top box 97 which interprets the data and content which is then displayed on the viewers TV 99 as menu of saved games. The viewer may then use the remote control to scroll down or up to select saved games. To select a game viewer may either press number relating to the game file, or press select. Once the viewer has selected a signal is sent to the set-top box 97.

The set-top box 97 then interprets the signal which is then sent via a modem, that is connected to the telephone 107, across the ADSL loop 82 to an gigabit switch 81 located at the hub. The gigabit switch 81 is operable to then redirect the request across a high speed ATM network to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is interpreted by an ATM switch 105 which re-directs the signal to the middleware server 1 which processes the request and loads the graphics for the saved game.

A signal is then transmitted to the viewers set-top box 97 to change channel to the required (PID) for the game. The receiver then switches channel to required PID and content is then transmitted over a broadcast signal to the viewers set-top box 97, which is then displayed on the viewers TV screen 99. Whilst the saved game data is processed and loaded by the middleware server 1 adverts within the local ad insertion server 5 are multiplexed and transmitted via the UHF terrestrial antenna over the wideband signal of the channel (PID) for the game to the viewers terminal.

An instruction is then sent by the middleware server to the games database 7, games controller 8, graphics accelerator 35 and cache engine 9 to begin a session. The games, data is then extracted from the data server 112 and processed by the graphics accelerator 35, which is then filtered by the games controller before being processed by the middleware server 1 central processors using right access memory. Content is then cached on the cache engine 9 which is then transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder.

Content is then compress into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, which contains a decoder. The decoder then feeds its RGB signal to the TV screen 99 via a TV scart cable and graphics are then displayed on the viewers TV screen 99.

In practice hundreds of thousands of terrestrial TV viewers if not millions would be able to receive game content via the broadcast signal and transmit requests upstream to the middleware server 1 via the return path through the telephone thus facilitating the game play.

According to one aspect of the present invention, means would be provided which would enable viewers to instantly access games by switching channel via a TV terminal using their remote control. For example in context of the present invention viewers may access the games system from a TV channel whereby content is transmitted over a wideband signal. If a viewer were to switch channels to a channel, which viewers are currently playing a game on, the viewer would see live content of the game currently being played.

The viewer may play the game by pressing the red button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

The set-top box 97 then interprets the signal, which is then transmitted via a modem that is connected by a telephone 107 to the ADSL loop. Connected to the ADSL loop is a gigabit switch 81 located at the local hub which redirects the signal to a ATM switch 68 situated on a high speed ATM network.

The ATM switch 68 is operable to redirect the request across a high-speed ATM network to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to a middleware server 1, which processes the request. The middleware server 1 then sends an instruction to the billing server 10 for payment authorisation. Verification is the transmitted to middleware server 1 by a billing server 10. An signal is then transmitted by the middleware server 1 to the games data server 8, games controller 8, cache engine 9 and graphics accelerator 35 to begin a session.

The games, data is then extracted from the data server 112 and processed by the graphics accelerator 35, which is then filtered by the games controller before being processed by the middleware server 1 central processors and then cached on the cache engine 9 which is then transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder.

Content is then compress into and encoded into an mpeg format using an mpeg

encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, which contains a decoder. The decoder then feeds its RGB signal to the TV screen 99 via a TV scart cable and graphics are then displayed on the viewers TV screen 99.

Device drivers are then downloaded or transmitted to the set-top box 97 via the wideband signal or via the return path which enables the use of USB, serial and infrared game pads and joysticks.

In this way a viewer may switch between games just as they would if they were to switch through TV channels to view current TV programs being broadcast. This is advantageous, as viewers would be able to switch between games in a near real-time environment. Whereas with current games systems to change a game, users would have to physically remove a CD/DVD and restart a new game whereas with the present view could simply change games as quickly as it would take to change channel on a TV.

According to one aspect of the present invention, means would be provided which would enable viewers to select games by voting via a TV terminal 99 using their remote control. For example viewers may be provided the option to play one of four games and the game that receives the largest vote is then broadcast.

During a TV program a signal may be sent downstream by the middleware server 1 in the wideband or narrowband transmission to the viewers set-top box 97, which interprets the data and displays a prompt on the TV screen 99 for viewers to vote to play a game. The viewer may select a game by pressing select using their remote control or by pressing a number or colour button relating to the game of their choice. The viewer then to selects a game by pressing the appropriate button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

The set-top box 97 then interprets the signal, a modem then transmits the signal via a telephone 107 that is connected by a ADSL cable 82 to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high-speed ATM network to an ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs

the signal to the middleware server 1. The middleware server 1 then interprets the data, which is then placed in the database 7 from which results are calculated and transmitted on wideband or narrowband signal to the viewers set-top box 97.

The broadcast signal is then intercepted by a UHF aerial 92 which is connected by a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, in which a signal converter circuit converts the signal from digital to analogue. A decoder then feeds the analogue signal to the TV screen 99 via a TV scart cable and voting results are then displayed on the viewers TV screen 99.

Once all votes have been collected from viewers set-top box 97 the middleware Server 1 then loads the data relating to the game with the majority vote and transmits a signal to the ATM switch 105 located in the headend. The ATM switch 105 is operable to redirect the signal to an ATM switch 68 located on the ATM network which redirects the signal to a gigabit switch 81 situated at the local hub. The switch 81 then directs over an ADSL cable to the viewers set-top box 97 instructing the set-top box 97 to switch channels to required program ID for the game with the most votes.

The graphics engine located on the middleware server 1 then produces images using various 3D rendering techniques such as wire-frame, shaded perspective texture mapping, mip mapping, bump mapping, linear correction, environment mapping, multi-pass rendering, fogging, deformable meshes, key framed animation, multi-textured, perspective mapping, atmospheric effects, texture filtering and transparency.

Content is then compress into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, which contains a decoder. The decoder then feeds its RGB signal to the TV screen 99 via a TV scart cable and graphics are then displayed on the viewers TV screen 99.

Device drivers are then downloaded or transmitted to the set-top box 97 via the wideband signal or via the return path which enables the use of USB, serial and infrared game pads and joysticks.

This of course could be used for voting for TV programs and adverts.

According to yet further aspect of the present invention, there is provided a games

system, which enables viewers to save games. Although most 1st generation and 2nd generation set-top boxes do not have a hard disc the viewer may still save games, through a middleware server 1 located at the headend of a TV operator.

The viewer is able to save a game at any point during a game by pressing the blue button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

The set-top box 97 then interprets the signal, which is then transmitted by the modem via a telephone 107 that is connected by a ADSL cable 82 to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. The middleware server 1 then interprets the requests and creates a data file containing information of the viewers game which is then stored remotely on the database 7.

To access data files of saved games a user may prompt a menu from which they can then press the red button to view saved games, which transmits a signal to the set-top box 97.

The set-top box 97 then interprets the signal, a modem then transmits the signal via a telephone 107 that is connected by a ADSL cable 82 to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the middleware server 1 then interprets the signal. The middleware server 1 then sends a request to the database 7 for all game files of the viewer to be sent to the middleware server 1. A search is then performed on the database 7 and viewer's personal files are transmitted back to the middleware server 1 which then processes the files and transmits the content and data downstream to across the ATM network to an ATM switch 68. The ATM switch 68 then redirects the signal to a gigabit switch 81 located in local hub, which is operable to redirect the signal over a ADSL cable to a set-top box 97.

The set-top box 97 interprets the data and content, which is then displayed on the viewers TV 99 as menu of saved games.

The viewer may then use the remote control to scroll down or up to select saved games. To select a game the viewer may either press number relating to the game

file, or press select. Once the viewer has selected a signal is transmitted via the remote control to an optical port where controller in the set-top box 97 converts the signal to numbers.

The set-top box 97 then interprets the data, and signal is then transmitted by a modem via the telephone 107, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high-speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the middleware server 1, which processes the request and loads the graphics for the saved game. A request is then transmitted downstream to the receiver in the set-top box 97 to switch channels to the required program ID for the game. The receiver then switches channel to required PID and content is then transmitted over a wideband signal to the viewers set-top box 97, which is then decoded and converted from digital to analogue before being displayed on the viewers TV screen 99.

A signal is then transmitted by the middleware server 1 to the data server 112, games controller 8, cache engine 9 and graphics accelerator 35 to begin a session.

The games, data is then extracted from the data server 112 and the graphics engine located on the middleware server 1 then produces the games images using the graphics accelerator 35. This is then filtered by the games controller 8 and then cached on the cache engine 9. In this way content may be accessed by the middleware server 1 from the cache engine 9 and transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder.

The mpeg encoder 60 then compresses the graphics into an mpeg format. The data is then multiplexed and transmitted as a wideband or narrowband signal via UHF antenna. The broadcast signal is then received by the viewers UHF aerial 92, which is then feed through the downlead into the set-top box 97, in which a decoder then translates the signal from digital to analogue to be displayed on the viewers TV screen 99. A two-way bi-directional communication path is then opened between the middleware server 1 and the viewer's set-top box 97 enabling the viewer to command the game through a remote control or games pad.

In practice hundreds of thousands of terrestrial viewers if not millions would be able to access their saved game content via the middleware server 1 and receive content via a ADSL return path or wideband signal thus facilitating the game play.

Means may be provided to store details on the viewer's game within a remotely located database 7, whereby when the viewer returns to play, they are then able to

continue from the point at which they left the game. When the viewer presses pause the set top box 97 switches channels to a channel where a menu would then provide the viewer with the options to save the game, load a game, rewind or view more information on an advert playing in the background. In this way the viewer is then shown video footage of other games and television commercials enhancing the gaming experience.

During games viewers may pause play and go to options menu, or to switch over to a TV channel. The viewer may at any time during a game pause a game by pressing the pause or stop button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

The set-top box 97 then interprets the data, and signal is then transmitted by a modem via the telephone 107, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high-speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 68 located within the headend or data centre of the terrestrial TV operator.

The ATM switch 68 then redirects the signal to the middleware server 1 which then interprets the requests and creates a data file containing information of the viewers game which is stored remotely on the database 7. When the viewer returns to play, they are then able to continue from the point at which they left the game by pressing play on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

The set-top box 97 then interprets the data, and signal is then transmitted by a modem via the telephone 107, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. The middleware server 1 then processes the request and transmits a request via wideband signal or via the return path to the viewers set top box to switch channels to the required PID for the game. The viewers set top box then switches channels and a graphics engine located on the middleware server 1 then produces images of the game from the point the viewer pressed the pause button using the data file stored in the database 7.

Content is then compressed into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is

connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92.

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and graphics are then displayed on the viewers TV screen 99. A two-way bi-directional communication path is then opened between the middleware server 1 and the viewer's set-top box 97 enabling the viewer to command the game through a remote control or games pad.

According to yet further aspect of the present invention, means may be provided that would allow the viewer to pay to play a game on-demand at any time regardless of whether it is being broadcast. The viewer may access a game to play immediately by selecting a game from an interactive listing by pressing the select button on their remote control, which transmits a signal via infrared radiation to an optical port 54 located in the set top box 97.

The set-top box 97 then interprets the data, and signal is then transmitted by a modem via the telephone 107, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high-speed ATM network to a ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the middleware server which then processes the request and transmits a signal via the ATM switch 68 to the billing server 10 for payment authorisation.

Upon credit verification from the billing server 10 an instruction would be sent by the middleware server 1 via the return path to the set-top box 70 to switch channels to require program ID (PID) for the games content. The middleware server 1 then transmits a request via the ATM switch 105 to another ATM switch 65 which then redirects the signal to a VOD/NVOD server 4 to transmit content relating to the program ID of game requested by the viewer.

Content is then streamed by the VOD/NVOD to a multiplexer 113, which combines the signal with a number of separate signals to be transmitted simultaneously over a single channel. Content is then transmitted downstream via the ATM network on a narrowband channel, which the set-top box 97 decodes and displays content on the viewers TV screen 99. A two-way bi-directional communication path is opened between the middleware server 1 and the viewer's set-top box 97 enabling the viewer to command the game through a remote control or games pad.

In this way games can be provided on demand, which utilises the existing return path

and does not affect wideband transmissions for scheduled broadcasts.

According to yet a further aspect of the present invention, means may be provided that would allow digital terrestrial viewers to play multi-player games, whereby viewers using the same device are able to play against each other within a split screen mode.

The method for facilitating a multi-player games on terrestrial digital television, according to the present invention comprises of a means to gathering file inputs and outputs from each controller and transmitting graphics in a split screen mode whereby 4 or more player's each using identifiable controllers can play. The middleware server 1 then processes the collected game data into game graphics, which are then transmitted over a wideband or narrowband signal to viewer's terminals.

When viewers plays a multi-player game on single device commands are transmitted from the controllers via a USB port or an optical port 54 located in the set-top box 97.

A controller in the set top box 97 then interprets the data, and signal is then transmitted by a modem via the telephone 107, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high-speed ATM network to an ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

The ATM switch 68 redirects the signal to the middleware server 1, which then interprets and processes the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9, games data server 7 and graphics controller 8.

Content is then compressed into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92.

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and graphics are then displayed on the viewers TV screen 99.

In this way using existing set top boxes viewers can play games within a multi-player environment on one TV whereby the middleware server 1 gathers data via return path from the viewer's controllers to generate the games graphics.

According to yet a further aspect of the present invention, means may be provided that would allow terrestrial viewers to play multi-player networked games, whereby viewers are able to play against each other.

The method for facilitating a multi-player networked game on terrestrial digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between player's set-top boxes to a middleware server 1. The middleware server 1 then processes the collected game data into game graphics, which are then transmitted over a broadcast signal to viewers terminals.

When a viewer plays a multi-player networked game commands are transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 97.

A controller in the set-top box 97 then interprets the data, and signal is then transmitted by a modem via the telephone 107, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high-speed ATM network to an ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

The ATM switch 105 redirects the signal to the middleware server 1, which then interprets and processes the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9, games data server 7 and graphics controller 8.

Content is then compressed into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92.

The signal is then received by the participating viewers UHF terrestrial aerial 92, 93 and is then feed through the downlead to the set-top box 97 and set-top box 95. A decoder in the set-top box decodes the content, which is translated from digital to analogue before being displayed on participating viewers TV screens 99, 72.

In this way viewers can play games within a multi-player networked environment on digital terrestrial TV using a set-top box 97, whereby the middleware server 1 exchanges data via return path between the viewer's terminals. Because the ADSL return path has the capacity of 2mb/s this allows multi-player networked games to be played at a higher performance than any current Internet system, which even with a high-speed broadband internet connection peak at a 512kb/s download and 128kb/s

upload. This is advantageous.

According to yet a further aspect of the present invention, means may be provided that would allow terrestrial viewers to play multi-player networked games, whereby viewers are able to place bets and gamble against each other.

The method for facilitating a multi-player networked gambling games on terrestrial digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between player's set-top boxes to a middleware server 1. The middleware server 1 then processes the collected game data into game graphics, which are then transmitted over a broadcast signal to viewers terminals.

When a viewer places a bet during a multi-player networked they are required to insert their smart card. The viewer then inputs the smart card, via a smart card drive on the set-top box 97 and they are prompted to provide a password, which may be a sequence of alphanumeric and punctuation characters entered by a user to authenticate to a users system. Alternatively the user may be asked to input a personal identification number PIN, a 4 to 12 character alphanumeric code or password used to authenticate a person's identity, when the viewer access the content on the games system. Using the remote control the viewer inputs their PIN, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

A random number generated by the session key, which serves as a key for a specific transaction or set of transactions. The 56-bit number is then retrieved from a protected elementary file on the smart card, which is then transmitted between the set-top box 97 and the card reader.

The set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1, which then sends an instruction to the billing server 10 for payment authorisation. Verification is the transmitted to middleware server 1 by a billing server 10. Upon credit verification from the billing server 10 an instruction would be sent by the middleware server 1 via the return path to the participating viewers set-top boxes notifying of the bet. Participating viewers are then prompted to place a bet.

The middleware server 1, which then interprets and processes the transactions and input/output files of each viewer and the games engine then produces the games

images using the graphic accelerator 35, cache engine 9, games data server 7 and graphics controller 8.

Content is then compressed into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92.

The signal is then received by the participating viewers UHF terrestrial aerial 92, 93 and is then feed through the downlead to the set-top box 97 and set-top box 95. A decoder in the set-top box decodes the content, which is translated from digital to analogue before being displayed on participating viewers TV screens 99, 72.

In this way it is possible for viewers to play gambling games such as Roulette, and Black Jack in a secure environment with other TV viewers using their existing set-top box. This is advantageous.

According to yet further aspect of the present invention, means may be provided that would allow viewers to play multi-player networked games on a digital terrestrial TV network using alternative devices such as a games console, a PC, a Mac or a set-top box.

The method for facilitating a multi-player networked game on terrestrial digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between player's games consoles 69, 76, PCs 78 and set-top boxes 97, 96 to a middleware server 1. Using the graphics engine.

For example using a games console, when a viewer plays a multi-player networked game commands are transmitted from the games pad to the games console 76.

A controller in the games console 76 then interprets the signal, which is then transmitted by a modem via a telephone 75, that is connected to a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to redirect the request across a high-speed ATM network to an ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

The ATM switch 105, redirects the signal to the middleware server 1, which then interprets and processes the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9, games data server 7 and graphics controller 8.

Content is then compressed into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to the multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92.

The signal is then received by the participating viewers UHF terrestrial aerial 92, 93 and is then feed through the downlead to the set-top box 97 and set-top box 95. A decoder in the set-top box decodes the content, which is translated from digital to analogue before being displayed on participating viewers TV screens 99, 72.

Alternatively the games console 76 may simply be connected to modem which connected to a telephone 107 which is operable to transmit signals over a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch 81 is operable to direct the signal to across a high-speed ATM network to an ATM switch 68. The ATM switch 68 redirects the signal to a third ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

The ATM switch 105 redirects the signal to the middleware server 1, which processes the file inputs and outputs of views. The middleware server 1 then transmits a signal via the return path directly to games console 76, which processes the data of players file inputs and outputs using a graphics engine stored on a DVD. In this way, users without digital TV may still participate in multi-player networked games using a conventional games console 76 and play with viewers using a set-top box 102 who do not have a games console. This is advantageous.

It will be appreciated that with a conventional 128 kb/s Internet link users may join in multiplayer networked games on terrestrial TV using a game console 102 or PC 78 whereby graphics are processed by the device. For example data including file inputs and outputs may be transmitted via a 128 kb/s link to the middleware server 1, which processes the data. The middleware server 1 may then process and transmit content to viewers who a playing with a set-top boxes and exchange data between games consoles 102 and PCs 78. In the games consoles 76 and PC 78 a graphics engine then processes the file inputs and outputs from other users terminal including set-top boxes and display content on the users screen.

In this way viewers using a games console 102 can play games within a multi-player networked environment with viewers using a terrestrial set-top box 70 or PC 78 whereby the middleware server 1 exchanges data via return path between the viewer's terminals. This is advantageous

According to yet further aspect of the present invention, means may be provided to enable a viewer using remote control or key broad to type in messages during a multi-player networked game and send messages to another viewer or group of viewers

who are playing the game.

During play by pressing the green button on their remote control, an instant messaging window may be loaded providing the viewer with ability to type in a message, which is displayed on screen. The viewer may select send, whereby they are required to select the players they require to send the message to by either pressing select next to the players name or by pressing a number.

When user is satisfied they can then press the green button to send which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

The set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 75 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. The middleware server 1 is then operable to gather and transmit the text messages to other viewers during a game, via a broadcast signal back to the ATM switch 105. The ATM switch 105 is operable to redirect the signal to an ATM switch 68 on the ATM network which redirects the signal to a gigabit switch 81 situated at the local hub. The switch 81 then directs over a ADSL cable to the viewers set-top box 96 which processes the text content which is then displayed on the viewers TV screen 95.

In this way viewers can send instant text messages during a multi-player networked game on terrestrial TV whereby text is transmitted upstream to the middleware server 1 which intercepts the message and transmits the text message downstream to the specified recipients set-top boxes. The text message is then displayed on their TV screen in conjunction with the game graphics. This is advantageous as viewers may communicate with other viewers in a game, for example they might share tips or coordinate their efforts as a team to during a game.

Alternatively text may be transmitted via a wideband transmission by encoding data into mpeg video transport stream, in the text stream transmission. In this way the text message is directly displayed on the TV screen and does not require the set-top box 99 to process the text content. This is advantageous

According to yet further aspect of the present invention, means may be provided to enable a viewer using telephone 107 and modem to talk with other viewers during a multi-player game on digital terrestrial television. Whereby through using voice over IP technology, data and voice requests may be transmitted upstream to a middleware server 1, which is operable control the transmission of voice and data across a DSL cable between viewers during a game play.

Preferably means would be provided whereby viewers may switch communication channels to communicate with other viewers by pressing number keys and on the remote control.

Means may also be provided through a menu during a multi-player networked game to enable views to create a team file, whereby through pressing yellow button during play a communications channel is the opened from a viewers set-top box 97 to multiple viewers devices whereby a conference call is initiated. This is advantageous, as this will enable viewers to communicate with fellow players during a multi-player network game, thus enhancing the game play experience.

During play by pressing the blue button on their remote control, a window may be loaded providing the viewer with list of all players, which is displayed on screen. The viewer may then scroll down to select viewers by pressing the select button to initiate the communication call during play, the viewer can then press the green button which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

The set-top box 97 then interprets the signal, which is then transmitted by a modem that is connected to telephone 107. The signal is then carried over the ADSL loop 82 to a gigabit switch 81 located at the local hub. The switch 81 is operable to redirect the request across a high-speed ATM network to a ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1.

The middleware server 1 then interprets the request and opens up a IP communication line between the specified viewers.

Using VoIP audio is digitalised in packet forms which is then transmitted from the viewers set-top box 97 to a switch 81 located at local hub. The switch 81 then directs the signal to over the ADSL loop specified viewers set-top box 96. The set-top box then decodes the audio packets. In this way a communication line is then established between set-top box 97 to set-top box 96 enabling viewers to communicate with others during a game.

It will be appreciated that through using a return path with VoIP this provides the means for communication for set-top box 97 to set-top box 96 or PC 78 to games console 69 or even games console 76 to set-top box 97. VoIP could be used on terrestrial digital television to enable viewers to communicate during a game or whilst accessing other interactive services, such a shopping, banking and e-mail. This is advantageous.

According to yet further aspect of the present invention, means may be provided that would allow the viewer to input text details, via a remote or games pad, of their name, location and e-mail address. This data is then stored in a database 7 which may be extracted by the middleware server 1 and input into a score table which is then transmitted via a wideband signal on a TV channel which can be accessed by viewers who switch to the TV channel. In this way all viewers could then view details of other viewers scores and performance relating to multi-player games, multi-player networked games or single player games.

During a multi-player game the middleware server 1 processes game data and results are held within a database 7. On completion of the game, the middleware server 1 sends a signal downstream via a broadcast signal to an ATM switch 105. The ATM switch 105 is operable to redirect the signal across the ATM network to a ATM switch 68 which directs the signal to a ATM switch 81 located on the local hub. The switch 81 then directs the signal across a ADSL loop to a set-top box 70. The set-top box 97 then interprets the data, which is then displayed on the viewer's TV screen 99 prompting the viewer to input their details using the remote control. The viewer types in their details, for example they may use the numerical buttons on the remote or a keyboard to type in their name. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 97.

Through a controller the set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1.

The middleware server 1 then interprets and processes the data and extracts all the viewers results from a database 7. The middleware server 1 then combines the data and creates a graphic table of the results with text details of all players including name, statistic, performance and scores. The middleware server 1 then transmits the data via the return path or via a terrestrial antenna as a wideband signal, which is then presented on the TV screen 99, where viewers are able to see the winners of the last games, including details of name, performance and statistics.

According to yet a further aspect of the present invention, means may be provided allowing viewers to play back game footage of a game they have just completed.

Through the games system when a viewer completes a game they are provided four main options including reply game, continue, save and exit.

Using the remote control, viewers may press the yellow button to playback footage of game they have just played. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 97.

A controller in the set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. Using the file inputs and outputs of the viewer, the graphics engine located on the middleware server 1 reproduces the game graphics.

Content is then compressed into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to the multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92.

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and the reply of the game is then displayed on the viewers TV screen 99.

Alternatively the signal may be transmitted downstream via the return path which connects to the set-top box via the telephone 107 which feeds the signal to the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and the reply of the selected player is then displayed on the viewers TV screen 99.

During playback the viewer may also prompt a second options menu from which they may also select an individual player to view by scrolling down a menu to the required player and pressing the select button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 97.

A controller in the set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the

request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. Using the file inputs and outputs of players gathered during play by the middleware server 1, the graphics engine is then able to reproduce playbacks of the selected player.

Content is then compressed into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to the multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92.

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and the reply of the selected player is then displayed on the viewers TV screen 99.

Alternatively the signal may be transmitted downstream via the return path which connects to the set-top box via the telephone 107 which feeds the signal to the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and the reply of the selected player is then displayed on the viewers TV screen 99.

According to a yet further aspect of the present invention, viewers may select not only individual players to view playbacks of a game but also the camera angle.

Viewers may select an angle to view a playback of a game by scrolling down a menu to the required angle and pressing the select button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 97.

A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 97.

A controller in the set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. Using the file inputs and outputs of players, the graphics engine located on the middleware server 1 is able to reproduce playbacks of the game at the required angle.

Content is then compressed into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to the multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92.

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and the reply of the game at the selected camera angle is then displayed on the viewers TV screen 99.

Alternatively the signal may be transmitted downstream via the return path which connects to the set-top box via the telephone 107 which feeds the signal to the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and the reply of the game at selected camera angle is then displayed on the viewers TV screen 99.

In addition to the option to select camera angles and players viewers according to a yet further aspect of the present invention, viewers may adjust the speed of playback, fast forward, rewind, zoom and view multiple cameras of the game.

Viewers may select additional cameras to view a playback of a game from by scrolling down a menu to the required cameras and pressing the select button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 97.

A controller in the set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. Using the file inputs and outputs of players the graphics engine located on the middleware server 1 is able to reproduce several playbacks of the game all at different camera angles, positions and zoom.

Content is then compressed into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to the multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92.

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and multiple cameras replays of the game are displayed on the viewers TV screen 99 in a split screen mode.

Alternatively the signal may be transmitted downstream via the return path which connects to the set-top box via the telephone 107 which feeds the signal to the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and multiple cameras replays of the game are displayed on the viewers TV screen 99 in a split screen mode.

The ability to view multiple playbacks could be used for multi-player games whereby viewers can view multiple characters at once, which is advantageous for when two or more viewers are playing on one device and have requested a playback of the game.

According to yet a further aspect of the present invention, means may be provided to enable a viewer to rewind a game to earlier point of play whereby the user is able to continue playing. This is achieved by remotely storing file data relating to controller inputs, outputs and history of a user on a middleware server 1.

When a viewer loses a game, a signal is then transmitted by the middleware server 1 downstream to set-top box 97 which processes the signal and decodes content on to the viewers screen 99 presenting a menu whereby the viewer has the option to rewind, continue, load game, exit game.

The viewer may then select rewind by pressing the blue button. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 97.

A controller in the set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs

the signal to the middleware server 1. Using the file inputs and outputs of players the graphics engine located on the middleware server 1 is able to reproduce playbacks of the game that is in reverse order.

Content is then compressed into and encoded into an mpeg format using an mpeg encoder 60. The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveller primarily tuned to the multiplexer 113. A wideband signal is then transmitted to the multiplexer 89 which is connected to a UHF masterhead amplifier 90 which is operable to boosts the signal ensuring that the transmission is received by the viewers UHF aerial 92.

Connected to the UHF aerial 92 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 99 and the other is feed into the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and the viewer then sees the game rewinding displayed on the viewer's TV screen 99.

Alternatively the signal may be transmitted downstream via the return path which connects to the set-top box via the telephone 107 which feeds the signal to the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and the viewer then sees the game rewinding displayed on the viewer's TV screen 99.

To stop the game rewinding at any point the viewer may press the blue button followed by the red button to play.

Through a TV channel viewers may access the games system main options whereby through selecting "live games" on the menu, viewers may view live footage of multi-player networked games and information on players names, performance, duration of play and numbers of players. From this the viewer may select a multi-player game and join in.

From a TV channel a viewer may be prompted to access the games system by a colour icon on the top of the screen. Using a remote control viewers may press the red button to access the games system, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

A controller in the set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs

the signal to the middleware server 1, which processes the request. Content is then transmitted via a broadcast signal over wideband transmission signal, which is then received by a UHF terrestrial aerial which feeds the signal via a downlead cable to the set-top box 97. A signal converter translates the signal from digital to analogue, which is then displayed directly on the viewer's TV screen 99.

Alternatively the signal may be transmitted downstream via the return path which connects to the set-top box via the telephone 107 which feeds the signal to the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and which is then displayed on viewers TV 99.

Data carried in the mpeg stream is then stored in the flash memory of the set-top box 97 which is then presented as a menu on viewers TV screen 99. Using the remote control the viewer may select "live games" a signal is then sent upstream to the middleware server 1 which interprets the request and transmits the required data downstream via the return path or via a terrestrial antenna as a wideband signal. Whereby the signal is intercepted by a terrestrial aerial 92 which passes the signal to the set-top box 97 which interprets the data and video carried in the signal and displays the graphics in combination with live game footage on the viewers TV screen 99.

The viewer is then presented with a menu of categories of games, which includes details of multi-player networked games, live footage, player names, performance, duration of game and number of players. Using the remote control the viewer can scroll down the menu, and press the select button to join in a live multi-player game. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 97.

A controller in the set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1, which processes the request. The middleware server 1 then sends an instruction to the billing server 10 for payment authorisation. Verification is the transmitted to middleware server 1 by a billing server 10.

A signal is then transmitted by the middleware server 1 to the games database server 7, graphics controller 8, cache engine 9 and graphics accelerator 35 to begin a session. Using the input and output files of each viewer and the games engine then produces the games images using the graphic accelerator 35, cache engine 9, games data server 112, database and graphics controller 8.

The games, data is then extracted from the data server 112 and the graphics engine located on the middleware server 1 then produces the games images using the graphics accelerator 35. This is then filtered by the games controller 8 and then cached on the cache engine 9. In this way content may be accessed by the middleware server 1 from the cache engine 9 and transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder.

The mpeg encoder 60 then compresses the graphics into an mpeg format. The data is then multiplexed and transmitted as a wideband or narrowband signal via UHF antenna. The broadcast signal is then received by the viewers UHF aerial, which is then feed through the downlead into the set-top box 97, in which a decoder then translates the signal from digital to analogue to be displayed on the viewers TV screen 99.

Alternatively the signal may be transmitted downstream via the return path which connects to the set-top box 97 via the telephone 107 which feeds the signal to the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and which is then displayed on viewers TV 99.

Using the remote control or games pad 42 the viewer is able to send commands upstream via the return path to the middleware server 1, which using the file inputs and outputs of each viewer the games engine processes graphics. Which are then transmitted to the viewer's set-top box 97, which is then displayed on the viewer's TV screen 99. In this way the viewer may visually select and join in a live multi-player networked game at any time during the game.

Viewers are also able to select via remote control or game pad 42 other viewers and challenge to a multi-player networked game. When a viewer challenges another viewer a signal is sent via a remote control or games pad 42 to a controller in the set-top box 22 which converts these levels to numbers using an analogue to digital converter (ADC) which is also installed on a set-top box 97.

The set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1. The middleware server 1 then processes the request and transmits data back via the ATM network to the viewers set-top box 96 notifying the challenged viewer of the other viewers challenge on their TV screen 95.

The challenged viewer is then provided the option to play a multi-player networked game. Using their remote control the viewer presses a green key to accept. A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 96.

A controller in the set-top box 96 then interprets the signal, which is then transmitted by a modem via the telephone 109 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1, which processes the request and transmits data downstream over the ATM network to the original viewers set-top box 97. The set-top box 97 interprets the data and displays a notification of acceptance of challenged viewer to play a multi-player networked game on the TV screen 99. An instruction is then sent to both viewers receivers to switch channels to the correct program ID.

The graphics engine located on the middleware server 1 then produces images using various 3D rendering techniques such as wire-frame, shaded perspective texture mapping, mip mapping, bump mapping, linear correction, environment mapping, multi-pass rendering, fogging, deformable meshes, key framed animation, multi-textured, perspective mapping, atmospheric effects, texture filtering and transparency.

Content is then compressed and encoded into an mpeg format using an mpeg encoder 60 and transmitted downstream via the return path or via terrestrial antenna as a broadcast signal whereby the set-top box 97 receiver decodes content, which is then displayed on the viewers TV 99.

Using the remote control or games pad 42 both viewers are able to send commands upstream via the return path to the middleware server 1 where the games engine processes graphics using the graphics accelerator 35, graphics controller 8, cache engine 9 and database 7.

According to yet further aspect of the present invention, means may be provided that would allow a user to pay for access games by using a smart card. Whereby the viewer to inputs a smart card, via a smart card drive on the set-top box 97, and a transaction is processed for content within a secure environment using a smart card.

A smart card is a credit card-sized, tamper-resistant security device that offers functions for secure information storage and information processing that rely on VLSI chip technology. A smart card contains a secure microprocessor chip embedded in the card. The chip can implement a secure file system, compute cryptographic

functions, and actively detect invalid access attempts to content on the games system. Of course with the same application of file system access rights, a smart card can be safely used on terrestrial, cable and satellite TV to access multiple, independent sources of content, including the games, shopping, banking, pay-per view movies and subscription channels. This is advantageous

A smart card is distinguished from a magnetic stripe card similar to a credit card. The basic smart cards have clock rate of 3.5-8 MHZ, 8-16 Kb/s of non-volatile memory for data storage, 8-16 Kb/s ROM for the card operating system, Around 256-500 bytes of RAM for operating system computation, 2-8 Kb/s EEPROM (externally-accessible, non-volatile).

During a televised program or TV commercial a viewer may be prompted to play a game. The viewer may respond to the prompt by pressing the red button on their remote control. The viewer is then presented with a menu from which they may select a game by pressing select using their remote control or by pressing a number or colour button relating to the game of their choice.

A signal is then transmitted from the remote control via infrared radiation to an optical port 54 located in the set-top box 97. A controller in the set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1, which processes the signal.
The middleware server 1 then transmits a signal downstream to the viewers TV screen prompting them to insert their smart card.

The viewer then inputs the smart card, via a smart card drive on the set-top box 97 and they are prompted to provide a password, which may be a sequence of alphanumeric and punctuation characters entered by a user to authenticate to a users system. Alternatively the user may be asked to input a personal identification number PIN, a 4 to 12 character alphanumeric code or password used to authenticate a person's identity, when the viewer access the content on the games system. Using the remote control the viewer inputs their PIN, which transmits a signal via infrared radiation to an optical port 54 located in the set-top box 97.

A random number generated by the session key, which serves as a key for a specific transaction or set of transactions. The 56-bit number is then retrieved from a protected elementary file on the smart card, which is then transmitted between the set-top box 97 and the card reader.

The set-top box 97 then interprets the signal, which is then transmitted by a modem via the telephone 107 that is connected by a ADSL cable to a gigabit switch 81 located at the local hub. The gigabit switch is operable to redirect the request across a high speed ATM network to an ATM switch 68 which redirects the request to a ATM switch 105 located within the headend or data centre of the terrestrial TV operator.

At the headend the signal is then interpreted by the ATM switch 105, which re-directs the signal to the middleware server 1, which then sends an instruction to the billing server 10 for payment authorisation. Verification is the transmitted to middleware server 1 by a billing server 10. Upon credit verification from the billing server 10 an instruction would be sent by the middleware server 1 via the return path to the set-top box 97 to switch channels to require program ID (PID) for the games content.

The middleware server 1 then transmits a signal to the games database server 7, graphics controller 8, cache engine 9 and graphics accelerator 35 to begin a session.

The games, data is then extracted from the data server 112 and the graphics engine located on the middleware server 1 then produces the games images using the graphics accelerator 35. This is then filtered by the games controller 8 and then cached on the cache engine 9. In this way content may be accessed by the middleware server 1 from the cache engine 9 and transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder.

The mpeg encoder 60 then compresses the graphics into an mpeg format. The data is then multiplexed and transmitted as a wideband or narrowband signal via UHF antenna. The broadcast signal is then received by the viewers UHF aerial, which is then feed through the downlead into the set-top box 97, in which a decoder then translates the signal from digital to analogue to be displayed on the viewers TV screen 99.

Alternatively the signal may be transmitted downstream via the return path which connects to the set-top box 97 via the telephone 107 which feeds the signal to the set-top box 97, through to a decoder. The decoder then feeds the RGB signal to the TV screen 99 via a TV scart cable and which is then displayed on viewers TV 99.

The ability to pay for games using a smart card could be used for gambling and betting. For example the viewer may be prompted to insert their smart card to place a bet during a horse race, football match or even for the national lottery. This of course could be used for paying for other services and even products. For example a viewer could use a smart card to pay to view a movie, subscribe to a TV channel or even purchase a pizza.

In addition to cable, satellite and terrestrial TV users being able to access the games system, Figure 7 shows examples of how a cellular mobile phone user would be able

to access the games system.

In this case the users equipment includes a GSM mobile 126 with a wireless antenna 210 that can receive and transmit radio signals which provides a return path for transmitting signals to the middleware server 1.

The GSM mobile 126 is equipped with wireless transmitter/receiver which is operable to connect via a low bandwidth QPSK radio signal or high bandwidth QAM radio signal to a Local Multi point Distribution System (LMDS) receiver 120 which connects to a combiner 121 that in turn is connected to both Time Divisional Multiple Access (TDMA) and Frequency Divisional Multiple Access (FDMA) 135 interface cards. Connected to both the TDMA and FDMA interface cards is an ATM fabric switch 125 which is connected to the middleware server 1.

In this way, each of the users terminals can be connected to the games system.
Using the present invention it is possible to enable users to play video games on a mobile with a return path of greater than 10 Mb/s on a QAM radio modulation. Which 6 Mb/s faster than digital TV or 20 times faster than the standard internet connection of 512 kb/s. At present cost of the license consumption per connection would be extremely impractical. With a 128 - 512 kb/s link would be sufficient for data to be transmitted downstream and upstream to middleware server 1 to enable users to play multi-player networked games against other users.

According to one aspect of the present invention there is a system comprising
a GSM Phone 127 which has a receiver/transmitter, a games pad or Joy Pad connected via the charger, which is operable to transmit commands to a middleware server 1 located in at the wireless base station. Means may be provided within a remote location for hosting, processing and transmitting game graphics within radio signal to a GSM Phone 127. The GSM Phone 127 is connected to an LMDS receiver via a wireless QAM or QPSK signal which provides the return path that will facilitate means for interacting and playing a game, which will now be explained by way of example.

According to yet further aspect of the present invention, there is provided a games system, which enables viewers to select and play games via a dedicated radio signal. Whereby graphics are transmitted to the GSM Mobile 127 or WAP Phone 131 via a radio signal and a graphics engine which is located remotely, for example on a middleware server 1, whereby the middleware server 1 is able to process all of the game graphics. This would mean that the GSM Mobile 127 would only be required to transmit requests via the return path to the middleware server 1 which then processes and transmits graphics back to the GSM Mobile 127 via preferably a QAM radio signal which the mobile converts from digital to analogue before displaying the graphics on screen. This is advantageous as the mobile is not required to process graphics.

A viewer may be prompted to play a game via a SMS text message or e-mail. The viewer may respond to the prompt by pressing the ok button on their phone pad, which transmits a radio signal to an LMDS receive situated in the wireless base station. The signal is then transmitted via the combined to an ATM switch.

The signal is then directed by the ATM switch to the middleware server 1, which processes the request. The middleware server 1 then sends an instruction to the billing server for payment authorisation. Verification is the sent to middleware server 1.

Whilst the game data is processed and loaded by the middleware server 1 adverts within the local radio insertion server 5 are multiplexed and transmitted via the LMDS receiver over a radio signal of the user for the game to the users mobile phone.

An instruction is then sent by the middleware server to the games database 7, games controller 8, graphics accelerator 35 and cache engine 9 to begin a session. The games, data is then extracted from the data server 112 and processed by the graphics accelerator 35, which is then filtered by the graphic controller 8 before being processed by the middleware server 1 central processors. Content is then cached on the cache engine 9 which is then transmitted to an ATM switch 105 which redirects the signal to an ATM switch 65 which operable to direct the signal to an mpeg encoder.

Content is then compress into and encoded into an mpeg format using an mpeg encoder. A radio signal is then transmitted to users GSM mobile 127, which signal converter. The signal is then feed to the screen and the games video starting sequence is displayed on the user's mobile screen.

Device drivers are then downloaded or transmitted to GSM mobile 127 via the radio signal, which enables the use of game pads and joysticks connected to the mobile power adaptor.

Using the key pad or a games pad the user is then able to send commands upstream via the return path to the middleware server 1 where the games engine processes graphics using the graphics accelerator 35, graphics controller 8, cache engine 9 and database 7 which are then transmitted to the users GSM mobile 127 via a radio signal.

In this way the mobile phone 127 is not required to process the games graphics, it is only required to transmit commands upstream to the middleware server 1 and decode signals. This is advantageous.

Alternatively the viewer may access games by calling a telephone channel from which is the user is able to select games to download by pressing the number keys on their GSM mobile 127 key pad relevant to games they wish to download.

For example a user could call 0800 800 900 where they are then given audio review of games available to play, after which a number is given relating to the game. Preferably screen shots or previews may be transmitted to mobile.

The user may then select game by pressing the relevant number. A signal is then transmitted to the middleware server 1. The middleware server 1 then sends an instruction to the billing server for payment authorisation. Verification is the sent to middleware server 1.

Whilst the game data is processed and loaded by the middleware server 1 adverts within the local radio insertion server 5 are multiplexed and transmitted via the LMDS receiver over a radio signal to the users mobile phone.

Data is then transmitted to users mobile phone and stored on the SIM card, once the download is complete the user can then disconnect the call and play their new game. This is advantageous as presently to access or purchase a game on a mobile phone is very difficult especially in comparison to console games.

According to yet a further aspect of the present invention, means may be provided that would allow mobile users to play multi-player networked games, whereby viewers are able to play against each other.

The method for facilitating a multi-player networked game on terrestrial digital television, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between player's mobile phone to a middleware server 1. The middleware server 1 then processes the collected game data into game graphics, which are then transmitted over a radio signal to users mobile phone.

When a viewer plays a multi-player networked game commands are transmitted from the key pad via a radio signal to middleware server 1. which then interprets and processes the input and output files of each user and the games engine then produces the games images.

A broadband signal is then transmitted to the TDMA and FDMA 135 which multiplex the signal before being transmitted by an LMDS transmitter 122 which is operable to transmit both QAM and QPSK radio signals to each users GSM Mobile 127, which is translated from digital to analogue before being displayed on participating viewers mobile screen.

In this way viewers can play games within a multi-player networked environment on digital cellular phones, whereby the middleware server 1 exchanges data via return path between the users mobile terminals. Because the return path has the capacity of 10 mb/s this allows multi-player networked games to be played at a higher performance. This is advantageous.

According to yet further aspect of the present invention, means may be provided that would allow the viewer to input text details, via a key pad, of their name, location and e-mail address. This data is then stored in a database 7 which may be extracted by the middleware server 1 and input into a score table, which is then transmitted via a LMDS transmitted as radio signal as text message to participating users GSM mobiles. User may then select view whereby they will be able to see the winners of the last games, including details of name, performance and statistics. This is advantageous as users who have successful high scores may be notified of prizes or qualification for entry for a next stage.

It will be appreciated that results may also be provided on a TV channel as described previously for digital satellite, terrestrial and cable TV.

According to the present invention, means would be provided which would enable viewers to select games category via a user interface and be presented with games available to play. Means would also be provided enabling viewers to view video footage of selected games and information relating to the game. This would be achieved by combining either transmitting video over a broadcast signal or by streaming video downstream through the return path which is combined with data providing the user interface.

Figure 8 shows an example a layout of a user interface that is dedicated to selecting games to play.

In this case the users interface includes a window 178 which shows video footage of the selected game, information on the game including the times 167, title 170, type of game 169 and channel number of the game.

In this way the viewer is able to see details of the game including title, type and see video footage of the game which helps the viewer decide which game to select to play. The viewer is also able to see video footage of television adverts in a second window 168. This is achieved by combining video and data which is then transmitted in a wideband signal to the users set top box which decodes the video and processes the data to display a user interface which displays details of games and video footage providing previews and selective adverts.

According to yet a further aspect of the present invention, the viewer may access a TV channel which is being broadcast on a wideband signal from which the viewer can prompt a menu to be loaded from which they can select to view games, saved games, game reviews and view advert.

Menus are overlaid on video in the wideband broadcast signal thus the viewer is able to select options whilst the background, graphics, video and music are being broadcast. This is advantageous as it does not require the set-top box 97 to process

and draw background graphics or process sound as this is already being broadcast.

Figure 9, shows a example of a layout of a user interface that is dedicated to selecting to view games, load games, view reviews and view adverts.

In this case the users interface would comprise of a window 175 which shows video footage of adverts and previews relating to games.

The viewer has a choice of four options which they can select by pressing the coloured buttons. For example the viewer may press the red button 178 to view games, the green button 179 to load a game, the blue button 156 to view reviews of games. The viewer also has the option to view information relating to the advert being played in the windows 175 by pressing the yellow button 155 on the remote control.

Some of the buttons may provide a link to other television channels, for example if the viewer selects reviews their receiver may be switched to separate channel providing reviews of games. Alternatively reviews may provided through the channel which they prompted the menu from.

According to yet a further aspect of the present invention, means may be provided that would allow viewers to view, select and join in live multi-player network games via a dedicated TV channel, which is operable to broadcast live games. The viewer is also able to see information on game including time of play, player details, high scores, player performance and details of the game itself.

Figure 10 shows an example user interface that through the remote control a user would be able to view, select and join in a live multiplayer network game.

In this case the users interface in which a window 153 shows live video footage of a multiplayer networked game, information 152 on the game including the title of the game, the type of game, number players time played, start time and the channel number of the game. In this way the viewer is able to see details of the multiplayer game including title, type and see video footage of the game which helps the viewer decide which game to select to join in. The viewer is also able to see video footage of television adverts which have been combined and transmitted in a wideband signal with the user interface and live game video footage.

The viewer may select a game by using keys on the remote to scroll up, down, left and right. When game is selected it is highlighted by a red coloured outline and sound related to the live game can be heard.

The viewer has a choice of four options which they can select by pressing the coloured buttons. For example the viewer may press the red button 158 to play the selected game, the green button 157 to view the selected game, the blue button 156 to details of all players including scores, rankings and name. The viewer also has the

option to view the advert being played in one of the windows 159 in the menu by pressing the yellow button 155 on the remote control.

According to yet a further aspect of the present invention means may be provided which would enable a viewer to pause a game and access options menu, or to switch over to a TV channel. When the viewer presses pause the set top box switches channels to channel where a menu would then provide the viewer with the options to save the game, load a game, rewind or view more information on an advert playing in the background. In this way the viewer is then shown video footage of other games and television commercials enhancing the gaming experience.

Figure 11 shows an example user interface that through the remote control a user would be able to access options during a paused game.

In this case the users interface would comprise of a window 164 which shows video footage of adverts relating to the game which has been paused.

The viewer has a choice of four options which they can select by pressing the coloured buttons.

For example the viewer must press the red button 163 to save the game, the green button 165 to load a game, the blue button 161 to rewind the game and to view the advert behind the menu press the yellow button 160 on the remote control.

According to yet a further aspect of present invention, means would be provided which would enable viewers to select games by voting via a TV terminal using their remote control. Whereby viewers would be provided the option to play one of three games and the game that receives the largest vote is then broadcast.

Figure 12 shows an example user interface that through the remote control a user would be able to vote for a games to play.

In this case the users interface in which a window 184 shows video footage of each game, the title of the game 181, the type of game 183 and the number of votes 182. In this way the viewer is able to see details of the game including title, type and see video footage of the game which helps the viewer decide which game to vote for. The viewer has a choice of three games which they can select by pressing the coloured buttons.

For example for a viewer to vote for the first game they must press the red button 185, the green button 186 to vote for the second game, the blue button 187 to vote for the third game and to view the advert behind the menu press the yellow button 188 on the remote control. Results of the number of votes would be shown on interface as a bar 182 indicating the percentage of votes. The game with the largest votes would then be broadcast to the participating users.

Figure 13 shows an example user interface that through the remote control a user would be able to view other viewers scores and game highlights.

In this case the users interface would comprise of a window 189 which shows video footage of viewers games who have been entered on the score table.

The viewer has a choice of four options which they can select by pressing the coloured buttons.

For example the viewer must press the red button 197 to play the game of the viewer they selected, the green button 196 to view video highlights of the game, the blue button 195 to view players profile and the yellow button 194 on the remote control to view the advert in the window 199.

According to yet a further aspect of the present invention, means may be provided that would allow terrestrial viewers to play multi-player networked games, whereby viewers are able to play against of users on other networks. For example a viewer with cable TV could play a multi-player networked game with viewers on satellite TV, terrestrial TV or even a wireless user.

The method for facilitating a multi-player networked game across multiple digital television source including terrestrial, satellite, cable and wireless, according to the present invention comprises of a means to gathering file inputs and outputs and exchanging data between player's devices to a middleware server 1. The middleware server 1 then processes the collected game data from each viewer whether satellite, cable, terrestrial or wireless. This data in the used to compile game graphics, which are then transmitted over a broadcast signal or via the return to viewers on terrestrial, cable and satellite. Data is also transmitted via a radio signal to wireless users.

When a viewer plays a multi-player networked game commands are transmitted from the device to middleware server the same way as described in each environment, however data is exchanged between different middleware servers which then using a graphics engine compile graphics to be transmitted to the viewers devices.

Figure 14 is a block diagram showing how multi-player games can be played between viewers on systems of Figure 4, Figure 5, Figure 6, Figure 7.

In this diagram the viewers are connected to the middleware server 200, in much the same way a Figure 4, Figure 5, Figure 6, Figure 7 where data is carried over a broadcast signal or high-speed network 209 from the TV operator 203 or Wireless base station 202 to the local hub 205 which redirects the signal to viewers set top box 203 or mobile phone 211.

Data and graphics may be exchange between middleware servers 200 on the TV

operator 203 or Wireless base station 202 via broadcast link or high-speed cable connection. In this way data file inputs and outputs may be exchanged between the middleware servers 200 which using a graphics engine then process and transmit content to the viewers device.

Alternatively data and graphics may be exchanged on local hub via a broadcast signal or high-speed cable connection. In this way data file inputs and outputs may be exchanged between the middleware servers 200 which using a graphics engine then process and transmit content to the viewers device. This is advantageous as viewers may play against other viewers on other TV networks.

Referring to figure 15 the drawing. The viewers terminal is a Set top box that includes: a CPU; RAM memory; non-volatile memory; display driver circuitry; a remote control 313; an IR interface 314; a dial up interface 218; an aerial in 219; an RF Out 213; a second RF Out 220; a TV Scart 211; a VCR Scart 212; a cable/data interface 216; a USB interface 217 and an MPEG decoder.

The viewer's terminal may also include EEPROM, or Flash memory in which components of operating system and application software can be stored. Additionally the viewer's terminal may also include up to 4mb of RAM memory depending on Set top box model and make.

Connected to the viewer's terminal via the TV Scart 211 lead is a TV screen 222 that has a speaker 221. Video frames may be provided from the Set top box via the TV Scart 211 to directly to TV screen 222. Alternatively the Set top box may be connected to the TV via a VCR which is connected to TV. Either way video is displayed from the Set top box to TV screen 222.

The CPU may be used to process user interfaces and to assist in decoding MPEG video that is received through the cable/data interface 216.

Through the cable/data interface 216 the viewers Set top box receives composite data signals form the network. The Set top box is operable to separate the composite data signal into three general signals: analog video, digital video and data.

The analogue signal may be used for broadcasting in-game sequences, start sequences, previews and reviews of games over a wideband transmission channel to viewers Set top boxes.

The digital video signal may be used for streaming live game video content to the viewers Set top box.

The data signal facilitates the exchanging of XML, HTML and Java instructions between the Set top box and a host or the Games Server. The host maybe the Proxy Server 248, HTTP Server or Middleware Server 249. The host provides access to

games system and the user interfaces. The host may also provide other services for example news on new games releases.

The dial up interface 218 that is illustrated in figure 15, is a modem that may be coupled to a telephone to provide the return path functionality for Satellite or Terrestrial TV. As previously described with Cable TV the return is two-way and does not require a telephone.

According to yet a further aspect of the present invention means may be provided within a remote location for hosting, processing, digitalising and transmitting game graphics within a live video transport stream to a viewers terminal.

As will be understood the viewers terminal may comprises of many variations in specification. This could include a USB interface, which enables devices such as game pads, or joysticks to be connected. Alternatively through the digital interface further expansion may be provided.

Referring to Figure 16, the drawing, the Game Server 280 consists of a CPU, RAM Memory, Graphics card, Sound card, one or more UW SCSI 80GB HDD, CD drive, DVD drive, Hot swaps RAID, 2mb Cache, USB interface and an Optical interface.

The Game Server 280 may also include SVGA/VGA screen and keyboard for administrating the Game Server 280, up dating drivers and maintenance.

Connected to the Graphics Card 362 via S-Video connector is an MPEG encoder 277 that is operable to capture and digitalis graphics rendered by the Game Server 280 into an MPEG-2 stream in a PAL, NTSC, HDTV or SECAM format.

The Graphics card 362 is operable to render game graphics, which are captured by an MPEG encoder 277 and transmitted over a transmission channel or streamed via the return path to a viewers Set top box.

An MPEG decoder 316 in the Set top box then decodes the signal which is then feed to the TV screen 222 via a TV Scart cable and the game graphics are displayed on the TV screen 222.

The Graphics card 362 is operable to provide NTSC, PAL, SECAM or HDTV output, however this is not necessary for the games system to work.

The Graphics card 362 may be adjusted to output different refresh rates ranging from 50 Hz to 200 Hz. The Graphics card is also operable to support resolutions ranging from 640x480 (200 Hz) to 2048x1536 (85 Hz).

Also connected to the MPEG encoder 277 is a Sound card that is operable to produce audio formats ranging from 11.025KHz, 8-bit mono to 44.1KHz 16-bit stereo

depending on the game. Higher audio formats such as 24-bit stereo or AC-3 digital audio output to enable Dolby surround sound may also be provided.

The sound is captured by an MPEG encoder 277 as an unbalanced/balanced audio composite signal and synchronized with the video. The video and audio is then transmitted in an MPEG format over a transmission channel or streamed via the return path to a viewers Set top box. The audio is then decoded and sound is output through the speakers of the viewer's TV screen 222 as the games frames are displayed.

Referring to Figure 17, the drawing, the Games Server consists of CPU, RAM Memory, Graphics card 362, Sound card with AV out connector 232, a UW SCSI 80GB HDD, CD drive 155, DVD drive 156, Hot swaps RAID, 2mb Cache, USB interface, Optical interface.

Figure 17 illustrates an alternative configuration whereby the Game Server is connected via AV connector is an MPEG encoder 277 that is operable to capture and digitalis graphics rendered by the Game Server into an MPEG-2 stream in a PAL, NTSC, HDTV or SECAM format.

It will be appreciated that in practice a plurality of different connections maybe used to connect the Game Server to the MPEG encoder. For example as figure 18 illustrates a break out cable that may be used to connect the Game server 280 to the MPEG encoder 277. Alternatively as figure 19 illustrates a break out box may be used to connect multiple outputs from the Game Server 280 to MPEG encoder 277.

Referring to figure 19, the Game Server 280 consists of a CPU, RAM Memory, Graphics card 152, Sound card with AV out connector, UW SCSI 80GB HDD, CD drive, DVD drive, Hot swaps RAID, 2mb Cache, USB interface, Optical interface, and a dial up interface 227.

The dial up interface 227 is an ADSL or Broadband modem that is used to connect the Game Server to the viewers Set top box.

The dial up interface 227 may be coupled to a telephone when using HDSL, RDSL or VDSL to connect the Game Server 280 to the network. Alternatively the Game Server 280 may be connected via two-way coaxial cable on a broadband network.

According to yet a further aspect of the present invention video may be captured from the Game Server 280 using a multitude of different interfaces and hardware. For example a Video Capture card may be used to capture video directly of the Game Servers 280 which may be directly interfaced with the MPEG encoder 277 through S-video or BNC Composite cables.

Alternatively as illustrated by figure 19 this may be indirectly via a break out box 327.

Whereby S-video 329, BNC composite 330 cables are used to connect the video and audio outputs from the Game Server 280 to a break out box 327 that is in turn connected to the MPEG encoder 277 via an Optical cable 331.

Referring to Figure 20, the drawing shows a detailed example of a Cable television network architecture and infrastructure that may be used to distribute video from Game Servers 280 to a viewers Set top boxes.

As will be understood the Games system includes many different parts including Game Servers 280, Proxy Servers 248 and Middleware Servers 249. These parts could be provided centrally in headend of TV operator or may form part of a distributed network of parts that are geographically separate as illustrated by Figure 20, which illustrates the Game Servers 280 located remotely in Local Hub and the Middleware Servers 249 within the Headend.

Of course there is no reason why Game Server could not located in Headend as illustrated in Patent GB 0129161.6, however the deterioration in the quality signal particularly over a twisted pair of copper line permits that the Game Server 280 should be located within the local hub.

Those skilled in the art will realize that a signal carried over a long distance on twisted copper particularly non insulated lines can suffer in quality and some times fail to reach the viewers terminal. In practice distance becomes important factor to quality of the signal and game play.

Referring to figure 20, the Headend consists of a Middleware Server 249 that is connected to Proxy Server 248 that are in turn connected to a Catalyst 250.

The Catalysts 250 is connected to a Billing Server 245 that is connected to a Mail Server 246 which is connected to an SQL Server 247 that is connected to Authentication Server. Connected to the Catalysts 250 is a Cache Engine 240 that is connected to a Graphics controller 239 that is connected to a Customer Database 238.

The Headend also includes a VOD/NVOD Server 241, which is connected to the Multiplexer 242. Also connected to the Multiplexer 242 is the Local Advert Insertion 243 and an MPEG Encoder/decoder 244 that is connected to Satellite and Terrestrial Video Feeds 59.

The Catalyst 250 and the Multiplexer 242 are both connected to a Router 252 that is connects to the cable backbone. In this way all the Headend equipment are connected and the Middleware Server 249 and Proxy Server 248 which are both operable to control and manipulate the various hardware through transmitting instructions across the network.

The Middleware Server 249 may also be used to exchange instructions across the cable backbone to viewers Set top boxes. In this way only viewers who request a game and not those who simply access the UI are use the Games Server 280. Viewers who want to access the UI do so through the Middleware Server 249.

Of course the Proxy Server 248 may also to be used to provide popular UI's, content caching and can filter event request discarding those without access rights. Thus allowing the Game Server 280 to be used by only for viewers who have requested to play a game.

Software held on Middleware Server 249 and Proxy Server 248 enables content and instructions to be distributed across the network. In this way many of the components of games system functionality may be provided in response to viewers requests and inputs. For example a viewer may send a request upstream to the Middleware Server 249 or Proxy Server 248 to access their saved games.

The Middleware Server 249 or Proxy Server 248 would then interprets the HTML/Java instruction and transmits an instruction to Authentication Server 251 to authenticate the viewer. Once the viewer has been authenticated their personnel files are then retrieved from the SQL Server 247 and a user interface

The Billing Server 245 is used for processing payments such as subscription and pay per play on viewer's accounts. The Authentication Server 251 is used for authenticating viewers, which could be used for authentication of subscription for channel access to the games system.

The Headend is connected by a Router 252 that is connected to the Local Hub by an optical switch 254. In this way data and video may be exchanged between Headend and Local Hub.

The Local Hub consists of a Game Server 280, MPEG Encoder/decoder 277, Multiplexer 255, Boot Server 275 and a Router 256 that reroutes the composite signals from the Headend to the viewers terminal via HFC.

Connected to Hub by HFC is the viewer's terminal that consists of a Set top box 260 that is connected to a TV screen 261 via a TV Scart lead. Figure 20 also illustrates a second viewer terminal that is a Games Console 257 that is also connected to the Game Server 280 by HFC.

Figure 20 also shows two other viewers terminals that includes a PC 266 that is connected via a cable modem 60 to second Game Server 280 by HFC and second Set top box 265. It will be appreciated that hardware described could be connected in a number of ways and that Figure 20 is a example of one way in which a cable TV network may be configured.

It will be appreciated that a plurality of connections may be used to connect the various parts of the cable TV network together. For example coaxial or twisted pairs of copper wiring may be used to connect the Proxy Server 248 and Middleware Server 249 to the Catalyst.

Referring to figure 20, according to yet a further aspect of the present invention means may be provided that would enable a viewer to access the Games Systems user interfaces from a transmission channel.

For example if a viewer presses 255 on remote control 313 Set top box 260 RF tuner tunes to TV channel 255. A video signal is then received by the cable interface and the video is then displayed on the TV screen 222. A red icon on the top left hand corner of the screen indicates that viewers may access the games press by pressing the red button on their remote control 313. The viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the Set top box 260 IR interface 314.

The Set top box 260 then interprets the signal and transmits a signal upstream via the return path to a Router 256 located at the local hub. The Router 256 directs the signal to an optical switch 254 which redirects the signal over the cable network to a second Router 252 located in the Headend of the Cable TV Operator. The router then directs the signal Catalyst 250 which is operable to direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 260. The Set top box 260 then interprets the HTML/Java instruction and renders the introductory user interface which is then displayed on the viewers TV screen 261. Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select options.

Preferably the video signal from the transmission channel is encapsulated in user interface thus the viewer is still able to view video from the transmission channel whilst accessing the UI. Alternatively video from alternative channels may be played in the user interface. Means may also be provided whereby video previews of games is streamed within the UI.

Referring to figure 20, According to yet a further aspect of the present invention means may be provided whereby using a Set top box 260 viewers may access and play games held remotely on Game Server 280 through using video streaming.

Through the introductory UI the viewer may highlight and select games to play. A viewer may select a game by highlighting the game title on the UI provided or by responding to a prompt of games preview video being played in the user interface.

If a viewer presses select on their remote control 313 then an infrared signal is sent to IR interface 314. The Set top box 260 interprets the signal and transmits a signal via the return path over HFC to a Router located in the hub. The Router 256 directs the signal to optical switch 254 that is operable to redirect the signal to a second Router 252 located at the Headend of the Cable TV Operator. The Router 252 then directs the signal via the Catalyst 250 to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then sends a signal to Authentication Server to authenticate the viewer's request. If the viewer's authentication is approved then a signal is transmitted to the Game Server 280 instructing the game as requested by the viewer to be loaded. The Game Server 280 then loads the game.

A software program located on the Game Server 280, Middleware Server 249 or Proxy Server 248 then assigns an IP address to the viewers Set top box enabling video to be streamed through IP Unicasting via the HFC return path to the viewers Set top box 260. A point to point link is then established between the Game Server 280 and the viewers Set top box 260.

Graphics rendered on the Game Server 280 are then captured by the MPEG encoder 277 and synchronized with the audio outputs from the Game Server 280. The digital output from the MPEG encoder is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over HFC to the viewers Set top box 260.

An MPEG decoder 316 in the Set top box 260 then decodes the MPEG stream and corresponding frames rendered by the Game Server 280 are then displayed on the viewer's TV screen 261.

The viewer may then command the game by manipulating the buttons on the remote control 313 which transmit radiation signals to the IR interface 314 on the Set top box 260. The signal is then converted into an instruction which is then transmitted upstream via the return path to the Games Server 280 which interprets the file inputs of the viewers and renders the games graphics.

The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output is then multiplexed into a single signal by a second Multiplexer 255 and streamed downstream over HFC to the viewers Set top box 260. An MPEG decoder 316 in the Set top box 260 then decodes the MPEG stream and the corresponding frames to viewers input are displayed on the TV screen 261.

In this way the viewer is able to play the game and the game is processed and rendered by the Game Server 280 and the video is streamed in a live MPEG stream to viewers Set top box 260 which decodes and displays the games frames. Those

skilled in the art will realize that from the point Game Server renders the graphics to the point the video is streamed and displayed on the viewer's TV screen is real time. This is advantageous.

Referring to figure 20, according to yet a further aspect of the present invention means may be provided that would enable viewers to play games held remotely on a Games Server whereby rendered graphics relating to viewers inputs and provided over a channel transmission. For example when a viewer selects a game via introductory UI, an instruction is transmitted upstream via the return path to a Router 256 that is operable to redirect the instruction to a Game Server 280 located at the local hub.

The Game Server 280 then interprets the instruction and loads the requested game. The game is then loaded on the Game Server 280 and a live video feed signal is sent from graphics card and sound card along a S-video or composite cable to MPEG Encoder. The video and audio is then captured and digitalized by the MPEG Encoder in real-time.

The Headend then queues the selected MPEG video for transmission. Either the Headend or Proxy Server 248 selects an available transmission channel and sends a HTML/Java instruction to viewers Set top box 260 to tune into the selected channel. The RF tuner in the cable interface 216 then tunes into the channel. The games graphics rendered by the Game Server are than are transmitted via a Multiplexer 255 over the channel as a Wideband signal. The Set top box then receives the signal and video is displayed on the viewer's TV screen 261.

Through manipulating the buttons on the remote control 313 instructions may be transmitted via the return path to Game Server 280 which is operable to interpret the viewers inputs on the remote control 313 and render the games graphics.

Graphics rendered by the Game Server are than captured by the MPEG encoder and transmitted over the channel as a Wideband signal. The Set top box then receives the signal and video corresponding to the viewer's inputs is displayed on the viewer's TV screen 261.

In this way the game is played remotely of a Server and is not downloaded on to the Set top box 260. Video is transmitted over a channel that only the viewer playing the game sees. This is advantageous.

Referring to figure 20, according to yet a further aspect of the present invention whilst a game is being loaded, by the Game Server 280, video adverts and previews of games may be provided on the viewers TV screen 261. This may be provided through a plurality of methods including video streaming or channel switching.

For example whilst the game is being loaded by the Game Server 280. The Middleware Server 249 or Proxy Server transmits an instruction to the viewers Set top

box 260 to switch channels. The RF tuner in the cable interface 216 then tunes into the channel as instructed and video is displayed on the viewers TV screen 261. When the Game Server 280 has loaded the game an instruction is transmitted to the Middleware Server 249 or Proxy Server 248 indicating that the game has loaded.

A transmission channel is then selected by the Middleware Server 249 or Proxy Server 248 and a HTML/Java instruction is transmitted via a Catalyst 250 to a Router 252 which redirects the signal over the cable backbone to a optical switch 254. The optical switch 254 then directs the signal to a second Router 256 located in the Local Hub.

The Router 256 then directs the signal over the coaxial cable to the viewers Set top box 260. The Set top box 260 then interprets the HTML/Java based instruction that contains an instruction to switch the RF Tuner to the required channel frequency 266 MHz or program identity (PID) to receive the video content.

The RF tuner in the cable interface 216 then switches to required channel frequency without user action and graphics rendered by Game Server 280 is then displayed on TV screen 261 as video frames.

Alternatively video may be streamed directly to Set top box via IP multicasting. For example the Middleware Server 249 may assign an IP address for MPEG stream. Video is then transmitted within IP MPEG stream to a Multiplexer 242.

The MPEG Video is then multiplexed into a signal by a Multiplexer 242 and streamed to a Router 252 which directs the signal over the Cable backbone to an optical switch 254 which directs the signal to a second Router 256 located at the local hub. The Router 256 then directs the signal over the coaxial cable to the viewers Set top box 260 where an MPEG decoder decodes the MPEG stream and displays previews of games on the viewers TV screen.

When the game loads an instruction is sent to the viewers Set top box to stop decoding.
A second IP address is then assigned to the viewers Set top box 1 by the Game Server 280, Middleware Server 249 or Proxy Server 248 enabling video to be streamed through IP Unicasting via the return path to the viewers Set top box 260. A point to point link is then established between the Game Server 280 and the viewers Set top box 260.

The video stream is then switched to Game Server 280 and graphics rendered on the Game Server 280 are then captured by the MPEG encoder and synchronized with the audio outputs from the Game Server 280.

The digital output from the MPEG encoder is then multiplexed into a signal by a Multiplexer 255 and streamed downstream over HFC to the viewers Set top box 260. An MPEG decoder 316 in the Set top box 260 then decodes the IP MPEG stream and

the games frames rendered by the Game Server 280 are then displayed on the viewer's TV screen 261.

Through manipulating the buttons on the remote control the viewer is then able to control the game as previously described.

Referring to figure 20, according to yet a further aspect of the present invention means may be provided that would enable a user to pause a game and then continue from the point the game was paused during a streamed game.

For example at any point during a game being played a viewer may press the blue button which transmits a signal via infrared radiation to an IR interface on the Set top box 260. The Set top box 260 is then operable to interpret the signal and transmit an instruction via the return path over HFC to the Game Server 280 indicating that viewer has paused the game.

A signal is the transmitted from the Game Server 280 to Router 256 which directs the signal to optical switch 254 which is operable to redirect the signal to a Router 252 located a the Headend of the TV operator. The Router 252 then redirects the signal via a Catalyst 250 to the Middleware Server 249 or Proxy Server 248 instructing the Server that the game has been paused.

The Middleware Server 249 or Proxy Server 248 then ends the video stream and the Game Server 280 saves the game in temporary file that is recoverable within 24hrs of the viewer returning to the game.

The Middleware Server 249 or Proxy Server 248 then sends an instruction to the viewers Set top box 260 to switch channels. The RF tuner in the cable interface 216 of the Set top box 260 then tunes into the channel without the viewers action as instructed and previews of games are displayed on the viewers screen 261. In this way other viewers who might still be in the room whilst the game is paused may be prompted to play other games or view previews of games available on the games system. This is advantageous.

When the viewer returns to continue the game they may simply press the blue button on the remote control 313 to continue from the point they left of. A signal is then sent by Set top box 260 upstream via HFC to a Router 256 which directs the signal to optical switch 254 which is operable to redirect the signal to a Router 252 located a the Headend of the TV operator. The Router 252 then redirects the signal via a Catalyst 250 to the Middleware Server 249 or Proxy Server 248 requesting the game to be loaded.

The Middleware Server 249 or Proxy Server 248 then assigns a new IP address for the MPEG Stream and transmits an instruction to the Game Server 280 to load the game from the temporary file. The Game Server 280 loads the file and renders the games

graphics from the point the paused the game. The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over HFC to the viewers Set top box 260. An MPEG decoder 316 in the Set top box 260 then decodes the MPEG stream and the corresponding frames to viewers input are displayed on the TV screen 261. In this way the viewer is able to continue the game from the point they pressed paused.

Referring to figure 20, according to yet a further aspect of the present invention means may be provided that would enable a viewer to pause a game and then continue from the point the game was paused during a game transmitted over a transmission channel.

For example at any point during a game being played a viewer may press the blue button which transmits a signal via infrared radiation to an IR interface on the Set top box 260. The Set top box 260 is operable to interpret the signal and transmit an instruction via the return path over HFC to the Game Server 280 indicating that viewer has paused the game.

A signal is the transmitted from the Game Server 280 to Router 256 which directs the signal to optical switch 254 which is operable to redirect the signal to a Router 252 located a the Headend of the TV operator. The Router 252 then redirects the signal via a Catalyst 250 to the Middleware Server 249 or Proxy Server 248 instructing the Server that the game has been paused.

The Middleware Server 249 or Proxy Server 248 then ends the video transmission and the Game Server 280 saves the game in temporary file that is recoverable within 24hrs of the viewer returning to the game.

The Middleware Server 249 or Proxy Server 248 then sends an instruction to the viewers Set top box 260 to switch channels. The RF tuner in the cable interface 216 of the Set top box 260 then tunes into the channel without the viewers action as instructed and previews of games are displayed on the viewers screen 261.

In this way other viewers who might still be in the room whilst the game is paused may be prompted to play other games or view previews of games available on the games system. This is advantageous.

When the viewer returns to continue the game they may simply press the blue button on the remote control 313 to continue from the point they left of. A signal is then sent by Set top box 260 upstream via HFC to a Router 256 which directs the signal to optical switch 254 which is operable to redirect the signal to a Router 252 located a the Headend of the TV operator. The Router 252 then redirects the signal via a

Catalyst 250 to the Middleware Server 249 or Proxy Server 248 requesting the game to be loaded.

The Middleware Server 249 or Proxy Server 248 then assigns selects a new transmission channel for the games video and transmits an instruction to the Game Server 280 to load the game from the temporary file. The Game Server 280 loads the file and renders the games graphics from the point the paused the game. The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output is then multiplexed into a single signal by a Multiplexer 255 and transmitted over a Wideband signal to viewers Set top box 260 which a coverts the signal to frames that are displayed on the TV screen 261. The viewer is then able to continue the game from the point they pressed paused.

Referring to figure 20, according to yet a further aspect of the present invention means may be provided that would enable a viewer save a game remotely.

For example at any point during a game being played a viewer may press the yellow button which transmits a signal via infrared radiation to an IR interface on the Set top box 260. The Set top box 260 is operable to interpret the signal and transmit an instruction via the return path over HFC to the Game Server 280 indicating that viewer has requested the game to be saved.

The Game Server 280 then provides then renders a UI. The UI graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output from the MPEG encoder is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over HFC to the viewers Set top box 260. An MPEG decoder 316 in the Set top box 260 then decodes the MPEG stream and the UI is displayed on the TV screen 261. The UI consists of a table enabling the viewer to type in a file name they would like to save the game under.

Through manipulating the keys on the remote control 313 like on a mobile key pad the numbers represent letters of the alphabet. The viewer may then type in a file name of their choice and press the select button to save. If the viewer presses select a signal is sent by the Set top box 260 via the return path across the HFC to the Game Server 280 which interprets the viewers inputs and saves the game.

Alternatively the UI may be rendered by the Set top box 260 and transmitted as HTML/Java instruction by the Middleware Server 249 or Proxy Server 248. For example during a game if a viewer may press the yellow button on the remote control 313 to

save the game an infrared signal is sent to IR interface.

The Set top box 260 interprets the signal and transmits a signal via the return path over HFC to a Router located in the hub. The Router 256 directs the signal to optical switch 254 that is operable to redirect the signal to a second Router 252 located at the Headend of the Cable TV Operator. The Router 252 then directs the signal via the Catalyst 250 to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then transmits an instruction via Catalyst 250 to a Router 252 which is operable to direct the instruction to an optical switch 254. The optical switch 254 then directs the instruction to a Router 256 located at the local hub which directs the instruction over HFC to the viewers Set top box 260.

The Set top box 260 is then operable to render the UI using the HTML/Java instruction enabling the viewer to type in the file name using the remote control 313. Similarly to save the game the viewer may press the select button on the remote control 313.

Referring to figure 20, according to yet a further aspect of the present invention means may be provided enabling viewers load a game from UI accessed from a transmission channel.

For example if a viewer presses 255 on remote control 313 the RF tuner in the Set top box 260 tunes to TV channel 255. A video signal is then received by the cable interface and the video is then displayed on the TV screen 222.

A red icon on the top left-hand corner of the screen indicates that viewers may access the games by pressing the red button on their remote control 313. The viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the Set top box 260 IR interface 314.

The Set top box 260 then interprets the signal and transmits a signal upstream via the return path to a Router 256 located at the local hub. The Router 256 directs the signal to an optical switch 254 which redirects the signal over the cable network to a second Router 252 located in the Headend of the Cable TV Operator. The router then directs the signal Catalyst 250 that is operable to direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 260. The Set top box 260 then interprets the HTML/Java instruction and renders the introductory user interface which is then displayed on the viewers TV screen 261. Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select options.

Alternatively the UI may be loaded from within game itself. For example during a game

a viewer may press the green button to access options. If the viewer presses the green button on remote control 313 then a signal is transmitted by the Set top box 260 upstream via a Router 256 to the Game Server 280 which then renders the UI. The UI graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output from the MPEG encoder 277 is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over HFC to the viewers Set top box 260. An MPEG decoder 316 in the Set top box 260 then decodes the MPEG stream and the UI is then displayed on the TV screen 261.

Through manipulating the keys on the remote control 313 the viewer select a file of their choice. The viewer may then load the game by pressing the select button that transmits infrared radiation to an IR interface on the Set top box 260.

The Set top box 260 then interprets the signal and transmits an instruction via a Router 256 to the Game Server 280 that is located at the local hub. The Game Server 280 then interprets the instruction and loads the requested file. The MPEG encoder 277 then captures the rendered graphics from the game that has been loaded and the video is streamed over HFC to the viewers Set top box 260.

An MPEG decoder 316 in the Set top box 260 is then operable to decode the MPEG Stream. The render graphics from the loaded game are then displayed on the viewer's TV screen 261. Through manipulating the keys on the remote control 313 the viewer is then able to continue playing the game from the point they saved the game. This is advantageous.

Referring to figure 20, according yet a further aspect means may be provided enabling through UI for a viewer to search for a game held remotely on the Game Server 280.

For example using the remote control 313 the viewer may access a games channel by pressing in a channel such as 255. When the viewer presses in a channel number on the remote the RF tuner in the cable interface 216 then tunes into the channel. Video transmitted over a transmission channel is then received by the viewers Set top box 260 and displayed on the viewers TV screen 261.

A red icon on the top left-hand corner of the screen indicates that viewers may access the games by pressing the red button on their remote control 313. The viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the Set top box 260 IR interface 314.

The Set top box 260 then interprets the signal and transmits a signal upstream via the return path to a Router 256 located at the local hub. The Router 256 directs the signal to an optical switch 254 which redirects the signal over the cable network to a second

Router 252 located in the Headend of the Cable TV Operator. The router then directs the signal Catalyst 250 which is operable to direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then transmits the user interface downstream to the Set top box 260 where it is realized in the RAM Memory. The user interface includes five main components: an introductory listing of new game releases; a list of game categories; a feature permitting the user to search a database for games available by tittle, developer, publisher and keywords; a video preview of games available to play and a video for advertising. The user interface (UI) is defined in HTML primitives and sent over the network by the Middleware Server 249 or Proxy Server 248.

Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select one of the various options provided in the UI. For example if the viewer selects search infrared radiation is then blasted from the remote control to an IR interface 314 on the Set top box 260.

The Set top box 260 is then operable to interpret the signal and transmit a signal via return path to a Router 256 located at the local hub. The Router 256 then directs the signal to an optical switch 254 located on the cable backbone which redirects the signal to a second Router 252 situated within the Headend of the Cable TV operator. The Router 252 then directs the signal via a Catalyst to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then transmits a second user interface downstream to the Set top box 260 where it is realized in the RAM Memory. The user interface consists of three main components which are text boxes permitting the user to search a database for games available by inputting the tittle of a game, developer, publisher or keywords like football.

Using the remote control 313 the viewer is able to input text characters into the text box. If the viewer presses select then an infrared radiation is then blasted from the remote control to an IR interface 314 on the Set top box 260. The Set top box 260 is then operable to interpret the signal and transmits the input text characters a data signal via return path to a Router 256 located at the local hub.

The Router 256 then directs the signal to an optical switch 254 located on the cable backbone, which redirects the signal to a second Router 252 situated within the Headend of the Cable TV operator. The Router 252 then directs the signal via a Catalyst to the Middleware Server 249 or Proxy Server 248. The Middleware Server 249 or Proxy Server 248 then interprets the data signal and transmit and search is performed on a database.

Games matching the viewers input text characters are then transmitted within a data

signal to viewers Set top box 260 that renders a third UI providing a list of games matching the viewers text input. To play any of the games the viewer may simply highlight the game and press select.

Referring to figure 20, according to yet a further aspect of the present invention means may be provided that would enable viewers to play multi player games on a Set top box. This is achieved by gathering the file inputs and outputs from the viewers Set top box. The Game Server uses the file inputs much in same way as single player games where the file inputs from the viewer are used to render the games graphics.

For example when a game is launched the viewer is presented with the games own UI which is either streamed or transmitted to viewers. For example the viewer may select to play a game from the introductory UI. When the game loaded and video is either streamed over IP or transmitted on a channel the viewer is presented with the games own user interface that is unique to every game and is separate to games systems UI's.

The games UI typically consists of four main options that includes single player; multi player; networked; video and controls. Through the games UI the viewer is operable to select multi player games.

If the viewer selects multi player games then a signal is transmitted from the viewers Set top box 260 upstream via a Router 256 to the Game Server 280. The Game Server 280 interprets the viewer's inputs and renders the UI. The UI is then captured by the MPEG encoder within the MPEG Video stream and streamed downstream over the HFC to the viewers Set top box 260. An MPEG decoder 316 in the Set top box 260 then decodes the IP MPEG stream and the UI is displayed within video frames on the viewer's TV screen 261.

The viewer is then able to configure a multi player through manipulating keys on the remote control 313. Those familiar with networked games will realize that within a games UI the viewer may typically select the number of players, time limits, level difficulty and the game mode whether player verses player or players verses computer. The viewer may also be able to select the screen mode whether split screen vertical or horizontal depending on the game.

Once the viewer is satisfied with the game options they may then launch the game through manipulating the buttons on the Set top box 260 remote controller.

For example if the viewer highlights and selects start game on the UI a signal is transmitted from the viewers Set top box 260 upstream via a Router 256 to the Game Server 280. The Game Server 280 interprets the viewer's inputs and loads the multi player game. Depending on the number of players selected the viewers are then able to command the game through manipulating keys on the remote control 313. Alternatively during a multi player game viewers may use other devices such as an

infrared keyboard, USB game pad or USB Joystick.

In this way two or viewers have the option not to share the remote control 313. Through manipulating the buttons on the remote control 313, an infrared keyboard, USB game pad or USB Joystick the viewers may command a game.

In same way as described in single player games the file inputs from the viewers Set top box 260 are transmitted upstream via a Router 256 to Game Server 280. The Game Server 280 using a software program interprets the viewers inputs and renders the games graphics. The graphics and audio from Game Server are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output from the MPEG Encoder is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over the HFC to the viewers Set top box 260. An MPEG decoder 316 in the Set top box 260 then decodes the IP MPEG stream and the corresponding video frames to the viewer's inputs are displayed on the TV screen 261.

The audio corresponding to viewer's inputs within the MPEG stream is also output through the viewer's speakers. In this way viewers may play multi player games such as those available on games consoles on a thin client Set top box 260.

Referring to figure 20, according to yet a further aspect of the present invention means may be provided that would enable viewers to play networked games on a Set top box. This is achieved by networking multiple Game Servers on a broadband network enabling file inputs and outputs to be exchanged at high speed between the Game Servers.

Game Server 280 sends instruction via coaxial cable to second Game Server 323. The Proxy Server 248 or Middleware Server 249 then selects a data channel on the broadband network and communication link is established between the Game Servers.

In this way the Game Server 280 can gather the file inputs from viewers Set top box 260 and the inputs of participating viewers from the other Game Server 323 which can be used to render the games graphics. For example referring to figure 20, as described in Patent GB 0129161.6 a viewer may view video footage of live multi player networked games through accessing a UI from a transmission channel. The viewer may also select to join in a multi player networked game by pressing select on the remote control 313.

For example if the viewer presses 255 on the remote control 313 the RF tuner in the Set top box 260 will tune to TV channel 255. A video signal is then received by the cable interface and the video of game previews or live game footage taken from multi-

player networked games is then displayed on the TV screen 222. A yellow icon in the top left-hand corner of the screen indicates that viewers may join in the networked game by pressing the yellow button on their remote control 313.

If the viewer then presses the yellow button on the remote control 313 an infrared signal is the transmitted to the Set top box 260 IR interface 314. The Set top box 260 then interprets the signal and transmits a signal upstream via the return path to a Router 256 located at the local hub. The Router 256 directs the signal to an optical switch 254 which redirects the signal over the cable network to a second Router 252 located in the Headend of the Cable TV Operator. The router then directs the signal Catalyst 250 that is operable to direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 260. The Set top box 260 then interprets the HTML/Java instruction and renders a user interface is then displayed on the viewers TV screen 261 informing the viewer that their request to join in the networked game has been accepted.

The Middleware Server 249 or Proxy Server 248 then transmits a HTML/Java instruction back downstream to the Game Server 280 to load the networked game.

The networked game is then loaded by the Game Servers and communication channel is assigned on the broadband network between Game Server 280 and participating Game Servers allowing data inputs to be exchanged between the Servers. The Middleware Server 249 or Proxy Server 248 then assigns a IP address to viewer enabling MPEG video captured by the MPEG encoders to be streamed to the Set top box 260.

A point to point communication link is then established between the Game Server 280 and Set top box 260. Using the data inputs from participating Game Servers the Game Server 280 then renders the games graphics. Video is then captured by the MPEG encoder 277 and encoded in an MPEG stream. The MPEG is then streamed from the Game Server 280 over HFC to the viewers Set top box 260. An MPEG decoder 316 in Set top box 260 then decodes the IP MPEG stream and the games frames corresponding to the data inputs from participating Game Servers are displayed on TV screen 261.

The viewer is able to command the game through manipulating the keys on the remote control 313 as described previously.

Alternatively a function with the UI will enable a viewer to create a multi player networked game that other viewers may select to join in by accessing the UI and viewing multi-player networked games. For example if the viewer presses 255 on the remote control 313 the Set top box 260 RF tuner will tune to TV channel 255.

A video signal is then received by the cable interface and the video of game previews or live game footage taken from multi-player networked games is then displayed on the TV screen 222. A red icon on the top left-hand corner of the screen indicates that viewers may access the games by pressing the red button on their remote control 313.

If the viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the IR interface 314 on the Set top box 260. The Set top box 260 then interprets the signal and transmits a signal upstream via the return path to a Router 256 located at the local hub. The Router 256 directs the signal to an optical switch 254 which redirects the signal over the cable network to a second Router 252 located in the Headend of the Cable TV Operator. The router then directs the signal Catalyst 250 that is operable to direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 260. The Set top box 260 then interprets the HTML/Java instruction and renders the introductory user interface which is then displayed on the viewers TV screen 261. Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select the multi player or network game options.

If the viewer selects the networked games by highlighting and pressing select on their remote control 313 an infrared signal is the transmitted to the IR interface 314 on the Set top box 260. The Set top box 260 then interprets the signal and transmits a signal upstream via the return path to a Router 256 located at the local hub.

The Router 256 directs the signal to an optical switch 254 which redirects the signal over the cable network to a second Router 252 located in the Headend of the Cable TV Operator. The router then directs the signal Catalyst 250 that is operable to direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 260. The Set top box 260 then interprets the HTML/Java instruction and renders a second user interface which is then displayed on the viewers TV screen 261.

The user interface comprises of four main components: an listing of networked games; an option to create a network game; a video preview of live networked games available to play and a video for advertising. The user interface (UI) is defined in HTML primitives and realized in the Set top box 260 RAM Memory.

Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select the network games to join in or create a new game options. The

viewer selects create new game by highlighting the option and pressing select then an infrared signal is the transmitted to the Set top box 260 IR interface 314.

The Set top box 260 then interprets the signal and transmits a signal upstream via the return path to a Router 256 situated at the local hub. The Router 256 then redirects the signal to an optical switch 254 which redirects the signal over the cable network to a second Router 252 located in the Headend of the Cable TV Operator. The router then directs the signal Catalyst 250 that is operable to direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream within the UI to all viewers indicating the networked game created by the viewer.

If a viewer responds by highlighting and selecting join in on the remote control 313 then a signal is carried upstream to the Middleware Server 249 or Proxy Server 248 which interprets the signal and transmits a HTML/Java instruction back downstream to the Game Server 280 and Game Server 323 to load the networked game.

The networked game is then loaded by the Game Servers and communication channel is assigned on the broadband network between Game Server 280 and Game Server 323 allowing data inputs to be exchanged at a high bit transfer speed of 20 (mbps) or more between the Servers.

The Middleware Server 249 or Proxy Server 248 then assigns two independent IP addresses enabling MPEG video captured by the MPEG encoders to be streamed to Set top box 265 and Set top box 260.

A point to point communication link is then established between the Game Server 280 and Set top box 260. A second point to point communication link is then established between the Game Server 323 and Set top box 265 enabling. The video output from the Game Server 280 is then captured by the MPEG encoders and streamed over HFC to Set top box 260 and Set top box 265.

An MPEG decoder in Set top box 260 and Set top box 265 then decodes the IP MPEG stream and the games frames are displayed on TV screen 261 and TV screen 268.

The viewers are then able to command the game through manipulating the keys on the remote control 313. For example if the second viewer presses left on their remote control 313 infrared radiation is blasted at the IR interface on the viewers Set top box 265.

The Set top box 265 is then operable to interpret the signal and transmits a signal upstream via the HFC to a Router 264 located at the local hub. The Router 264 is operable to redirect the signal to Game Servers 323 which interprets the viewers

inputs and transmits the data input along a coaxial cable to the other Game Server 280 which interprets the data input. The Games Servers then render the graphics corresponding to the data inputs from the viewers Set top box 265.

Video is then captured by the MPEG encoders and streamed from the Game Servers over HFC to Set top box 260 and Set top box 265. An MPEG decoder in Set top box 260 and Set top box 265 then decodes the IP MPEG stream and the corresponding game frames to the data inputs from Set top box 265 are displayed on TV screen 261 and TV screen 268.

In this way both viewers inputs are used by the Game Servers to render the graphics enabling viewers to play networked games. It will be appreciated that multiples of viewers could participate in a networked game in this way. This is advantageous.

Alternatively the viewer may select a networked game option within a games own UI which is either streamed or transmitted to viewers terminal when a game is first launched. For example the viewer may select to play Quake from the introductory UI. When the game loaded and video is either streamed over IP or transmitted on a channel the viewer is presented with the games own user interface that is unique to every game and is separate to games systems UI's.

The games UI typically consists of four main options that includes single player; multi player; networked; video and controls. Through the games UI the viewer is operable to select multi player or networked games.

If the viewer selects networked games then a signal is transmitted from the viewers Set top box 260 upstream via a Router 256 to the Game Server 280. The Game Server 280 interprets the viewer's inputs and renders the UI.

The UI is then captured by the MPEG encoder within the MPEG Video stream and streamed downstream over the HFC to the viewers Set top box 260. An MPEG decoder 316 in the Set top box 260 then decodes the IP MPEG stream and the UI is displayed within video frames on the viewer's TV screen 261.

The viewer is then able to create a networked through manipulating keys on the remote control 313. If the viewer highlights and selects start game then a signal is transmitted from the viewers Set top box 260 upstream via a Router 256 to the Game Server 280. The Game Server 280 interprets the viewer's inputs and loads the networked game.

The Middleware Server 249 or Proxy Server 248 transmits a HTML/Java instruction downstream within the games system UI to all viewers indicating that the networked game created by the viewer.

If a viewer responds by highlighting and selecting join in on the remote control 313

then a signal is carried upstream to the Middleware Server 249 or Proxy Server 248 which interprets the signal and transmits a HTML/Java instruction back downstream to the Game Server 323 to load the networked game.

The video output from the Game Server 280 is then captured by the MPEG encoders and streamed from the Game Servers over HFC to Set top box 260 and Set top box 265. An MPEG decoder in Set top box 260 and Set top box 265 then decodes the IP MPEG stream and the game frames are displayed on TV screen 261 and TV screen 268.

In this way both viewers inputs are used by the Game Servers to render the graphics enabling viewers to play networked games equivalent to those available on games consoles and PC's using a thin client Set top box and a remote control. This is advantageous.

Referring to figure 20, according to yet a further aspect of the present invention means may be provided which would enable a viewer to play PC, MAC, Amiga, Atrai, Playstation, X-box, Nintendo games on there existing Set top box without any hardware or software additions to the Set top box. This is achieved by a number of ways. Firstly the Game Server 280 is operable to switch operating systems (O/S) on boot up.

For example if a viewer selects a game from the introductory UI provided that is a Playstation format a signal is transmitted upstream to the Middleware Server 249 or Proxy Server 248 requesting the game.

The Middleware Server 249 or Proxy Server 248 is operable to interpret the signal and transmit a instruction via a Catalyst 250 to a Router 252 which redirects the signal to an Optical Switch located on local hub. The Optical Switch then directs the signal to Boot Server 275.

The Boot Server 275 then analysis the boot log, to identify any Game Servers currently running the PS2 O/S. If the Boot Server 275 does not identify an available Game Server running PS2 O/S, then the Server is operable to select a Game Server and reboot the Server.

An instruction is then transmitted to the Game Server 280 to restart. The Game Server 280 then restarts and loads the PS2 O/S. When the Game Server 280 has loaded the O/S a signal is transmitted upstream to the Middleware Server 249 or Proxy Server 248 indicating that the Game Server 280 has been reset to the required O/S.

The game is then loaded on the Game Server 280. A software program located on the Game Server 280, Middleware Server 249 or Proxy Server 248 then assigns an IP address to the viewers Set top box 260 enabling video to be streamed through IP Unicasting via the HFC return path to the viewers Set top box 260. A point to point link

is then established between the Game Server 280 and the viewers Set top box 260.

Graphics rendered on the Game Server 280 are then captured by the MPEG encoder 277 and synchronized with the audio outputs from the Game Server 280.

The digital output from the MPEG encoder is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over HFC to the viewers Set top box 260.

An MPEG decoder 316 in the Set top box 260 then decodes the MPEG stream and corresponding frames rendered by the Game Server 280 are then displayed on the viewer's TV screen 261.

The viewer may then command the game by manipulating the buttons on the remote control 313. For example if the viewer presses the number 2 button on the remote control 313 a radiation signal is blasted at the IR interface 314 on the Set top box 260.

The signal is then interpreted by the Set top box 260 which transmits a signal upstream via the return path to the Games Server 280 which interprets the file inputs of the viewers and renders the games graphics. The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output from the MPEG encoder is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over HFC to the viewers Set top box 260. An MPEG decoder 316 in the Set top box 260 then decodes the MPEG stream and the corresponding frames to viewers input are displayed on the TV screen 261.

In this way the viewer is able to play a Playstation game using only a Set top box 260. This is advantageous.

Those skilled in the art will realize that from the point Game Server renders the graphics to the point the video is streamed and displayed on the viewer's TV screen is real time. This is advantageous.

Alternatively emulation software maybe used to emulate an operating system whereby an emulation software is run on top an operating system such as Windows, Linux, Unix or Sun. Through the second method operating systems maybe switched without resetting or rebooting the Game Server.

Alternatively through a third method that uses software drivers installed on an operating system, this would enable the Game Server 280 to interpret game formats from other platforms without emulation or rebooting the Game Server 280.

Through either of the above methods the Game Server 280 is operable to run PC, MAC, Amiga, Atari, Playstation, X-box, Nintendo and Linux games from which the

MPEG encoder 277 is operable to capture the video and audio output from the Game Server 280. The MPEG encoder 70 is also operable to encode the output into an MPEG video stream, which may then be transmitted or streamed to a Set top box 260.

A decoded in the Set top box 260 is operable to decode the digital output from the MPEG encoder 277 from which successive video frames rendered by the Game Server 280 are displayed on a viewer's TV screen 261. This is advantageous as the viewer is not constrained by format issues, or required to buy a console to play games.

It is appreciated that through the method described this would also enable viewers to play multi-player or networked games regardless of the format whether PC, Atari, Amiga, Sony, X-box or Nintendo games on a conventional Cable Set top box.

Referring to Figure 21, the drawing shows a detailed example of a Satellite television network architecture and infrastructure that may be used to distribute video from Game Servers 280 to a viewers Set top boxes.

As will be understood the Games system includes many different parts including Game Servers 280, Proxy Servers 248 and Middleware Servers 249. These parts could be provided centrally in Headend of TV operator or may form part of a distributed network of parts that are geographically separate as illustrated by Figure 21, which shows the Game Servers 280 located remotely in Local Hub and the Middleware Servers 249 within the Headend.

Of course there is no reason why Game Server 280 could not located in Headend as shown in Patent GB 0129161.6, however the deterioration in the quality signal particularly over a twisted pair of copper line permits that the Game Server 280 should be located within the local hub.

Those skilled in the art will realize that a signal carried over a long distance on twisted copper particularly non insulated lines can suffer in quality and some times fail to reach the viewers terminal. In practice distance becomes important factor to quality of the signal and game play when video is carried over ADSL.

Referring to figure 21, the Headend consists of a Proxy Server 248 that is connected to a Middleware Server 249 that is in turn connected to an ATM Switch 272.

The ATM Switch 272 is connected to a Billing Server 245 that is connected to a Mail Server 246 which is connected to an SQL Server 247 that is connected to Authentication Server. Also connected to the ATM Switch 272 is a Cache Engine 240 that is connected to a Graphics controller 239 that is connected to a Customer Database 238.

The Headend also includes a VOD/NVOD Server 241, which is connected to the

MPEG Encoder 244. Also connected to the MPEG Encoder/decoder 244 is the Local Advert Insertion 243 and a Multiplexer 242 that is connected to a Digital Broadcasting Satellite Unit 278. The MPEG Encoder 244 is also connected to an ATM Switch 271 that is connects via a second ATM Switch 272 to the ATM backbone.

In this way all the Headend equipment are connected and the Middleware Server 249 and Proxy Server 248 are both operable to control and manipulate the various hardware through transmitting instructions across the network.

The Middleware Server 249 may also used exchange instructions across the ATM backbone to viewers Set top boxes. In this way only viewers who request a game and not those who simply access the UI are able to use the Games Server 280. Viewers who want to access the UI do so through the Middleware Server 249.

Of course the Proxy Server 248 may also to be used to provide popular UI's, content caching and can filter event request discarding those without access rights. Thus allowing the Game Server 280 to be used by only for viewers who have requested to play a game.

Software held on Middleware Server 249 and Proxy Server 248 enables content and instructions to be distributed across the ATM network. In this way many of the components of games system functionality may be provided in response to viewers requests and inputs. For example a viewer may send a request upstream to the Middleware Server 249 or Proxy Server 248 to access their saved games.

The Middleware Server 249 or Proxy Server 248 would then interpret the HTML/Java instruction and send an instruction to the Authentication Server 251 to authenticate the viewer. Once the viewer has been authenticated their personnel files are then retrieved from the SQL Server 247 and a user interface would provide the viewer with a list of their saved games.

The Billing Server 245 is used for processing payments such as subscription and pay per play on viewer's accounts. The Authentication Server 251 is used for authenticating viewers, which could be used for authentication of subscription for channel access to the games system.

The Headend is connected by a ATM Switch 273 that is connected to the Local Hub by a Switch 274. In this way data and video may be exchanged between Headend and Local Hub.

The Local Hub consists of a Game Server 280, MPEG Encoder/decoder 277, Multiplexer 276, Boot Server 275 and a Switch 274 that is operable to direct signals from the Headend to the viewers terminal via ADSL.

Connected to Hub by ADSL is the viewer's terminal that consists of a Set top box 291

that is connected to a TV screen 292 via a VCR 290. Figure 21 also illustrates a second viewer terminal that is a Games Console 286 that is connected to the Game Server 280 by dial up interface 218 coupled to a telephone.

It will be appreciated that hardware described cloud be connected in a number of ways and that Figure 21 is a example of one way in which a satellite TV network may be configured.

It will be appreciated that a plurality of connections may be used to connect the various parts of the satellite TV network together. For example coaxial or twisted pairs of copper wiring may be used to connect the Proxy Server 248 and Middleware Server 249 to the ATM Switch 272.

Referring to figure 21, according to yet a further aspect of the present invention means may be provided that would enable a viewer to access user interface from a transmission channel.

For example if a viewer presses 255 on remote control 313 the RF tuner in the Set top box 291 will tune to TV channel 255. A video signal is then received by the data interface and the video is then displayed on the TV screen 292.

A red icon on the top left-hand corner of the screen indicates that viewers may access the games by pressing the red button on their remote control 313. If the viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the IR interface 314 on the Set top box 291.

The Set top box 291 then interprets the signal and transmits a signal upstream via the dial up interface 218 to a Switch 274 located at the local hub. The Switch 274 then directs the signal to an ATM Switch 273 which redirects the signal over the ATM network to a third ATM Switch 272 located in the Headend of the Satellite TV Operator. The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream via the dial up interface 218 to the viewers Set top box 291. Alternatively this may be transmitted within a transmission channel as a data signal.

The Set top box 291 then interprets the HTML/Java instruction and renders the introductory user interface which is then displayed on the viewers TV screen 291. Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select options.

Preferably the video signal from the transmission channel is encapsulated in user interface thus the viewer is still able to view video from the transmission channel

whilst accessing the UI. Alternatively video from alternative channels may be played in the user interface. Means may also be provided whereby video previews of games is streamed within the UI.

Referring to figure 21, According to yet a further aspect of the present invention means may be provided whereby using Satellite Set top boxes viewers may access and play games held remotely on Game Server 280 through using video streaming.

Through the introductory UI the viewer may highlight and select games to play. A viewer may select a game by highlighting the game title on the UI provided or by responding to a prompt of games preview video being played in the user interface. If a viewer presses select on their remote control 313 then an infrared signal is sent to IR interface 314.

The Set top box 291 interprets the signal and transmits a signal via dial up interface 218 over ADSL to a Switch 274 located in the local hub. The Switch 274 then directs the signal to an ATM Switch 273 that is operable to redirect the signal to another ATM Switch 272 located at the Headend of the Satellite TV Operator. The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then sends a signal to Authentication Server 251 to authenticate the viewer's request. If the viewer's authentication is approved then a signal is transmitted to the Game Server 280 instructing the game as requested by the viewer to be loaded. The Game Server 280 then loads the game.

A software program located on the Game Server 280, Middleware Server 249 or Proxy Server 248 then assigns an IP address to the viewers Set top box 291. This enables video to be streamed through IP Unicasting via the dial up interface 218 over ADSL to the viewers Set top box 291. A point to point link is then established between the Game Server 280 and the viewers Set top box 291.

Graphics rendered on the Game Server 280 are then captured by the MPEG encoder 277 and synchronized with the audio outputs from the Game Server 280. The video output from the Game Server 280 is then encoded by MPEG encoder and the digital output is then multiplexed into a single signal by a Multiplexer 276 and streamed downstream over ADSL to the viewers Set top box 291.

An MPEG decoder 316 in the Set top box 291 then decodes the MPEG stream and corresponding frames rendered by the Game Server 280 are then displayed on the viewer's TV screen 292.

The viewer may then command the game by manipulating the buttons on the remote control 313 which transmit radiation signals to the IR interface 314 on the Set top box 291. The signal is then converted into an instruction which is then transmitted upstream via the dial up interface 218 to the Games Server 280 which interprets the

file inputs of the viewers and renders the games graphics.

The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server 280 via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal. The digital output from the MPEG encoder is then multiplexed into a single signal by a Multiplexer 276 and streamed downstream over ADSL to the viewers Set top box 291.

An MPEG decoder 316 in the Set top box 291 then decodes the MPEG stream and the corresponding frames to viewers input are displayed on the TV screen 292. In this way the viewer is able to play the games equivalent to that available on a games console.

This is achieved by rendering games graphics on the Game Server 280 which is captured by the MPEG encoder 277 and streamed in a live MPEG video stream to the viewers Set top box 291 which decodes and displays the games frames.

Those skilled in the art will realize that from the point Game Server 280 renders the graphics to the point the video is streamed and displayed on the viewer's TV screen 291 is real time. This is advantageous.

Referring to figure 21, according to yet a further aspect of the present invention means may be provided that would enable a viewer to play games held remotely on a Games Server 280 whereby rendered graphics relating to viewers inputs and provided over a channel transmission.

For example when a viewer selects a game via introductory UI, an instruction is transmitted upstream via the dial up interface 218 to a Switch 274 that is operable to redirect the instruction to a Game Server 280 located at the local hub. The Game Server 280 then interprets the instruction and loads the requested game.

The game is then loaded on the Game Server 280 and the MPEG encoder 277 captures a live video and audio feed from the graphics card and sound card along a s-video or composite cable. The video and audio is then encoded and formatted by the MPEG encoder 277 in real-time.

Either the Headend or Proxy Server 248 selects an available transmission channel and sends a HTML/Java instruction to viewers Set top box 291 to tune into the selected channel. The receiver/tuner in the data interface 216 then tunes into the channel. The games graphics rendered by the Game Server 280 are than are transmitted via a Multiplexer 276 over the transmission channel as a Wideband signal.

The viewers Satellite Dish 289 is then operable to incept the signal that is feed via a down lead to the viewer's Set top box 291. The Set top box 291 then converts the

signal to analogue and the video is displayed on the viewer's TV screen 292.

Through manipulating the buttons on the remote control 313 instructions may be transmitted via the dial up interface 218 to Game Server 280 which is operable to interpret the viewers inputs on the remote control 313 and render the games graphics. Graphics rendered by the Game Server are than captured by the MPEG encoder 277 and transmitted over the channel as a Wideband signal.

The viewers Satellite Dish 289 is then operable to incept the signal that is feed via a down lead to the viewer's Set top box 291. The Set top box 291 then converts the video signal to analogue and video corresponding to the viewer's inputs is displayed on the viewer's TV screen 292.

In this way the game is played remotely of a Server and is not downloaded on to the Set top box 291. Video is transmitted over a channel that only the viewer playing the game sees. This is advantageous.

Referring to figure 21, according to yet a further aspect of the present invention whilst a game is being loaded, by the Game Server 280, video adverts and previews of games may be provided on the viewers TV screen 291. This may be provided through a plurality of methods including video streaming or channel switching.

For example whilst the game is being loaded by the Game Server 280. The Middleware Server 249 or Proxy Server transmits an instruction downstream via the return path to the viewers Set top box 291 to switch channels.

A receiver/tuner in the viewers Set top box 291 then tunes the into the channel as instructed and video received via the Satellite Dish 289 is feed into viewers Set top box 291 and adverts and game previews are displayed on the viewers TV screen 292. When the Game Server 280 has loaded the game an instruction is transmitted to the Middleware Server 249 or Proxy Server 248 indicating that the game has loaded.

Middleware Server 249 or Proxy Server 248 then selects a transmission channel and a HTML/Java instruction is transmitted via an ATM Switch 272 to a second ATM Switch 273. The ATM Switch 273 is operable to redirect the signal over the ATM backbone to a Gigabyte Switch 274 located in the Local Hub.

The Gigabyte Switch 274 then directs the signal over the ADSL loop to the viewers Set top box 291. The Set top box 291 then interprets the HTML/Java based instruction that contains an instruction to switch the receiver/tuner to the required channel frequency 266 MHz or program identity (PID) to receive the video content.

The receiver/tuner in the Set top box 291 then switches to required channel frequency without user action and graphics rendered by Game Server 280 is then received through the Satellite Dish 289 and feed via a downlead to the viewer's Set top box 291.

The Set top box 291 then converts the video signal to analogue that is feed to the TV screen 292 via a TV Scart cable. The games frames rendered by Game Server 280 are then displayed on TV screen 292 as video frames. As described the viewer is then able to control the game through manipulating the buttons on the remote control 313.

Alternatively video may be streamed directly to Set top box 291 via IP multicasting. For example the Middleware Server 249 may assign an IP address for an MPEG stream. Video is then transmitted within an IP MPEG stream to a Multiplexer 242. The MPEG Video is then multiplexed into a signal by a Multiplexer 242 and streamed to an ATM Switch 271 which directs the signal via a second ATM Switch 273 over the ATM backbone to a Gigabyte Switch 274 situated at the local hub.

The Gigabyte Switch 274 is operable to direct the signal over the ADSL loop via a dial up interface 218 to the viewers Set top box 291 where an MPEG decoder decodes the MPEG stream. The decoder then feeds the signal to the TV screen 292 via a TV Scart cable and previews of games are displayed on the viewer's TV screen 292.

When the game loads an instruction is sent to the viewers Set top box 291 to stop decoding and a second IP address is then assigned to the viewers Set top box 291 by the Game Server 280, Middleware Server 249 or Proxy Server 248. The IP address enables the video to be streamed through IP Unicasting via the dial up interface 218 to the viewers Set top box 291. A point to point link is then established between the Game Server 280 and the viewers Set top box 291.

The video stream is then switched to Game Server 280 and graphics rendered on the Game Server 280 are then captured by the MPEG encoder 277 and synchronized with the audio outputs from the Game Server 280. The MPEG Video is then multiplexed into a signal by a Multiplexer 276 and streamed downstream over ADSL to the viewers Set top box 291. An MPEG decoder 316 in the Set top box 291 then decodes the IP MPEG stream and the games frames rendered by the Game Server 280 are then displayed on the viewer's TV screen 292.

Through manipulating the buttons on the remote control the viewer is then able to control the game as previously described.

Referring to figure 21, according to yet a further aspect of the present invention means may be provided that would enable a user to pause a game and then continue from the point the game was paused during a streamed game.

For example at any point during a game being played a viewer may press the blue button which transmits a signal via infrared radiation to an IR interface on the Set top box 291. The Set top box 291 is then operable to interpret the signal and transmit an instruction via the dial up interface 218 over ADSL to the Game Server 280 indicating that viewer has paused the game.

A signal is the transmitted from the Game Server 280 to a Gigabyte Switch 274 which directs the signal to an ATM Switch 273 which is operable to redirect the signal to a second ATM Switch 272 located a the Headend of the Satellite TV operator. The ATM Switch 272 then redirects the signal to the Middleware Server 249 or Proxy Server 248 instructing the Server that the game has been paused.

The Middleware Server 249 or Proxy Server 248 then ends the video stream and the Game Server 280 saves the game in temporary file that is recoverable within 24hrs of the viewer returning to the game.

The Middleware Server 249 or Proxy Server 248 then sends an instruction to the viewers Set top box 291 to switch channels. The receiver/tuner in the data interface 216 on the Set top box 291 then tunes into the channel without the viewer's action as instructed.

The Satellite Dish 289 then receives a channel transmission and video previews of games are displayed on the viewer's screen 292. In this way other viewers who might still be in the room whilst the game is paused may be prompted to play other games or view previews of games available on the games system. This is advantageous.

When the viewer returns to continue the game they may simply press the blue button on the remote control 313 to continue from the point they left of. A signal is then sent by Set top box 291 upstream via dial up interface 218 to a Gigabyte Switch 274 which directs the signal to an ATM Switch 273. The ATM Switch 273 is operable to redirect the signal to a second ATM Switch 272 located in the Headend of the Satellite TV operator. The ATM Switch 272 then redirects the signal to the Middleware Server 249 or Proxy Server 248 requesting the game to be loaded.

The Middleware Server 249 or Proxy Server 248 then assigns a new IP address for the MPEG Stream and transmits an instruction to the Game Server 280 to load the game from the temporary file.

The Game Server 280 then loads the file and renders the games graphics from the point the paused the game. The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output is then multiplexed into a single signal by a Multiplexer 276 and streamed downstream over ADSL to the viewers Set top box 291 in which a MPEG decoder 316 then decodes the MPEG stream and the game graphics are displayed on the TV screen 292. In this way the viewer is able to continue the game from the point they pressed paused.

Referring to figure 21, according to yet a further aspect of the present invention means

may be provided that would enable a viewer to pause a game and then continue from the point the game was paused during a broadcast game.

For example at any point during a game being played a viewer may press the blue button which transmits a signal via infrared radiation to an IR interface on the Set top box 291. The Set top box 291 is operable to interpret the signal and transmit an instruction via the dial up interface 218 over ADSL to the Game Server 280 indicating that viewer has paused the game.

A signal is the transmitted from the Game Server 280 to a Gigabyte Switch 274 which directs the signal to an ATM Switch 273 which is operable to redirect the signal to a second ATM Switch 274 located a the Headend of the Satellite TV operator. The ATM Switch 274 then redirects the signal to the Middleware Server 249 or Proxy Server 248 instructing the Server that the game has been paused.

The Middleware Server 249 or Proxy Server 248 then ends the video transmission and the Game Server 280 saves the game in temporary file that is recoverable within 24hrs of the viewer returning to the game.

The Middleware Server 249 or Proxy Server 248 then sends an instruction to the viewers Set top box 291 to switch channels. The receiver/tuner in the data interface 216 of the Set top box 291 then tunes into the channel without the viewers action as instructed and video previews of games are received by the Satellite Dish 289 are displayed on the viewers TV screen 292.

In this way other viewers who might still be in the room whilst the game is paused may be prompted to play other games or view previews of games available on the games system. This is advantageous.

When the viewer returns to continue the game they may simply press the blue button on the remote control 313 to continue from the point they left of.

For example if the viewer presses the blue button infrared radiation is blasted at IR interface 314 on the Set top box 291. The Set top box 82 then interprets the signal and transmits a signal upstream via the ADSL loop to a Gigabyte Switch 274.

The Gigabyte Switch then redirects the signal to an ATM Switch 273 which is operable to redirect the signal to a second ATM Switch 272 located a the Headend of the Satellite TV operator. The ATM Switch 272 then redirects the signal to the Middleware Server 249 or Proxy Server 248 requesting the game to be loaded.

The Middleware Server 249 or Proxy Server 248 then assigns selects a new transmission channel for the games video and transmits an instruction to the Game Server 280 to load the game from the temporary file.

The Game Server 280 loads the file and renders the games graphics from the point the paused the game. The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal. The MPEG Video then multiplexed into a single signal by a Multiplexer 276 and transmitted by a Satellite 68 over a channel transmission.

The broadcast signal is then intercepted by the viewers Satellite dish 87 which is feed into the data interface 216 on the set-top box 81. A converter/decoder in the Set top box then translates the signal from digital to analogue and the frames rendered by the Game Server 280 are displayed on the viewers TV 82. The viewer is then able to continue the game from the point they pressed paused.

Referring to figure 21, according to yet a further aspect of the present invention means may be provided that would enable a viewer save a game remotely.

For example at any point during a game being played a viewer may press the yellow button which transmits a signal via infrared radiation to an IR interface on the Set top box 291. The Set top box 291 is operable to interpret the signal and transmit an instruction via the dial up interface 218 over ADSL to the Game Server 280 indicating that viewer has requested the game to be saved. The Game Server 280 then provides then renders a UI.

The UI graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The video feed is then multiplexed into a single signal by a Multiplexer 276 and streamed downstream over ADSL to the viewers Set top box 291 in which an MPEG decoder 316 then decodes the MPEG stream and the UI is displayed on the TV screen 292. The UI consists of a table enabling the viewer to type in a file name they would like to save the game under.

Through manipulating the keys on the remote control 313 the viewer may type in a file name of their choice and press select to save. If the viewer presses select a signal is sent by the Set top box 291 via the dial up interface 218 across the ADSL loop to the Game Server 280 which interprets the viewers inputs and saves the game.

Alternatively the Set top box 291 may render the UI. For example during a game if a viewer presses the yellow button on the remote control 313 to save the game an infrared signal is sent to IR interface.

The Set top box 291 then interprets the signal and transmits a signal upstream via the dial up interface 218 over the ADSL loop to a Gigabyte Switch 274 located in the local hub. The Gigabyte Switch 274 directs the signal to an ATM Switch 273 that is operable

to redirect the signal to a second ATM Switch 272 located at the Headend of the Satellite TV Operator. The ATM Switch 272 is operable to direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits an instruction back to a ATM Switch 272 which is operable to direct the instruction to a second ATM Switch 273 located on the ATM Backbone. The ATM Switch 273 then directs the instruction to a Gigabyte Switch 274 located at the local hub that redirects the instruction over ADSL to the viewers Set top box 291.

The Set top box 291 is operable using the HTML/Java to render the UI from which the viewer may type in the file name. To save the game the viewer may press the select button on the remote control 313. Which transmits a signal upstream to the Middleware Server 249 or Proxy Server 248 requesting the game to be saved.

The Middleware Server 249 or Proxy Server 248 then saves the game, which is retrievable through a UI provided to the viewer when they access the games system. It will be appreciated that a plurality of different user authentication systems may be used to authenticate a viewer and retrieve the viewers personnel saved games. This is advantageous.

Referring to figure 21, according to yet a further aspect of the present invention means may be provided enabling viewers to load a game from UI accessible from a transmission channel.

For example if the viewer presses 255 on remote control 313 then a receiver/tuner in viewers Set top box 291 then tunes to TV channel 255. The Satellite Dish 289 then receives a video signal and the video is then displayed on the TV screen 292.

A red icon on the top left-hand corner of the screen indicates that viewers may access the games by pressing the red button on their remote control 313. The viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the Set top box 291 IR interface 314.

The Set top box 291 then interprets the signal and transmits a signal upstream via the return path to a Gigabyte Switch 274 located at the local hub. The Gigabyte Switch 46 the redirects the signal to an ATM Switch 273 which redirects the signal over the ATM network to a second ATM Switch 272 located in the Headend of the Satellite TV Operator.

The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248. The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 291.

The Set top box 291 then interprets the HTML/Java instruction and renders the introductory user interface which is then displayed on the viewers TV screen 292. Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select options.

Alternatively the Game Server 280 may render the UI. For example during a game a viewer may press the green button to access options. If the viewer presses the green button an instruction is transmitted upstream via the dial up interface 218 to the Game Server 280 which then renders the UI.

The UI graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output from the MPEG encoder is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over ADSL to the viewers Set top box 291. An MPEG decoder 316 in the viewers Set top box 291 then decodes the MPEG stream and the UI is then displayed on the TV screen 292.

Through manipulating the keys on the remote control 313 the viewer select a file of their choice. The viewer may then load the game by pressing the select button on their remote control 313. If the viewer presses select this transmits infrared radiation to an IR interface 314 on the Set top box 291.

The Set top box 291 then interprets the signal and transmits an instruction via the dial up interface 218 to the Game Server 280 located in the local hub. The Game Server 280 then interprets the instruction and loads the requested file.

The MPEG encoder 277 then captures the rendered graphics from the game that has been loaded and the video is streamed over ADSL to the viewers Set top box 291. An MPEG decoder 316 in the Set top box 291 is then operable to decode the MPEG Stream and the rendered graphics from the loaded game are then displayed on the viewer's TV screen 292. Through manipulating the keys on the remote control 313 the viewer is then able to continue playing the game from the point they saved the game. This is advantageous.

Referring to figure 21, according yet a further aspect means may be provided enabling through UI for a viewer to search for a game held remotely on the Game Server 280.

For example using the remote control 313 the viewer may access a games channel by pressing in a channel such as 255. When the viewer presses in a channel number on the remote control 313 the receiver/tuner in the data interface 216 then tunes into the channel. Video transmitted over a transmission channel is then received by the viewers Satellite Dish 289 and feed to the Set top box 291 and displayed on the viewer's TV screen 292.

A red icon on the top left-hand corner of the screen indicates that viewers may access the games press by pressing the red button on their remote control 313. The viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the Set top box 291 IR interface 314.

The Set top box 291 then interprets the signal and transmits a signal upstream via the dial up interface 218 to a Gigabyte Switch 274 located at the local hub. The Gigabyte Switch 274 then directs the signal to an ATM Switch 273 which redirects the signal over the ATM network to a second ATM Switch 272 located in the Headend of the Satellite TV Operator. The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits the UI downstream within a HTML/Java instruction to the viewers Set top box 291 where it is realized in the RAM Memory.

The user interface includes five main components: an introductory listing of new game releases; a list of game categories; a feature permitting the user to search a database for games available by tittle, developer, publisher and keywords; a video preview of games available to play and a video for advertising. The user interface (UI) is defined in HTML primitives and sent over the network by the Middleware Server 249 or Proxy Server 248.

Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select one of the various options provided in the UI.

For example if the viewer selects search infrared radiation is then blasted from the remote control to an IR interface 314 on the Set top box 291. The Set top box 291 is then operable to interpret the signal and transmit a signal via the dial up interface 218 to a Gigabyte Switch 274 located at the local hub.

A Gigabyte Switch 274 then directs the signal to an ATM Switch 273 located on the ATM backbone which redirects the signal to a second ATM Switch 272 situated within the Headend of the Satellite TV operator. The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits a second user interface downstream to the Set top box 291 where it is realized in the RAM Memory. The user interface consists of three main components which are text boxes permitting the user to search a database for games available by inputting the tittle of a game, developer, publisher or keywords like football.

Using the remote control 313 the viewer is able to input text characters into the text box. If the viewer presses select then an infrared radiation is then blasted from the

remote control to an IR interface 314 on the Set top box 291.

The Set top box 291 is then operable to interpret the signal and transmits the input text characters as a data signal via dial up interface 218 to a Gigabyte Switch 274 located at the local hub. The Gigabyte Switch 274 then directs the signal to an ATM Switch 273 located on the ATM backbone which redirects the signal to a second ATM Switch 272 situated within the Headend of the Satellite TV operator. The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248. The Middleware Server 249 or Proxy Server 248 then interprets the data signal and a search is performed on a database.

Details of games matching the viewers input text characters are then transmitted within a data signal to viewers Set top box 291 that renders a third UI providing a list of games matching the viewers text input. To play any of the games the viewer may simply highlight the game and press select.

Referring to figure 21, according to yet a further aspect of the present invention means may be provided that would enable viewers to play multi player games on a Satellite Set top box. This is achieved by gathering the file inputs and outputs from the viewers Set top box. The Game Server uses the file inputs much in same way as single player games where the file inputs from the viewer are used to render the games graphics.

For example when a game loaded and video is either streamed over IP or transmitted on a channel the viewer is presented with the games own user interface that is unique to every game and is separate to games systems UI's.

The games UI typically consists of four main options that includes single player; multi player; networked; video and controls. Through the games UI the viewer is operable to select multi player games.

If the viewer selects multi player games then a signal is transmitted from the viewers Set top box 291 upstream via a Gigabyte Switch 274 to the Game Server 280. The Game Server 280 then interprets the viewer's inputs and renders the UI.

The UI is then captured by the MPEG encoder 277 within the MPEG Video stream and streamed downstream over the ADSL to the viewers Set top box 291. An MPEG decoder 316 in the Set top box 291 then decodes the IP MPEG stream and the UI is displayed within video frames on the viewer's TV screen 292.

Through UI provided the viewer is able to configure a multi player through manipulating keys on the remote control 313. Those familiar with networked games will realize that within a games UI the viewer may typically select the number of players, time limits, level difficulty and the game mode whether player verses player or players verses computer. The viewer may also be able to select the screen mode whether split screen vertical or horizontal depending on the game.

Once the viewer is satisfied with the game options they may then launch the game through manipulating the buttons on the remote controller.

For example if the viewer highlights and selects start game on the UI a signal is transmitted from the viewers Set top box 291 upstream via a Gigabyte Switch 274 to the Game Server 280. The Game Server 280 interprets the viewer's inputs and loads the multi player game.

Depending on the number of players selected the viewers are then able to command the game through manipulating keys on the remote control 313. Alternatively during a multi player game viewers may use other devices such as an infrared keyboard, USB game pad or a USB Joystick.

In this way viewers have the option not to share the remote control 313. Through manipulating the buttons on the remote control 313, an infrared keyboard, USB game pad or USB Joystick the viewers may command a game.

In same way as described in single player games the file inputs from the viewers Set top box 291 are transmitted upstream via the dial up interface 218 to the Game Server 280. The Game Server 280 using a software program is operable to interpret each viewers inputs and render the games graphics.

The graphics and audio from Game Server are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over the ADSL to the viewers Set top box 291. An MPEG decoder 316 in the Set top box 291 then decodes the IP MPEG stream and the corresponding video frames to each viewer's inputs are displayed on the TV screen 292 in a split screen mode.

The audio corresponding to viewer's inputs within the MPEG stream is also output through the viewer's speakers. In this way viewers may play multi player games such as those available on games consoles on a thin client Satellite Set top box 291.

Referring to figure 21, according to yet a further aspect of the present invention means may be provided that would enable viewers to play networked games using a Satellite Set top box 291. This is achieved by networking multiple Game Servers using coaxial cable on a broadband network enabling file inputs and outputs to be exchanged at high bit transfer speeds of 20 (mbps) or more between the Game Servers. Alternatively the Game Servers may be networked using RDSL, VDSL or HDSL interfaces.

Either way the Game Server 280 can gather the file inputs from viewers Set top box 291 and the inputs of participating viewers from the other Game Server 323 which can be used to render the games graphics.

Referring to figure 21 as described in Patent GB 0129161.6 a viewer may view video footage of live multi player networked games through accessing a UI from a transmission channel. The viewer may also select to join in a multi player networked game by pressing select on the remote control 313.

For example if the viewer presses 255 on the remote control 313 the Set top box 291 receiver/tuner will tune to TV channel 255. A video signal is then received by the Satellite Dish 289 and the video of live game footage taken from multi-player networked games is then displayed on the TV screen 222. A yellow icon on the top left-hand corner of the screen indicates that viewers may join in the networked game by pressing the yellow button on their remote control 313.

If the viewer then presses the yellow button on the remote control 313 an infrared signal is the transmitted to the an IR interface 314 on the Set top box 291. The Set top box 291 then interprets the signal and transmits a signal upstream via the dial up interface to a Gigabyte Switch 274 located at the local hub.

A Gigabyte Switch 274 then directs the signal to an ATM Switch 273 which redirects the signal over the ATM network to a second ATM Switch 272 located in the Headend of the Satellite TV Operator. The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 291. The Set top box 291 then interprets the HTML/Java instruction and renders a user interface is then displayed on the viewers TV screen 292 informing the viewer that their request to join in the networked game has been accepted.

The Middleware Server 249 or Proxy Server 248 then transmits a HTML/Java instruction back downstream to the Game Server 280 to load the networked game.

The networked game is then loaded by the Game Servers and communication channel is assigned on the broadband network between Game Server 280 and participating Game Servers allowing data inputs to be exchanged between the Servers. The Middleware Server 249 or Proxy Server 248 then assigns a IP address to viewer enabling MPEG video captured by the MPEG encoders to be streamed to the Set top box 291.

A point to point communication link is then established between the Game Server 280 and Set top box 291. Using the data inputs from participating Game Servers the Game Server 280 then renders the games graphics. The video output from the Game Server

280 is then captured by the MPEG encoder 277 and encoded in an MPEG stream. The MPEG is then streamed from the Game Server 280 over ADSL to the viewers Set top box 291.

An MPEG decoder 316 in Set top box 291 then decodes the IP MPEG stream and the games frames corresponding to the data inputs from participating Game Servers are displayed on TV screen 292.

The viewer is able to command the game through manipulating the keys on the remote control 313 as described previously.

Alternatively a function within a UI will enable a viewer to create a multi player networked game that other viewers may select to join in by accessing the games system introductory UI and viewing multi-player networked games.

For example if the viewer presses 255 on the remote control 313 the Set top box 291 receiver/tuner will tune to TV channel 255. A video signal is then received by the Satellite Dish 289 and the video of game previews or live game footage taken from multi-player networked games is then displayed on the TV screen 222.

A red icon on the top left-hand corner of the screen indicates that viewers may access the games by pressing the red button on their remote control 313. If the viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the IR interface 314 on the viewers Set top box 291.

The Set top box 291 then interprets the signal and transmits a signal upstream via the dial up interface 218 to a Gigabyte Switch 274 located at the local hub. The Gigabyte Switch 274 then directs the signal to an ATM Switch 273 which redirects the signal over the ATM network to a second ATM Switch 272 located in the Headend of the Satellite TV Operator. The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248. The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 291.

The Set top box 291 then interprets the HTML/Java instruction and renders the introductory user interface which is then displayed on the viewers TV screen 292. Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select the multi player or network game options.

If the viewer selects the networked games by highlighting and pressing select on their remote control 313 an infrared signal is the transmitted to the IR interface 314 on the Set top box 291.

The Set top box 291 then interprets the signal and transmits a signal upstream via the dial up interface to a Gigabyte Switch 274 located at the local hub. The Gigabyte

Switch 274 then directs the signal to an ATM Switch 273 which redirects the signal over the ATM network to a second ATM Switch 272 located in the Headend of the Satellite TV Operator. The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 291.

The Set top box 291 then interprets the HTML/Java instruction and renders a second user interface which is then displayed on the viewers TV screen 292. The user interface comprises of four main components: an listing of networked games; an option to create a network game; a video preview of live networked games available to play and a video for advertising. The user interface (UI) is defined in HTML primitives and realized in the Set top box 291 RAM Memory.

Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select the network games to join in or create a new game options. If the viewer selects create new game by highlighting the option and pressing select then an infrared signal is the transmitted to the IR interface 314 on the Set top box 291.

The Set top box 291 then interprets the signal and transmits a signal upstream via the dial up interface to a Gigabyte Switch 274 located at the local hub. The Gigabyte Switch 274 then directs the signal to an ATM Switch 273 which redirects the signal over the ATM network to a second ATM Switch 272 located in the Headend of the Satellite TV Operator. The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream within the UI to all viewers indicating the networked game created by the viewer.

If a viewer responds by highlighting and selecting join in on the remote control 313 then a signal is carried upstream to the Middleware Server 249 or Proxy Server 248 which interprets the signal and transmits a HTML/Java instruction back downstream to the Game Server 280 and Game Server 323 to load the networked game.

The networked game is then loaded by the Game Servers and a communication channel is assigned on the broadband network between Game Server 280 and Game Server 323 allowing data inputs to be exchanged at a high bit transfer speed of 20 (mbps) or more between the Servers.

The Middleware Server 249 or Proxy Server 248 then assigns two independent IP addresses enabling MPEG video captured by the MPEG encoders to be streamed to Set top box 291 and Set top box 285.

A point to point communication link is then established between the Game Server 280 and Set top box 291. A second point to point communication link is also established between the Game Server 323 and Set top box 285. Video is then captured by the MPEG encoders and streamed from the Game Servers over ADSL to Set top box 291 and Set top box 285.

An MPEG decoder in Set top box 291 and Set top box 285 then decodes the IP MPEG stream which is feed as an analogue signal to the viewers TV screens via a TV Scart cable. The games frames are then displayed on TV screen 292 and TV screen 288.

The viewers are then able to command the game through manipulating the keys on the remote control 313. For example if the second viewer presses left on their remote control 313 infrared radiation is blasted at the IR interface 314 on the viewers Set top box 285.

The Set top box 285 is then operable to interpret the signal and transmits a signal upstream via the dial up interface to a Gigabyte Switch 274 located at the local hub. The Gigabyte Switch 274 is operable to redirect the signal to Game Server 323 which interprets the viewers inputs and transmits the data input along a coaxial/ADSL cable to the other Game Server 280 which interprets the data input.

The Games Servers then render the graphics corresponding to the data inputs from the viewers Set top box 285. Video is then captured by the MPEG encoders and streamed from the Game Servers over the ADSL Loop to Set top box 291 and Set top box 285.

An MPEG decoder in Set top box 291 and Set top box 285 then decodes the IP MPEG stream and the corresponding game frames to the data inputs from Set top box 285 are displayed on TV screen 292 and TV screen 288.

It will be appreciated that in practice hundreds if not thousands of viewers could participate in a networked game in this way. This is advantageous.

Referring to figure 21, according to yet a further aspect of the present invention viewers may also select a networked game option within a games own UI which is either streamed or transmitted to viewers terminal when a game is first launched.

For example the viewer may select to play a game from the introductory UI. When the game loaded and video is either streamed over IP or transmitted on a channel the viewer is presented with the games own user interface that is unique to every game and is separate to games systems UI's.

The games UI typically consists of four main options that includes single player; multi player; networked; video and controls. Through the games UI the viewer is operable to select multi player or networked games.

If the viewer selects networked games then a signal is transmitted from the viewers Set top box 285 upstream via a Gigabyte Switch 274 to the Game Server 323. The Game Server 323 interprets the viewer's inputs and renders the UI.

The UI is then captured by the MPEG encoder 277 with the IP MPEG Video stream and streamed downstream over the ADSL loop via the dial up interface 218 to the viewers Set top box 285. An MPEG decoder 316 in the Set top box 285 then decodes the IP MPEG stream and the UI is displayed within video frames on the viewer's TV screen 288.

The viewer is then able to create a networked through manipulating keys on the remote control 313. If the viewer highlights and selects start game then a signal is transmitted from the viewers Set top box 285 upstream via the dial up interface 218 to the Game Server 323. The Game Server 323 then interprets the viewer's inputs and loads the networked game.

The Middleware Server 249 or Proxy Server 248 then transmits a HTML/Java instruction downstream within the games system introductory UI to all viewers indicating that the networked game created by the viewer.

If a viewer responds by highlighting and selecting join in on the remote control 313 then a signal is carried upstream to the Middleware Server 249 or Proxy Server 248 indicating the viewers request to join the networked game.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits a HTML/Java instruction back downstream to the Game Server 280 to load the networked game. Video is then captured by the MPEG encoders and streamed from the Game Servers over the ADSL loop to Set top box 285 and Set top box 291.

An MPEG decoder in Set top box 285 and Set top box 291 then decodes the IP MPEG stream and the game frames are displayed on TV screen 288 and TV screen 291.

The viewers are then able to command the game through manipulating the keys on the remote control 313. For example if the viewer who created the game presses the left button on their remote control 313 infrared radiation is blasted at the IR interface 314 on the viewers Set top box 285.

The Set top box 285 is then operable to interpret the signal and transmits a signal upstream via the dial up interface to a Gigabyte Switch 274 located at the local hub. The Gigabyte Switch 274 is operable to redirect the signal to Game Server 323 which interprets the viewers inputs and transmits the data input along a coaxial/ADSL cable to the other Game Server 280 which interprets the data input.

The Games Servers then render the graphics corresponding to the data inputs from

the viewers Set top box 285. Video is then captured by the MPEG encoders and streamed from the Game Servers over the ADSL Loop to Set top box 291 and Set top box 285.

An MPEG decoder in Set top box 291 and Set top box 285 then decodes the IP MPEG stream and the corresponding game frames to the data inputs from Set top box 285 are displayed on TV screen 292 and TV screen 288.

In this way both viewers inputs are used by the Game Servers to render the graphics enabling viewers to play networked games equivalent to those available on games consoles and PC's using a thin client Set top box and a remote control. This is advantageous.

Referring to figure 21, according to yet a further aspect of the present invention means may be provided which would enable a viewer to play PC, MAC, Amiga, Atrai, Playstation, X-box, Nintendo games on there existing Set top box without any hardware or software additions. This is achieved by a number of methods. Firstly the Game Server 280 is operable to switch operating systems (O/S) on boot up.

For example if a viewer selects a game from the introductory UI provided by the Middleware Server 249 or Proxy Server 248 that is a Playstation format. Then the Middleware Server 249 or Proxy Server 248 is operable to transmit a instruction requesting a Game Server within the PS2 O/S via an ATM Switch 272 to a second Switch 273 which redirects the signal to an third Switch 274 located on the local hub. The Switch 274 then directs the signal to Boot Server 275. The Boot Server 275 then interprets the signal and analysis the boot log, to identify any Game Servers currently running the PS2 O/S.

If the Boot Server 275 does not identify an available Game Server running PS2 O/S, then the Server is operable to select a Game Server and reboot the Server. An instruction is then transmitted to the Game Server 280 to restart.

The Game Server 280 then restarts in the PS2 O/S. When the Game Server 280 has loaded the O/S a signal is transmitted back upstream to the Middleware Server 249 or Proxy Server 248 indicating that the Game Server 280 has been reset to the required O/S.

The game is then loaded on the Game Server 280. A software program located on the Game Server 280, Middleware Server 249 or Proxy Server 248 then assigns an IP address to the viewers Set top box 291 enabling video to be streamed through IP Unicasting via the ADSL return path to the viewers Set top box 291.

A point to point link is then established between the Game Server 280 and the viewers Set top box 291. Graphics rendered on the Game Server 280 are then captured by the MPEG encoder 277 and synchronized with the audio outputs from the Game Server

280.

Video is then multiplexed into a single signal by a Multiplexer 276 and streamed downstream over the ADSL loop to the viewers Set top box 291. An MPEG decoder 316 in the Set top box 291 then decodes the MPEG stream and corresponding frames rendered by the Game Server 280 are then displayed on the viewer's TV screen 292.

The viewer may then command the game by manipulating the buttons on the remote control 313 which transmit radiation signals to the IR interface 314 on the Set top box 291. The signal is then converted into an instruction which is then transmitted upstream via the return path to the Games Server 280 which interprets the file inputs of the viewers and renders the games graphics.

The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server 280 via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output then multiplexed into a single signal by a Multiplexer 276 and streamed downstream over ADSL to the viewers Set top box 291 in which an MPEG decoder 316 then decodes the MPEG stream and the corresponding frames to viewers input are displayed on the TV screen 292.

In this way the viewer is able to play the game and the game is processed and rendered by the Game Server and the video is streamed in a live MPEG stream to viewers Set top box 291 which decodes and displays the games frames. Those skilled in the art will realize that from the point Game Server renders the graphics to the point the video is streamed and displayed on the viewer's TV screen is real time. This is advantageous.

Alternatively emulation software maybe used to emulate an operating system whereby an emulation software is run on top an operating system such as Windows, Linux, Unix or Sun. Through the second method operating systems maybe switched without resetting or rebooting the Game Server 280.

Alternatively through a third method that uses software drivers installed on an operating system, this would enable the Game Server 280 to interpret game formats from other platforms without emulation or rebooting the Game Server 280.

Through either of the above methods the Game Server 280 is operable to run PC, MAC, Amiga, Atari, Playstation, X-box, Nintendo and Linux games from which the MPEG encoder 277 is operable to capture the video and audio output from the Game Server 280. The MPEG encoder 70 is also operable to encode the output into an MPEG video stream, which may then be transmitted or streamed to a Set top box 291.

A decoded in the Set top box 291 is operable to decode the digital output from the

MPEG encoder 277 from which successive video frames rendered by the Game Server 280 are displayed on a viewer's TV screen 292. This is advantageous as the viewer is not constrained by format issues, or required to buy a console to play games.

It is appreciated that through the method described this would also enable viewers to play multi-player or networked games regardless of the format whether PC, Atari, Amiga, Sony, X-box or Nintendo games on a conventional Satellite Set top box 291.

Referring to figure 22, the Headend consists of a Middleware Server 249 that is connected to Proxy Server 248 that is in turn connected to an ATM Switch 295.

The ATM Switch 295 is connected to a Billing Server 245 that is connected to a Mail Server 246 which is connected to an SQL Server 247 that is connected to Authentication Server 251. Also connected to the ATM Switch 295 is a Cache Engine 240 that is connected to a Graphics controller 239 that is connected to a Customer Database 238.

The Headend also includes a VOD/NVOD Server 241, which is connected to the MPEG Encoder 244. Also connected to the MPEG Encoder/decoder 244 is the Local Advert Insertion 243 and a Multiplexer 245 that is connected to a Digital Terrestrial UHF Antenna 293. The MPEG Encoder 244 is also connected to an Switch 295 that is connects via a second Switch 296 to the ATM backbone. In this way all the Headend equipment are connected to the ATM backbone.

The Middleware Server 249 and Proxy Server 248 are both operable to control and manipulate the hardware within the Headend through transmitting instructions across the network.

The Middleware Server 249 may also used exchange instructions across the ATM backbone to viewers Set top boxes. For example viewers who want to access the UI would do so through transmitting an instruction via the dial up interface 218 over the ADSL loop to a Switch 297 which would redirect the signal to a second Switch 296 located on the ATM backbone. The Switch 296 is operable to redirect the signal to third Switch 295 located in the Headend of the Terrestrial TV operator.

The Switch 295 is then operable to direct the signal to the Middleware Server 249 that interprets the signal and transmits a HTML/Java instruction downstream over ADSL loop to viewers Set top box 302. The Set top box 302 would then render the UI using the HTML parameters defined in the HTML/Java instruction.

Of course the Proxy Server 248 may also to be used to provide popular UI's, content caching and can filter event request discarding those without access rights. Thus allowing the Game Server 280 to be used by only for viewers who have requested to play a game.

Software held on Middleware Server 249 and Proxy Server 248 enables content and instructions to be distributed across the ATM network. In this way many of the components of games system functionality may be provided in response to viewers requests and inputs.

For example a viewer may send a request upstream to the Middleware Server 249 or Proxy Server 248 to access their saved games. The Middleware Server 249 or Proxy Server 248 would then interpret the HTML/Java instruction and send an instruction to the Authentication Server 251 to authenticate the viewer. Once the viewer has been authenticated their personnel files are then retrieved from the SQL Server 247.

The Middleware Server 249 that interprets the files retrieved from the SQL Server 247 transmits a HTML/Java instruction downstream over ADSL loop to viewers Set top box 302.

The Set top box 302 would then render the UI using the HTML parameters defined in the HTML/Java instruction and a user interface (UI) would be displayed on the TV screen 301 providing the viewer with a list of their saved games. Those skilled in the art will realized that the UI is realized in the RAM Memory of the Set top box 302.

The Billing Server 245 is used for processing payments such as subscription and pay per play on viewer's accounts. The Authentication Server 251 is used for authenticating viewers, which could be used for authentication of subscription for channel access to the games system.

A Switch 295 that is connected to the Local Hub by a second Switch 296 connects the Headend to the Local hub. In this way data and video may be exchanged between Headend and Local Hub.

The Local Hub consists of a Game Server 280, MPEG Encoder/decoder 277, Multiplexer 89, Boot Server 275 and a Gigabyte Switch 297 that is operable to direct signals from the Headend to the viewers Set top boxes via the ADSL loop.

Connected to Hub by ADSL is the viewer's terminal that consists of a Set top box 302 that connected to VCR 303 via VCR Scart lead that is connected to TV screen via an RF lead. The Set top box 302 is also connected to the TV Screen via the TV Scart.

Connected to Set top box is an UHF Aerial 304 that is operable to receive video and data signals over a wideband signal. Also connected to the Set top box 302 via a dial up interface 218 is a telephone 300. This enables data to be exchange between the Set top box 302 and Game Server 280, Middleware Server 249 or Proxy Server 248.

Figure 22 also illustrates a second viewer terminal that is a Games Console 95 that is connected to the Game Server 280 by dial up interface 218 coupled to a Telephone

327. Also connected to Games console via a RF adapter is a TV screen 306.

Figure 22 also illustrates a third viewer terminal that is a Integrated TV and Set top box 305 that is connected to the Game Server 280 by dial up interface 218 coupled to a Telephone 309.

It will be appreciated that hardware described cloud be connected in a number of ways and that Figure 22 is a example of one way in which a Terrestrial TV network may be configured to enable viewers to access games held remotely on the Game Servers.

It will be appreciated that a plurality of connections may be used to connect the various parts of the Terrestrial TV network together. For example coaxial or twisted pairs of copper wiring may be used to connect the Proxy Server 248 and Middleware Server 249 to the Switch 297.

Referring to figure 22, according to yet a further aspect of the present invention means may be provided that would enable a viewer to access a user interface from a transmission channel.

For example if a viewer presses 255 on remote control 313 the RF tuner in the Set top box 302 will tune to TV channel 255. A video signal is then intercepted by the UHF Aerial that is feed to the Set top box 302 via a downlead.

A decoder in the Set top box 302 then converts the signal to analogue that is feed via a TV Scart lead to the TV screen 301. Video reviews of games are then displayed on viewer's TV screen 301. A red icon on the top left-hand corner of the screen indicates that viewers may access the games press by pressing the red button on their remote control 313.

If the viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the IR interface 314 on the Set top box 302. The Set top box 302 then interprets the signal and transmits a signal upstream via the dial up interface to a Switch 297 located at the local hub. The Switch 297 then directs the signal to a second Switch 296 which redirects the signal over the ATM network to a third Switch 295 located in the Headend of the Terrestrial TV Operator. The Switch 295 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream via the dial up interface to the viewers Set top box 302. Alternatively this may be transmitted within a transmission channel as a data signal.

The Set top box 302 then interprets the HTML/Java instruction and renders the introductory user interface which is then displayed on the viewers TV screen 301.

Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select options.

Preferably the video signal from the transmission channel is encapsulated in user interface thus the viewer is still able to view video reviews of games from the transmission channel whilst accessing the UI.

Alternatively video from alternative channels may be played in the user interface whereby the viewers RF tuner is switched to another channel frequency which may for example be providing previews of games. Means may also be provided whereby video previews of games is streamed within a window of UI which is defined in HTML.

Referring to figure 22, According to yet a further aspect of the present invention means may be provided whereby using a Terrestrial Set top box 302 viewers may access and play games held remotely on Game Server 280 through using video streaming.

Through the introductory UI the viewer may highlight and select games to play. A viewer may select a game by highlighting the game title on the UI provided or by responding to a prompt of games preview video being played in the user interface.

If a viewer presses select on their remote control 313 then an infrared signal is sent to IR interface 314. The Set top box 302 then interprets the signal and transmits a signal via dial up interface 218 over the ADSL loop to a Switch 297 located in the local hub. The Switch 297 then directs the signal to a second Switch 296 that is operable to redirect the signal to a Switch 295 located at the Headend of the Terrestrial TV Operator. The ATM Switch 272 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then sends a signal to Authentication Server 251 to authenticate the viewer's request. If the viewer is authentication is approved then a signal is transmitted to the Game Server 280 instructing the game as requested by the viewer to be loaded. The Game Server 280 then loads the game.

A software program located on the Game Server 280, Middleware Server 249 or Proxy Server 248 then assigns an IP address to the viewers Set top box 302 enabling video to be streamed through IP Unicasting via the dial up interface over ADSL to the viewers Set top box 302. A point to point communication link is then established between the Game Server 280 and the viewers Set top box 302.

Graphics rendered on the Game Server 280 are then captured by the MPEG encoder 277 and synchronized with the audio outputs from the Sound card. Video encoded by MPEG encoder is then multiplexed into a single signal by a Multiplexer 276 and streamed downstream over ADSL to the viewers Set top box 302. An MPEG decoder 316 in the Set top box 302 then decodes the MPEG stream and corresponding frames rendered by the Game Server 280 are then displayed on the viewer's TV screen 301.

The viewer may then command the game by manipulating the buttons on the remote control 313 which transmit radiation signals to the IR interface 314 on the Set top box 302. The signal is then converted into an instruction which is then transmitted upstream via the dial up interface 218 to the Games Server 280 which interprets the file inputs of the viewers and renders the games graphics.

The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server 280 via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output is then multiplexed into a single signal by a Multiplexer 276 and streamed downstream over the ADSL loop to the viewers Set top box 302. An MPEG decoder 316 in the Set top box 302 then decodes the MPEG stream and the corresponding frames to viewers input are output via TV Scart as analogue and displayed on the TV screen 301.

In this way the viewer is able to play the games equivalent to that available on a games console. This is achieved by rendering games graphics on the Game Server 280 which is captured by the MPEG encoder 277 and streamed in a live MPEG video stream to the viewers Set top box 302 which decodes and displays the games frames.

Those skilled in the art will realize that from the point Game Server 280 renders the graphics to the point the video is streamed and displayed on the viewer's TV screen 92 is real time. This is advantageous.

Referring to figure 22, according to yet a further aspect of the present invention means may be provided that would enable a viewer to play games held remotely on a Games Server 280 whereby rendered graphics relating to viewers inputs are provided over a channel transmission.

For example when a viewer selects a game via introductory UI, an instruction is transmitted upstream via the dial up interface 218 to a Switch 297 that is operable to redirect the instruction to a Game Server 280 located at the local hub. The Game Server 280 then interprets the instruction and loads the requested game. The game is then loaded on the Game Server 280 and the MPEG encoder 277 captures the video output from the graphics card. The MPEG encoder also captures the audio output from the sound card. The video and audio output is then synchronized and encoded into a digital output by the MPEG encoder 277.

Either the Headend or Proxy Server 248 selects an available transmission channel and sends a HTML/Java instruction to viewers Set top box 302 to tune into the selected channel. The RF tuner in the data interface 216 then tunes into the channel.

The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveler primarily tuned to Multiplexer 245. The digital output signal is then multiplexed into a single signal by a Multiplexer 276 and transmitted by an UHF Antenna 293 as a wideband signal. An UHF Masterhead amplifier 298 then boosts the signal ensuring that the viewer's UHF Aerial 304 receives the transmission.

Connected to the UHF Aerial 304 is a downlead, which connects to a dual UHF output PSU, one output feeding TV screen 301 and the other is feed into the set-top box 302, which contains a decoder. The decoder then feeds its RGB signal to the TV screen 301 via a TV Scart cable and the games frames are displayed as video on the viewer's TV screen 301.

Through manipulating the buttons on the remote control 313 instructions may be transmitted via the dial up interface to Game Server 280 which is operable to interpret the viewers inputs on the remote control 313 and render the games graphics. Graphics rendered by the Game Server are than captured by the MPEG encoder 277 and transmitted over the channel as a Wideband signal. The UHF Aerial 304 then receives the transmission which is feed into Set top box 302 via a downlead and video corresponding to the viewer's inputs is displayed on the viewer's TV screen 301.

In this way the game is played remotely of a Server and is not downloaded on to the Set top box 302. Video is transmitted over a channel that only the viewer playing the game sees. This is advantageous.

Referring to figure 22, according to yet a further aspect of the present invention whilst a game is being loaded, by the Game Server 280, video adverts and previews of games may be provided on the viewers TV screen 301. This may be provided through a plurality of methods including video streaming or channel switching.

For example whilst the game is being loaded by the Game Server 280. The Middleware Server 249 or Proxy Server transmits an instruction to the viewers Set top box 302 to switch channels. The RF tuner in the data interface 216 of the viewers Set top box 302 then tunes the into the channel as instructed and video is received via the UHF Aerial 304 which is feed into viewers Set top box 301 and displayed on the viewers TV screen 301.

When the Game Server 280 has loaded the game an instruction is transmitted to the Middleware Server 249 or Proxy Server 248 indicating that the game has loaded.

A transmission channel is then selected by the Middleware Server 249 or Proxy Server 248 and a HTML/Java instruction is transmitted to Switch 295 which is operable to redirect the signal over the ATM backbone via a second Switch 296 to a Switch 297 located at the Local Hub.

The Switch 297 then directs the signal over the ADSL loop to the viewers Set top box 302. The Set top box 302 then interprets the HTML/Java based instruction that contains an instruction to switch to the required channel frequency 266 MHz or program identity (PID) to receive the video content via the UHF Aerial 304.

A RF tuner in the Set top box 94 then switches to required channel frequency without the viewers action and graphics rendered by Game Server 280 is then received through the UHF Aerial 304 as digital input. The digital input is then converted to analogue by the Set top box 302 and feed via the TV Scart to the TV screen 301. Graphics rendered by the Game Server 280 are then displayed on TV screen 301 as video frames.

Alternatively video may be streamed directly to Set top box 302 via IP multicasting. For example the Middleware Server 249 may assign an IP address for MPEG stream. Video is then transmitted within IP MPEG stream to a Multiplexer 242. The MPEG Video is then multiplexed into a signal by a Multiplexer 242 and streamed to a Switch 295 which directs the signal via a second Switch 296 over the ATM backbone to a Switch 297 situated at the local hub.

The Switch 297 is operable to direct the signal over the ADSL loop via a dial up interface to the viewers Set top box 302 where an MPEG decoder decodes the MPEG stream and displays previews of games on the viewers TV screen 301.

When the game loads an instruction is sent to the viewers Set top box 302 to stop decoding and a second IP address is then assigned to the viewers Set top box 302 by the Game Server 280, Middleware Server 249 or Proxy Server 248. The IP address enables the video to be streamed through IP Unicasting via the dial up interface to the viewers Set top box 302. A point to point communication link is then established between the Game Server 280 and the viewers Set top box 302.

The video stream is then switched to Game Server 280 and graphics rendered on the Game Server 280 are then captured by the MPEG encoder 277 and synchronized with the audio outputs from the Game Server 280.

The digital output from the MPEG encoder is then multiplexed into a signal by a Multiplexer 276 and streamed downstream over the ADSL loop to the viewers Set top box 302. An MPEG decoder 316 in the Set top box 302 then decodes the IP MPEG stream and the games frames rendered by the Game Server 280 are then displayed on the viewer's TV screen 301.

Through manipulating the buttons on the remote control the viewer is then able to control the game as previously described.

Referring to figure 22, according to yet a further aspect of the present invention means may be provided that would enable a user to pause a game and then continue from

the point the game was paused during a streamed game.

For example at any point during a game being played a viewer may press the blue button which transmits a signal via infrared radiation to an IR interface 314 on the Set top box 302. The Set top box 302 is then operable to interpret the signal and transmit an instruction via the dial up interface 218 over the ADSL loop to a Switch 297 located at local hub. The Switch 297 is operable to direct the signal to the Game Server 280 indicating that the game has been paused.

A signal is the transmitted from the Game Server 280 to a Switch 297 which directs the signal to a second Switch 296 which is operable to redirect the signal to a Switch 295 located a the Headend of the Terrestrial TV operator. The Switch 295 then redirects the signal to the Middleware Server 249 or Proxy Server 248 instructing the Server that the game has been paused.

The Middleware Server 249 or Proxy Server 248 then ends the video stream and the Game Server 280 saves the game in temporary file that is recoverable within 24hrs of the viewer returning to the game.

The Middleware Server 249 or Proxy Server 248 then sends an instruction to the viewers Set top box 302 to switch channels. The RF tuner on the Set top box 301 then tunes into the channel without the viewer's action as instructed.

The UHF Aerial 304 then receives the transmission that is feed into Set top box 302 via a downlead. The Set top box 302 then converts the digital input to analogue which is feed along a TV Scart to viewer TV screen 301 upon which video previews of games are displayed.

In this way other viewers who might still be in the room whilst the game is paused may be prompted to play other games or view previews of games available on the games system. This is advantageous.

When the viewer returns to continue the game they may simply press the blue button on the remote control 313 to continue from the point they left of. If the viewer presses the blue button then an infrared radiation is blasted at the IR interface 314 on the Set top box 302.

The Set top box 302 then interprets the viewer's inputs and transmits a signal upstream via dial up interface 218 to a Switch 297 located at the local hub. The Switch 297 is operable to redirect the signal to a second Switch 296 which directs the signal to a third Switch 295 located in the Headend of the Terrestrial TV operator. The Switch 295 then redirects the signal to the Middleware Server 249 or Proxy Server 248 requesting the game to be loaded.

The Middleware Server 249 or Proxy Server 248 then assigns a new IP address for the

MPEG Stream and transmits an instruction to the Game Server 280 to load the game from the temporary file. The Game Server 280 loads the file and renders the games graphics from the point the paused the game.

The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server 280 via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal. The MPEG Video then multiplexed into a single signal by a Multiplexer 67 and streamed downstream over ADSL to the viewers Set top box 302 in which a MPEG decoder 316 then decodes the MPEG stream and the game graphics are displayed on the TV screen 301. In this way the viewer is able to continue the game from the point they pressed paused.

Referring to figure 22, according to yet a further aspect of the present invention means may be provided that would enable a viewer to pause a game and then continue from the point the game was paused during a game which is transmitted over a transmission channel.

For example at any point during a game being played a viewer may press the blue button which transmits a signal via infrared radiation to an IR interface on the Set top box 302. The Set top box 302 is operable to interpret the signal and transmit an instruction via the dial up interface over ADSL to the Game Server 280 indicating that viewer has paused the game.

A signal is the transmitted from the Game Server 280 to a Switch 297 which directs the signal to a second Switch 296 which is operable to redirect the signal to a Switch 295 located a the Headend of the Terrestrial TV operator. The Switch 295 then redirects the signal to the Middleware Server 249 or Proxy Server 248 instructing the Server that the game has been paused.

The Middleware Server 249 or Proxy Server 248 then ends the video transmission and the Game Server 280 saves the game in temporary file that is recoverable within 24hrs of the viewer returning to the game.

The Middleware Server 249 or Proxy Server 248 then sends a HTML/Java instruction to the viewers Set top box 302 to switch channels. The RF tuner in the data interface 216 of the Set top box 302 then tunes into the channel without the viewers action as instructed and video previews of games are received by the UHF Aerial 304 and displayed on the viewers TV screen 301.

In this way other viewers who might still be in the room whilst the game is paused may be prompted to play other games or view previews of games available on the games system. This is advantageous.

When the viewer returns to continue the game they may simply press the blue button on the remote control 313 to continue from the point they left of. If the viewer presses

the blue button then infrared radiation is blasted at the IR interface 314 on the viewers Set top box 302 in which a driver interprets the viewers inputs.

The Set top box 302 then transmits a signal upstream via dial up interface 218 to a Switch 297 located at the local hub. The Switch 297 is operable to redirect the signal to a second Switch 296 which directs the signal to a third Switch 295 located in the Headend of the Terrestrial TV operator. The Switch 295 then redirects the signal to the Middleware Server 249 or Proxy Server 248 requesting to continue the game.

The Middleware Server 249 or Proxy Server 248 then assigns selects a new transmission channel for the games video and transmits an instruction to the Game Server 280 to load the game from the temporary file. The Game Server 280 loads the file and renders the games graphics from the point the paused the game.

The Middleware Server 249 or Proxy Server 248 then transmits an instruction to the viewers Set top box 302 to switch channels to the new selected channel. The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output signal is then fed into filter system, comprising a tunable notch followed by a multiple channel filter/leveler primarily tuned to Multiplexer 245. The digital output signal is then multiplexed into a single signal by a Multiplexer 276 and transmitted by an UHF Antenna 293 as a Wideband signal. An UHF Masterhead amplifier 298 then boosts the signal ensuring that the viewer's UHF Aerial 304 receives the transmission.

The transmission is then received by the UHF Aerial 304 and is feed via downlead into the Set top box 302, which contains a decoder. The decoder then feeds its RGB signal to the TV screen 301 via a TV Scart cable and the games frames from the point the viewer paused the game are displayed as video on the viewer's TV screen 301. The viewer is then able to continue the game from the point they pressed paused. This is advantageous.

Referring to figure 22, according to yet a further aspect of the present invention means may be provided that would enable a viewer save a game remotely.

For example at any point during a game being played a viewer may press the yellow button which transmits a signal via infrared radiation to an IR interface on the Set top box 302. The Set top box 302 is operable to interpret the signal and transmit an instruction via the dial up interface 218 over the ADSL loop to the Game Server 280 indicating that viewer has requested the game to be saved.

The Game Server 280 then renders a UI. The UI graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or

AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The video feed is then multiplexed into a single signal by a Multiplexer 276 and streamed downstream over ADSL to the viewers Set top box 302 in which an MPEG decoder 316 then decodes the MPEG stream and the UI is displayed on the TV screen 301.

The UI consists of a text box enabling the viewer to type in a file name they would like to save the game under. Through manipulating the keys on the remote control 313 the viewer may type in a file name of their choice and press select to save. If the viewer presses select a signal is sent by the Set top box 302 via the dial up interface across the ADSL loop to the Game Server 280 which interprets the viewers inputs and saves the game.

Alternatively the Set top box 302 may render the UI. For example during a game if a viewer presses the yellow button on the remote control 313 to save the game an infrared signal is sent to IR interface. The Set top box 302 interprets the signal and transmits a signal upstream via the dial up interface over the ADSL loop to a Switch 297 located in the local hub. The Switch 296 then directs the signal to a second Switch 296 that is operable to redirect the signal to a third Switch 295 located at the Headend of the Terrestrial TV Operator. The Switch 295 is operable to then direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits an instruction back to the Switch 295 which is operable to direct the instruction to a second Switch 296 located on the ATM Backbone. The Switch 296 then directs the instruction to a third Switch 297 located at the local hub that redirects the instruction over ADSL to the viewers Set top box 302.

The Set top box 302 is operable using the HTML/Java to render the UI from which the viewer may type in the file name. To save the game the viewer may press the select button on the remote control 313. Which transmits a signal upstream to the Middleware Server 249 or Proxy Server 248 requesting the game to be saved.

The Middleware Server 249 or Proxy Server 248 then saves the game, which is retrievable through a UI provided to the viewer when they access the Games System. It will be appreciated that a plurality of different user authentication systems may be used to authenticate a viewer and retrieve the viewers personnel saved games. This is advantageous.

Referring to figure 22, according to yet a further aspect of the present invention means may be provided enabling viewers load a game from a UI accessible via a TV channel.

For example if the viewer presses 255 on remote control 313 then the RF tuner in

viewers Set top box 302 then tunes to TV channel 255. The UHF Antenna 304 then receives a video signal and the video is then displayed on the TV screen 301.

A red icon on the top left-hand corner of the screen indicates that viewers may access the games UI by pressing the red button on their remote control 313.

If the viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the IR interface 314 on the Set top box 302. The Set top box 302 then interprets the signal and transmits a signal upstream via the dial up interface to a Switch 297 located at the local hub.

The Switch 297 the redirects the signal to a second Switch 296 which redirects the signal over the ATM network to a third Switch 295 located in the Headend of the Terrestrial TV Operator. The Switch 295 is operable to then direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 302. The Set top box 302 then interprets the HTML/Java instruction and renders the introductory user interface which is then displayed on the viewers TV screen 301. Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select options.

Within the UI the viewer may highlight and select saved games using the remote control 313. If the viewer selects saved games then an infrared signal is the transmitted to the IR interface 314 on the Set top box 302. The Set top box 302 then interprets the signal and transmits a signal upstream via the dial up interface to a Switch 297 located at the local hub. The Switch 297 the redirects the signal to a second Switch 296 which redirects the signal over the ATM network to a third Switch 295 located in the Headend of the Terrestrial TV Operator. The Switch 295 is operable to then direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and the viewer's personnel saved games retrieved from the SQL Server 247. The Middleware Server 249 or Proxy Server 248 then transmits a HTML/Java instruction back downstream to the viewers Set top box 302.

The Set top box 302 then interprets the HTML/Java instruction and renders a second UI which consists of a list of the viewers personnel saved games retrieved from the SQL Server 247. Through manipulating the buttons on the remote control 313 the viewer may highlight and select a game to load. This is advantageous.

Alternatively the Game Server 280 may render the UI from which the viewer can accessed saved games to that particular game. For example during a game a viewer may press the green button to access options. If the viewer presses the green button

an instruction is transmitted upstream via the dial up interface to the Game Server 280 which then renders the UI. The UI graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over ADSL to the viewers Set top box 302 in which an MPEG decoder 316 then decodes the MPEG stream and the UI is then displayed on the TV screen 301.

Through manipulating the keys on the remote control 313 the viewer select a file of their choice. The viewer may then load the game by pressing the select button on their remote control 313.

If the viewer presses select this transmits infrared radiation to an IR interface 314 on the Set top box 302. The Set top box 302 then interprets the signal and transmits an instruction via the dial up interface to the Game Server 280 that is located in the local hub. The Game Server 280 then interprets the instruction and loads the requested file.

The MPEG encoder 277 then captures the rendered graphics from the game that has been loaded and the video is streamed over ADSL to the viewers Set top box 302. An MPEG decoder 316 in the Set top box 302 is then operable to decode the MPEG Stream. The rendered graphics from the loaded game are then displayed on the viewer's TV screen 301. Through manipulating the keys on the remote control 313 the viewer is then able to continue playing the game from the point they saved the game. This is advantageous.

Referring to figure 22, according yet a further aspect means may be provided enabling through UI for a viewer to search for a game held remotely on the Game Server 280.

For example using the remote control 313 the viewer may access a games channel by pressing in a channel such as 255. When the viewer presses in a channel number on the remote control 313 the RF tuner in the data interface 216 then tunes into the channel. Video transmitted over a transmission channel is then received by the viewers UHF Aerial 304 and feed to the Set top box 302 via a downlead and displayed on the viewer's TV screen 301.

A red icon on the top left-hand corner of the screen indicates that viewers may access the games by pressing the red button on their remote control 313.

If the viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the IR interface 314 on the Set top box 302. The Set top box 302 then interprets the signal and transmits a signal upstream via the dial up interface to a Switch 297 located at the local hub. The Switch 297 then directs the signal to a second Switch 296 which redirects the signal over the ATM network to a third Switch

295 located in the Headend of the Terrestrial TV Operator. The Switch 295 is then operable to direct the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits a UI downstream within a HTML/Java instruction to the viewers Set top box 302 where it is realized in the RAM Memory.

The user interface includes five main components: an introductory listing of new game releases; a list of game categories; a feature permitting the user to search a database for games available by tittle, developer, publisher and keywords; a video preview of games available to play and a video for advertising. The user interface (UI) is defined in HTML primitives and sent over the network by the Middleware Server 249 or Proxy Server 248.

Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select one of the various options provided in the UI. For example if the viewer selects search infrared radiation is then blasted from the remote control to an IR interface 314 on the Set top box 302.

The Set top box 302 is then operable to interpret the signal and transmit a signal via the dial up interface to a Switch 297 located at the local hub. The Switch 297 then directs the signal to a second Switch 296 located on the ATM backbone which redirects the signal to a third Switch 295 situated within the Headend of the Terrestrial TV operator. The Switch 295 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits a second user interface downstream to the Set top box 302 where it is realized in the RAM Memory. The user interface consists of three main components which are text boxes permitting the user to search a database for games available by inputting the tittle of a game, developer, publisher or keywords like football.

Using the remote control 313 the viewer is able to input text characters into the text box. If the viewer presses select then an infrared radiation is then blasted from the remote control to an IR interface 314 on the Set top box 302.

The Set top box 302 is then operable to interpret the signal and transmits the input text characters as a data signal via dial up interface to a Switch 297 located at the local hub. The Switch 297 then directs the signal to a second Switch 295 located on the ATM backbone which redirects the signal to a third Switch 295 situated within the Headend of the Terrestrial TV operator. The Switch 295 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the data signal and a search is performed on a database.

Details of games matching the viewers input text characters are then transmitted within a data signal to viewers Set top box 302 that renders a third UI providing a list of games matching the viewers text input. To play any of the games the viewer may simply highlight the game and press select.

Referring to figure 22, according to yet a further aspect of the present invention means may be provided that would enable viewers to play multi player games on a Terrestrial Set top box.

This is achieved by gathering the file inputs and outputs from the viewers Set top box 302. The Game Server uses the file inputs much in same way as single player games whereby the file inputs received from the viewer's Set top box 302 are used to render the games graphics.

For example when a game loaded and video is either streamed over IP or transmitted on a channel the viewer is presented with the games own user interface that is unique to every game and is separate to games systems UI's. The games UI typically consists of four main options that includes single player; multi player; networked; and options. Through the games UI the viewer is operable to select multi player games.

If the viewer selects multi player games then a signal is transmitted from the viewers Set top box 302 upstream via a Switch 297 to the Game Server 280. The Game Server 280 then interprets the viewer's inputs and renders the UI.

The UI is then captured by the MPEG encoder within the MPEG Video stream and streamed downstream over the ADSL loop to the viewers Set top box 302. An MPEG decoder 316 in the Set top box 302 then decodes the IP MPEG stream and the UI is displayed within video frames on the viewer's TV screen 301.

Through UI provided the viewer is able to configure a multi player through manipulating keys on the remote control 313. Those familiar with networked games will realize that within a games UI the viewer may typically select the number of players, time limits, level difficulty and the game mode whether player verses player or players verses computer. The viewer may also be able to select the screen mode whether split screen vertical or horizontal depending on the game.

Once the viewer is satisfied with the game options they may then launch the game through manipulating the buttons on the remote controller.

For example if the viewer highlights and selects start game on the UI a signal is transmitted from the viewers Set top box 302 upstream via a Switch 297 to the Game Server 280.

The Game Server 280 then interprets the viewer's inputs and loads the multi player

game. Depending on the number of players selected the viewers are then able to command the game through manipulating keys on the remote control 313.

Alternatively during a multi player game viewers may use other devices such as an infrared keyboard, USB game pad or a USB Joystick. In this way two or more viewers have the option to use their own controller. Through manipulating the buttons on the remote control 313, an infrared keyboard, USB game pad or USB Joystick the viewers may command the game.

In same way as described in single player games the file inputs from the viewers Set top box 302 are transmitted upstream via the dial up interface 218 to the Game Server 280. The Game Server 280 using a software program is operable to interpret each viewers inputs and render the games graphics.

The graphics and audio from Game Server are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal.

The digital output from the MPEG encoder is then multiplexed into a single signal by a Multiplexer 89 and streamed downstream over the ADSL to the viewers Set top box 302.

An MPEG decoder 316 in the Set top box 302 then decodes the IP MPEG stream and the corresponding video frames to each viewer's inputs are displayed on the TV screen 292 in a split screen mode. The audio corresponding to viewer's inputs within the MPEG stream is also output through the viewer's speakers.

In this way viewers may play multi player games such as those available on games consoles on a thin client Terrestrial Set top box 302. This is advantageous.

Referring to figure 22, according to yet a further aspect of the present invention means may be provided that would enable viewers to play networked games using a Terrestrial Set top box 302.

This is achieved by networking multiple Game Servers using coaxial cable on a broadband network enabling file inputs and outputs to be exchanged at high bit transfer speeds of 20 (mbps) or more between the Game Servers.

In this way the Game Server 280 can gather the file inputs from viewers Set top box 302 and the inputs of participating viewers from the other Game Server 323 which can be used to render the games graphics.

Referring to figure 22 as described in Patent GB 0129161.6 a viewer may view video footage of live multi player networked games through accessing a UI from a transmission channel. The viewer may also select to join in a multi player networked

game by pressing select on the remote control 313.

For example if the viewer presses 255 on the remote control 313 the Set top box 302 RF tuner in data interface will tune to TV channel 255. A video signal is then received by the UHF Aerial 79 and video of live game footage taken from multi-player networked games is then displayed on the TV screen 301. A yellow icon on the top left-hand corner of the screen indicates that viewers may join in the networked game by pressing the yellow button on their remote control 313.

If the viewer then presses the yellow button on the remote control 313 an infrared signal is the transmitted to the an IR interface 314 on the Set top box 302.

The Set top box 302 then interprets the signal and transmits a signal upstream via the dial up interface 218 to a Switch 297 located at the local hub. The Switch 297 then directs the signal to a second Switch 296 which redirects the signal over the ATM network to a third Switch 295 located in the Headend of the Terrestrial TV Operator. The Switch 295 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 302. The Set top box 302 then interprets the HTML/Java instruction and renders a user interface which is then displayed on the viewers TV screen 301 informing the viewer that their request to join in the networked game has been accepted.

The Middleware Server 249 or Proxy Server 248 then transmits a HTML/Java instruction back downstream to the Game Server 280 to load the networked game.

The networked game is then loaded by the Game Server 280 and communication channel is assigned on the broadband network between Game Server 280 and participating Game Servers allowing data inputs to be exchanged between the Servers.

The Middleware Server 249 or Proxy Server 248 then assigns a IP address to viewer enabling MPEG video captured by the MPEG encoders to be streamed to the Set top box 302. A point to point communication link is then established between the Game Server 280 and Set top box 302.

Using the data inputs from participating Game Servers the Game Server 280 then renders the games graphics. Video is then captured by the MPEG encoder 277 and encoded in an MPEG stream. The MPEG is then streamed from the Game Server 280 over ADSL to the viewers Set top box 302.

An MPEG decoder 316 in the Set top box 302 then decodes the IP MPEG stream and the games frames corresponding to the data inputs from participating Game Servers

are displayed on TV screen 301.

The viewer is able to command the game through manipulating the keys on the remote control 313 as described previously.

Alternatively a function within a UI will enable a viewer to create a multi player networked game that other viewers may select to join in by accessing the games system introductory UI and viewing multi-player networked games.

For example if the viewer presses 255 on the remote control 313 the Set top box 302 RF tuner will tune to TV channel 255. A video signal is then received by the UHF Aerial 304 and the video of game previews or live game footage taken from multi-player networked games is then displayed on the TV screen 301. A red icon on the top left-hand corner of the screen indicates that viewers may access the games by pressing the red button on their remote control 313.

If the viewer then presses the red button on the remote control 313 an infrared signal is the transmitted to the IR interface 314 on the Set top box 302.

The Set top box 302 then interprets the signal and transmits a signal upstream via the dial up interface 218 to a Switch 297 located at the local hub. The Switch 297 then directs the signal to a second Switch 296 which redirects the signal over the ATM network to a third Switch 295 located in the Headend of the Terrestrial TV Operator. The Switch 295 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 302. The Set top box 302 then interprets the HTML/Java instruction and renders the introductory user interface which is then displayed on the viewers TV screen 301.

Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select the multi playen the Headend of the Terrestrial TV Operator. The Switch 295 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream to the viewers Set top box 302.

The Set top box 302 then interprets the HTML/Java instruction and renders a second user interface which is then displayed on the viewers TV screen 301.

The user interface comprises of four main components: an listing of networked games; an option to create a network game; a video preview of live networked games available to play and a video for advertising. The user interface (UI) is defined in HTML primitives and realized in the Set top box 302 RAM Memory.

Through manipulating the buttons on the remote control 313 the viewer is able to highlight and select the network games to join in or create a new game options. If the viewer selects create new game by highlighting the option and pressing select then an infrared signal is the transmitted to the IR interface 314 on the Set top box 302.

The Set top box 302 then interprets the signal and transmits a signal upstream via the dial up interface 218 to a Switch 297 located at the local hub. The Switch 297 then directs the signal to a second Switch 296 which redirects the signal over the ATM network to a third Switch 295 located in the Headend of the Terrestrial TV Operator. The Switch 295 then directs the signal to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits a HTML/Java instruction back downstream to all viewers Set top boxes who are accessing the networked game UI.

The Set top boxes then interpret the instruction and updates the UI indicating that the networked game created by the viewer. Viewers may then respond by highlighting and selecting join in on UI.

For example if viewer with integrated Set top box 308 presses join on the remote control 313 then a signal is carried upstream to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 interprets the signal and transmits a HTML/Java instruction back downstream to the Game Server 280 and Game Server 323 to load the networked game.

The networked game is then loaded by the Game Servers and communication channel is assigned on the broadband network between Game Server 280 and Game Server 323 allowing data inputs to be exchanged at a high bit transfer speed of 20 (mbps) or more between the Servers.

The Middleware Server 249 or Proxy Server 248 then assigns two independent IP addresses enabling MPEG video captured by the MPEG encoders to be streamed to Set top box 302 and Set top box 308.

A point to point communication link is then established between the Game Server 280 and Set top box 302. A second point to point communication link is then established between the Game Server 323 and Set top box 308.

Video is then captured by the MPEG encoders and streamed from the Game Servers over the ADSL loop to Set top box 302 and Set top box 308. An MPEG decoder in the Set top boxes 302, 308 then decodes the IP MPEG stream and the games frames are

displayed on the viewers TV screens 51/58.

The viewers are then able to command the game through manipulating the keys on the remote control 313. For example if the second viewer presses left on their remote control 313 infrared radiation is blasted at the IR interface on the viewers Set top box 308.

The Set top box 308 is then operable to interpret the signal and transmits a signal upstream via the ADSL loop to a Switch 297 located at the local hub. The Switch 297 is operable to redirect the signal to Game Servers 323 which interprets the viewers inputs and transmits the data input along a coaxial cable to the other Game Server 280 which interprets the data input.

The Games Servers then render the graphics corresponding to the data inputs from the viewers Set top box 308.

Video is then captured by the MPEG encoders and streamed from the Game Servers over the ADSL loop to the viewers Set top boxes 302, 308. An MPEG decoder in the Set top boxes 302, 308 is operable to decode the IP MPEG stream and the RGB output is feed via the TV Scart 211 to the viewers TV screens 301, 308. The corresponding game frames to the data inputs from Set top box 308 are displayed on the viewers TV screens 301, 308.

In this way all the viewers inputs are used by the Game Servers to render the graphics, enabling viewers to play networked games. It will be appreciated that multiples of viewers could participate in a networked game in this way. This is advantageous.

Referring to figure 22, alternatively the viewer may select a networked game option within a games own UI which is either streamed or transmitted to viewers terminal when a game is first launched.

For example the viewer may select to play Quake from the introductory UI. When the game loaded and video is either streamed over IP or transmitted on a channel the viewer is presented with the games own user interface that is unique to every game and is separate to games systems UI's.

The games UI typically consists of four main options that includes single player; multi player; networked; video and controls. Through the games UI the viewer is operable to select multi player or networked games.

If the viewer selects networked games then a signal is transmitted from the viewers Set top box 302 upstream via a Switch 297 to the Game Server 280. The Game Server 280 interprets the viewer's inputs and renders the UI.

The UI is then captured by the MPEG encoder within the MPEG Video stream and streamed downstream over the ADSL loop to the viewers Set top box 302. An MPEG decoder 316 in the Set top box 302 then decodes the IP MPEG stream and a UI is displayed within the video frames displayed on the viewer's TV screen 301.

The viewer is then able to select networked game through manipulating keys on the remote control 313. If the viewer presses select on the networked games then a signal is transmitted from the viewers Set top box 302 to the Game Server 280. The Game Server 280 interprets the viewer's inputs and renders a second UI.

The UI is then captured by the MPEG encoder within the MPEG Video stream and streamed downstream over the ADSL loop to the viewers Set top box 302. An MPEG decoder 316 in the Set top box 302 then decodes the IP MPEG stream and a second UI is displayed within the video frames displayed on the viewer's TV screen 301.

The second UI consist of various options enabling to configure a networked game. Through the UI the viewer is then able to configure a net

If the viewer highlights and selects start game then a signal is transmitted from the viewers Set top box 302 upstream via a Switch 297 to the Game Server 280. The Game Server 280 interprets the viewer's inputs and loads the networked game.

The Middleware Server 249 or Proxy Server 248 transmits a HTML/Java instruction downstream within the Games system UI to all viewers accessing the Game System indicating that the networked game created by the viewer.

Viewers are then able to respond by highlighting and selecting join in on the remote control 313. For example if the viewer with the integrated Set top box 308 selects to join in then a signal is carried upstream to the Middleware Server 249 or Proxy Server 248.

The Middleware Server 249 or Proxy Server 248 then interprets the signal and transmits a HTML/Java instruction back downstream to the Game Server 323 to load the networked game. Video is then captured by the MPEG encoders and streamed from the Game Servers over the ADSL loop to the viewers Set top boxes 302, 308.

An MPEG decoder in Set top box 302/98 then decodes the IP MPEG stream and the game frames are displayed on both viewers TV screens 301, 308.

In this way both viewers inputs are used by the Game Servers to render the graphics and that because the game is rendered by the Game Servers and the graphics are provided within an MPEG Stream or a Transmission Channel then the viewers are not limited to 8-bit games. Thus the present invention would enable viewers to play networked games equivalent or superior to 128-bit games such as those available on games consoles and PC's using a thin client Set top box and a remote control. This is

advantageous.

Referring to figure 22, according to yet a further aspect of the present invention means may be provided which would enable a viewer to play PC, MAC, Amiga, Atrai, Playstation, X-box, Nintendo games on there existing set-top box without any hardware or software additions to the Set top box 302. This is achieved by a number of ways. Firstly the Game Server 280 is operable to switch operating systems (O/S) on boot up.

For example if a viewer selects a game from the introductory UI provided by the Middleware Server 249 or Proxy Server 248 that is a Playstation format. Then the Middleware Server 249 or Proxy Server 248 is operable to transmit a instruction requesting a Game Server within the PS2 O/S via a Switch 295 to a second Switch 296 which redirects the signal to an third Switch 297 located on the local hub. The Switch 297 then directs the signal to Boot Server 275.

The Boot Server 275 then analysis the boot log, to identify any Game Servers currently running the PS2 O/S.

If the Boot Server 275 does not identify an available Game Server running a PS2 O/S, then the Boot Server is operable to select a Game Server and reboot the Server. An instruction is then transmitted to the Game Server 280 to restart.

The Game Server 280 then restarts in the PS2 O/S. When the Game Server 280 has loaded the O/S a signal is transmitted back upstream to the Middleware Server 249 or Proxy Server 248 indicating that the Game Server 280 has been reset to the required O/S.

The game is then loaded on the Game Server 280. A software program located on the Game Server 280, Middleware Server 249 or Proxy Server 248 then assigns an IP address to the viewers Set top box 302 enabling video to be streamed through IP Unicasting via the ADSL return path to the viewers Set top box 302. A point to point link is then established between the Game Server 280 and the viewers Set top box 302.

Graphics rendered on the Game Server 280 are then captured by the MPEG encoder 277 and synchronized with the audio outputs from the Game Server 280. Video is then multiplexed into a single signal by a Multiplexer 255 and streamed downstream over the ADSL loop to the viewers Set top box 302.

An MPEG decoder 316 in the Set top box 302 then decodes the MPEG stream and corresponding frames rendered by the Game Server 280 are then displayed on the viewer's TV screen 301.

The viewer may then command the game by manipulating the buttons on the remote control 313 which transmit radiation signals to the IR interface 314 on the Set top box

302. The signal is then converted into an instruction which is then transmitted upstream via the return path to the Games Server 280 which interprets the file inputs of the viewers and renders the games graphics.

The graphics are then captured by the MPEG encoder 277 that is connected to the Game Server via an S-video connector or AV connector and encoded in PAL or NTSC depending on the viewer's terminal. Video then multiplexed into a single signal by a Multiplexer 89 and streamed downstream over ADSL to the viewers Set top box 302 in which an MPEG decoder 316 then decodes the MPEG stream and the corresponding frames to viewers input are displayed on the TV screen 301.

In this way the viewer is able to play the game and the game is processed and rendered by the Game Server and the video is streamed in a live MPEG stream to viewers Set top box 302 which decodes and displays the games frames.

Those skilled in the art will realize that from the point Game Server 280 renders the graphics to the point the video is streamed and displayed on the viewer's TV screen is real time. This is advantageous.

Alternatively emulation software maybe used to emulate an operating system whereby an emulation software is run on top an operating system such as Windows, Linux, Unix or Sun. Through the second method operating systems maybe switched without resetting or rebooting the Game Server 280.

Alternatively through a third method that uses software drivers installed on an operating system, this would enable the Game Server 280 to interpret game formats from other platforms without emulation or rebooting the Game Server 280.

Through either of the above methods the Game Server 280 is operable to run PC, MAC, Amiga, Atari, Playstation, X-box, Nintendo and Linux games from which the MPEG encoder 277 is operable to capture the video and audio output from the Game Server 280.

The MPEG encoder 70 is also operable to encode the output into an MPEG video stream, which may then be transmitted or streamed to the Set top box 302.

A decoded in the Set top box 302 is operable to decode the digital output from the MPEG encoder 277 from which successive video frames rendered by the Game Server 280 are displayed on a viewer's TV screen 301. This is advantageous as the viewer is not constrained by format issues, or required to buy a console to play games.

It is appreciated that through the method described this would also enable viewers to play multi-player or networked games regardless of the format whether PC, Atari, Amiga, Sony, X-box or Nintendo games on a conventional Terrestrial Set top box 302.

Referring to figure 23, that illustrates a user interface that may be provided to a viewer when accessing the Games System to access their saved games.

Preferably video relating to the saved game may be streamed or transmitted to within the UI. For example if a user highlighted a saved game using their remote control 313 then a signal is transmitted upstream via the return path to the Middleware Server 249 which is operable to interpret the viewers selection and switch streams to PID of the saved game highlighted. The video relating to the saved game is then streamed or transmitted to the viewers Set top box and displayed in the window within the UI as illustrated by figure 23.

This is achieved by storing the data inputs from the last 5 minutes of a viewer's game in system log of the Game Server 280. When the viewer access the saved games through UI, the file inputs are used to recreate a video clip of the last 5 minutes of viewer's game which is then streamed via an MPEG stream or transmitted over a transmission channel. In this way the viewer may visually see their saved games. This is advantageous.

Referring to figure 24, According to yet a further aspect of the present invention there is a UI with a window defined by HTML parameters in which video previews of games and live video footage of games may be streamed or transmitted over a transmission channel.

Preferably when the viewer highlights a games title within the UI video footage relating to the game may be played with the window provided in the UI.

For example if a user highlighted a game using their remote control 313 then a signal is transmitted upstream via the return path to the Middleware Server 249 which is operable to interpret the viewers selection and switch streams to PID of game highlighted. The video relating to the game is then streamed or transmitted to the viewers Set top box and displayed in the window within the UI as illustrated by Figure 24.

CLAIMS

1. A video games system comprising of a user ternminal having a screen, means of receiving data, video and audio, means of decoding data, video and audio and means for inputting and transmitting data inputs and outputs to a Games Server or Middleware Server located remotely on a network that is operable to process, render and transmitt a video game within a signal to a users terminal that is operable to process, decode and display video provided with a signal on a screen.

2. A video games system as claimed in Claim 1, wherein a Games Server or Middleware Server operable to receive data inputs and outputs from a plurality of different types of user terminals, the users terminal being connected to pluarity of different input devices including but not limited to a Games Pad, Remote Control Unit, Keyboard or Joystick.

3. A video games system as claimed in Claim 1 or Claim 2, wherein a Games Server or Middleware Server located remote is operable to host, process and transmit a pluraity of different video games within broadcast signal to a user terminal.

4. A video games system as claimed in Claim 1, Claim 2 or Claim 3, wherein a Games Server or Middleware Server is operable to receive data inputs and outputs from a users terminal that is connected through a transmission, the server being operable to interpret the users inputs and outputs to process and render a video game stored on a Server or Middleware Server.

5. A video games system as claimed in any one of the proceeding claims, wherein a Games Server or Middleware Server is provided a central location or comprises a distributed network of part geographically seperate.

6. A video games system as claimed in any one of the proceeding claims, wherein a Games Server or Middleware Server comprising of CPU, RAM, VRAM, EEPROM, Hard Disc, Graphics Card, a graphics co-processor, Ethernet network card is used to process and render a video game using data inputs and outputs provided over a communication line from a users terminal.

7. A video games system as claimed in any one of the proceeding claims, where Games Server or Middleware Server may be a PC based system, Sun Solaris or Linux based system.

8. A video games system as claimed in any one of the proceeding claims, wherein a client terminal including an input device, CPU, memory, software, decoder and a modem for transmission of data inputs and outputs that may be used by a Server to process a game.

9. A video games system as claimed in any one of the proceeding claims, wherein the users terminals are any one of a digital cable TV set top box, a digital terrestrial TV set top box, a digital Satellite TV set top box, a DSL set top box, a games console, a PC, a mobile phone or any other means for accessing and playing a video game stored remotely on a Games Server or Middleware Server.

10. A video games system as claimed in any one of the proceeding claims, wherein the users terminals may by connected to Game Server or Middleware Server by any on of a Digital Satellite TV Network, Digital Cable TV network, Digital terrestrial TV network, Wireless Network or DSL based network.

11. A video games system as claimed in any one of the proceeding claims, wherein graphics engine located remotely on a Middleware server, Games Server or Application Server is used to process and render a video game using data inputs and outputs provided by a users terminal.

12. A video games system as claimed in any one of the proceeding claims, where the method of controling a video game is provided through a remote control, games pad, joystick or keyboard whereby data inputs and outputs are transmitted within a return path to a Middleware server, Games Server or Application Server, which is operable to processes and transmit a graphics within MPEG 1 or MPEG 2 video stream to a users set-top box.

13. A video games system as claimed in any one of the proceeding claims, wherein a graphics provided from a Middleware Server or Games Server may be transmitted to a set-top box through a plurality of delivery lines, including IP and Digital Subscriber Line (DSL) Technology.

14 A video games system as claimed in any one of the proceeding claims, wherein a communication is established between the Games Server or Middleware Server and a users terminal using modems attached to twisted pair copper line infrastructure, DSL as a method of delivery for rendered graphics from a Games Server or Middleware Server within MPEG 1 or MPEG 2 format.

15. A video games system as claimed in any one of the proceeding claims, where a video game rendered by a Games Server or Middleware Server is encoded by MPEG encoder within MPEG 1 and provided within an MPEG-2 Transport Stream to a users set top box which is operable to decode the MPEG signal using an MPEG decoder and display video frames corresponding to those rendered by the Games Server or Middleware server on a TV screen.

16. A video games system as claimed in any one of the proceeding claims, where a method of providing data within MPEG 2 TS, consists of enconding data within a transmission single which may be used by the video games system for sending control information to digital set top boxes, and transmitting games menus, prompts, in-game and GUI data.

17. A video games system as claimed in any one of the proceeding claims, wherein software compiled in C or Java held remotely on a Middleware Server, Game Server or Application server at a TV data center or headend is operable to interpret users data inputs or outputs and instruct the Middleware Server, Game Server or Application server to render a video game.

18. A video games system as claimed in any one of the proceeding claims, wherein a data inputs and outputs are provided to a Games Server or Middleware server using the JavaScript functionality within a set top box to caputure data inputs and outputs when a users presses a button on a remote control, games pad, joystick or keyboard.

19. A video games system as claimed in any one of the proceeding claims, wherein a data inputs and outputs are provided to a Games Server or Middleware server using an application stored within a set top box memory to caputure and transmit data inputs and outputs when a users presses a button on a remote control, games pad, joystick or keyboard.

20. A video games system as claimed in any one of the proceeding claims, wherein means for using game pads, joysticks, remote control, keyboard to provide data inputs and outputs is provided through software device drivers, which may be downloaded, installed or embedded on a users set-top box.

21. A video games system as claimed in any one of the proceeding claims, wherein software provided on a Games Server or Middleware Server consists of application modules, device drivers, graphics engines, graphics controllers, hardware drivers and system protocols that facilites games system functionality.

22. A video games system as claimed in any one of the proceeding claims, wherein software provide on a users terminal consists of application modules, device drivers, hardware drivers and system protocols that facilites access and control of video games provided on a Games Server or Middleware Server.

23. A video games system as claimed in any one of the proceeding claims, wherein network software stored on Games Server or Middleware Server and user terminals enables the communication within a bi-directional form between set top boxes and the Games Server or Middleware server that facilates the transmission of data input and outputs to a Games Server or Middleware Server.

24. A video games system as claimed in any one of the proceeding claims, wherein network software stored on Games Server or Middleware Server and user terminals enables the communication within a bi-directional form between set top boxes and the Games Server or Middleware server that facilates the transmission of MPEG encoded video to a users set top box.

25. A video games system as claimed in any one of the proceeding claims, where protocols that enable the use of the return channel for a users set top box facilitating the exchange of signals between user set top box and a Games Server or Middleware located in the data center of a TV operator, backbone or local hub.

26. A video games system as claimed in any one of the proceeding claims, where a users ternminal is operable to transmit requests to the Middleware server or Games Server to launch a game, that is then loaded on Middleware server or Games Server and rendered using the Random Access Memory.

27. A video games system as claimed in any one of the proceeding claims, wherein graphics from a video game processed by a Games Server or Middleware Sever is provided with a unique packet identity (PID) over a transmission channel which may be received by users set top box that is operable to decode and display the rendered graphics on a users screen.

28. A video games system as claimed in any one of the proceeding claims, wherein a video game provided by a Games Server or Middleware Server consists of a number of TS packets containing audio, video and text data that may be provided over a transport network to a users set top box.

29. A video games system as claimed in any one of the proceeding claims, where a method of processing a video game remotely on a Games Server or Middleware Server consists of caputuring the PAL or NTSC output from a graphics card using a hardware MPEG encoder that is operable to encode the rendered graphic frames within MPEG 1 or MPEG 2 stream.

30. A video games system as claimed in any one of the proceeding claims, where a method of processing a video game remotely on a Games Server or Middleware Server consists of caputuring the S-video output from a graphics card using a hardware MPEG encoder that is operable to encode the rendered graphic frames within MPEG 1 or MPEG 2 stream.

31. A video games system as claimed in any one of the proceeding claims, where a method of processing a video game remotely on a Games Server or Middleware Server consists of caputuring the S-video output from graphics card and Audio output from a sound card using a hardware MPEG encoder that is operable to encode the rendered graphic frames within MPEG 1 or MPEG 2 stream.

32. A video games system as claimed in any one of the proceeding claims, where a method of processing and transmiting a video game audio provided remotely on a Games Server or Middleware Server consists of caputuring Audio output from a sound card using a hardware MPEG encoder that is operable to encode the audio output from Games Server or Middleware Server within MPEG 1 or MPEG 2 stream that is then transmited to user terminal that is operable to decode the MPEG audio and video that is then output through a television set.

33. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a TCP/IP connection between the network, users set top box and Games Server or Middleware Server.

34. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a TCP/IP connection between the network, users set top box and Games Server or Middleware Server using Real-Time Streaming Protocol to provide video to the users terminal.

35. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a TCP/IP connection between the network, users set top box and Games Server or Middleware Server using UDP Protocol to provide video to the users terminal.

36. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a Unicast IP connection between the network, users set top box and Games Server or Middleware Server.

37. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a Unicast IP connection between the network, users set top box and Games Server or Middleware Server using Real-Time Streaming Protocol to provide video to the users terminal.

38. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a Unicast IP connection between the network, users set top box and Games Server or Middleware Server using Real-Time Streaming Protocol to provide video to the users terminal over ADSL.

39. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a Internet Protocol connection between the network, users set top box and Games Server or Middleware Server using Internet Protocol Television Protocol to provide video to the users terminal.

40. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a Internet Protocol connection between the network, users set top box and Games Server or Middleware Server using Internet Protocol Television Protocol to provide video over a cable based network to a users terminal.

41. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a Unicast IP connection between the network, users set top box and Games Server or Middleware Server using Asynchronous Transfer Mode (ATM) to provide video over an ATM based network to the users terminal.

42. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a Unicast IP connection between the network, users set top box and Games Server or Middleware Server using Asynchronous Transfer Mode (ATM) to provide video over an ATM based network to the users terminal that is connected by an ADSL connection to an Digital Subscriber Line Access Module that is connected to the ATM network.

43. A video games system as claimed in any one of the proceeding claims, where method providing processed game video within a viewers set top box is provided through a Wideband signal whereby graphics rendered by a Games Server or Middleware Server a encoded within an MPEG formatt and transmitted to a users set top box on a Wideband signal which is operable to decode the signal and display the video on the users TV screen.

44. A video games system as claimed in any one of the proceeding claims, where method providing processed game video within a viewers set top box is encoded by an MPEG encoder card and multiplexed by the rate mux and transmitted via a broadcast signal over wideband transmission signal which is then received by a receiver in a set-top box which is operable to decoder and translate the the signal from digital to analogue thereby displaying the rendered games frames processed by the Games Server or Middleware Server on the users screen.

45. A video games system as claimed in any one of the proceeding claims, where method providing processed game video within a viewers set top box is provided through a Narrowband signal whereby graphics rendered by a Games Server or Middleware Server a encoded within an MPEG formatt and transmitted to a users set top box on a Narrowband signal which is operable to decode the signal and display the video on the users TV screen.

46. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a two-way communication between the users set top box and Games Server or Middleware Server using hybrid fibre coaxial to provide video to the users terminal that is connected by an Cable Modem to an hybrid fibre coaxial network that is connected to the high bandwidth optical cable network that in turn is connected through a series of switches and routers to a Games Server or Middleware Server.

47. A video games system as claimed in any one of the proceeding claims, where method of transmiting a video game frames provided remotely on a Games Server or Middleware Server may be facilitated through a two-way communication between the users set top box and Games Server or Middleware Server using hybrid fibre coaxial to provide video to the users terminal that is connected by an Cable Modem to an hybrid fibre coaxial network that is connected to the high bandwidth broadband network that in turn is connected through a series of switches and routers to a Games Server or Middleware Server.

48. A video games system as claimed in any one of the proceeding claims, comprising of Middleware server, a graphics controller, a cache engine, graphics engine, a database, a graphics accelerator, a billing server, a VOD/NVOD server, a local advert insertion, an Mpeg encoder, a broadband network connecting to a viewers terminal, in which a set-top box, games console, PC can be used to play games stored remotely on a Games Server, Middeware Server or Application server.

49. A video games system as claimed in any one of the proceeding claims, comprising many different parts including Game Servers, Proxy Servers and Middleware Servers that could be provided centrally in headend of TV operator or may form part of a distributed network of parts that are geographically separate

50. A video games system as claimed in any one of the proceeding claims, wherein a method capturing video from the Game Server or Middleware Server consisting of a Video Capture card that may be used to capture video directly of the Game Servers or Middleware Server which may be directly interfaced with the MPEG encoder through S-video or BNC Composite cables.

51. A video games system as claimed in any one of the proceeding claims, wherein a method capturing video from the Game Server or Middleware Server consisting of interfacing the Games Server or Middleware Server indirectly via a break out box, where S-video or BNC composite cables are used to connect the video and audio outputs from the Game Server or Middleware Server to a break out box that is in turn connected to the MPEG encoder.

52. A video games system as claimed in any one of the proceeding claims, where a method for facilitating a multi-player games on cable digital television, comprises of a means to gathering file inputs and outputs from each users controller which is then processed by a Middleware Server or Games Server, the rendered graphics are then encoded in MPEG and transmitted over a wideband or narrowband signal to viewers terminals.

53. A video games system as claimed in any one of the proceeding claims, where a method for facilitating a multi-player games on satellite digital television, comprises of a means to gathering file inputs and outputs from each users controller which is then processed by a Middleware Server or Games Server, the rendered graphics are then encoded in MPEG and transmitted over a transmission signal to viewers terminals.

54. A video games system as claimed in any one of the proceeding claims, where a method for facilitating a multi-player games on terrestrial digital television, comprises of a means to gathering file inputs and outputs from each users controller which is then processed by a Middleware Server or Games Server, the rendered graphics are then encoded in MPEG and transmitted over a transmission signal to viewers terminals.

55. A video games system as claimed in any one of the proceeding claims, wherein a video game provided with a MPEG 2 transport stream consists of at least three streams: a video stream, an audio stream, and a text stream, which contains closed-captioned text.

56. A video games system as claimed in any one of the proceeding claims, wherein a video game provided with a MPEG 2 transport stream may include other streams that might be associated with a video game, such as foreign language audio.

57. A video games system as claimed in any one of the proceeding claims, where a method of identifying an MPEG stream used by a set top box is through PID identifies.

58. A video games system as claimed in any one of the proceeding claims, where each video game provided within a MPEG stream consists of at least three PIDs.

59. A video games system as claimed in any one of the proceeding claims, where Video Games provided by Games Server or Middleware Server are mapped to PIDs through the Program Map Table (PMT) which may be used users terminal to identify a video game.

60. A video games system as claimed in any one of the proceeding claims, where the method of accessing games provided on a Games Server or Middleware Server is provided through HTML based users interafaces that may be provided over a transmission channel to a users set top box prefarbly the game menus can be overlaid on direct broadcast thus the viewer is able to select options whilst the background, graphics, video and music are being broadcast.

61. A video games system as claimed in any one of the proceeding claims, where video provided with a unique packet identity (PID) over a transmission channel is used to provide in game and cut scene video graphics during a game that may be displayed on a users set top box screen, provided by a Games Server within a number of transport packets containing audio, video, text data for a video game.

62. A video games system as claimed in any one of the proceeding claims, where video provided with a unique packet identity (PID) over a transmission channel is used to provide background graphics, cut scenes, animations, in game graphics, video, music and sound during a game.

63. A video games system as claimed in any one of the proceeding claims, where a method of transmiting a video game content from a Games Server may be provided over a transmission channel or streamed over a return path to a viewers Set top box which is operable to decode the encoded MPEG video and display the rendered frames by the Games Server on a TV screen.

64. A video games system as claimed in any one of the proceeding claims, where process of playing a game consists of a user controling a game played remotely on a Games Server or Middleware Server through manipulating the buttons on the remote control from which data inputs and outputs are transmitted upstream via a modem to a Games Server or Middleware Server which is using the data inputs and outputs processes the game, the video output from the Games Server or Middleware Server is then encoded in an MPEG stream and transmitted downstream to the users set top box.

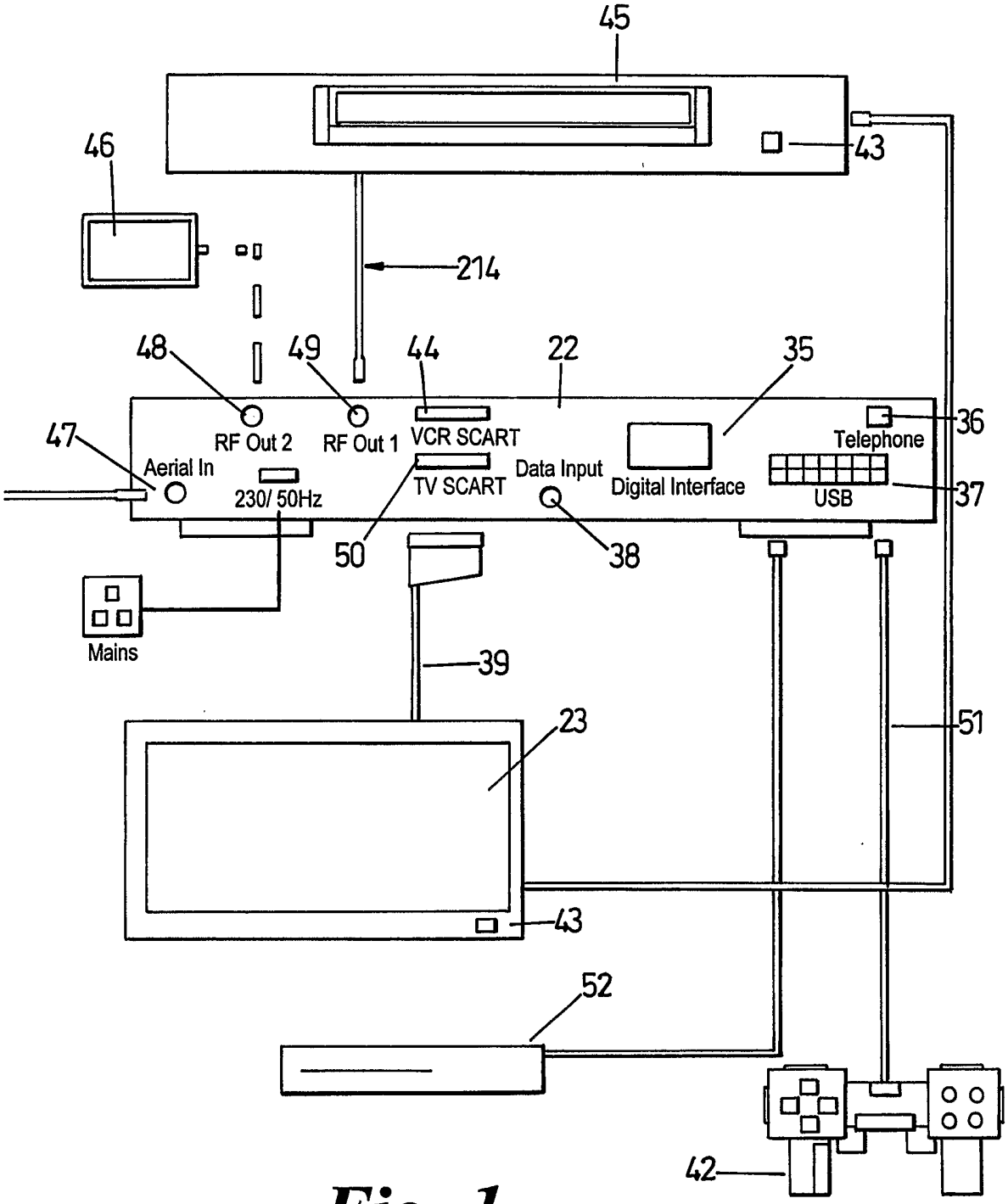
65. A video games system as claimed in any one of the proceeding claims, where a user may be provided to play any game regardless of the format whether PC, Playstation, Nintendo, Amiga or even X-box using a conventional Set top box, achieved through a software program that is designed to run various operating systems in real time on the Games Server including Windows, Playstation, Nintendo, Atari, Amiga or X-box O/S.

66. A video games system as claimed in any one of the proceeding claims, where video content output by Games Server is compressed and encoded into an mpeg format using a real-time mpeg encoder and transmitted downstream through the return path or as a wideband broadcast signal to the users set-top box receiver which is operable to decodes the encoded content which is then displayed on the viewers TV.

67. A video games system as claimed in any one of the proceeding claims, where digital output from an MPEG encoder is multiplexed into a single signal by a Multiplexer and streamed downstream over ADSL to the viewers Set top box, in which an MPEG decoder then decodes the MPEG stream and games video is then displayed on the users TV screen.

68. A video games system as claimed in any one of the proceeding claims, where a viewer may save a game remotely remotely on a Games Server or Middleware Server through transmitting a request upstream to a Middleware Server, Games Server or Proxy Server requesting the game to be saved, whereby the Middleware Server or Proxy Server then saves the game remotely on a hard disc or an alternative form of date storage.

69. A video games system as claimed in any one of the proceeding claims, where a viewer may retrieve a saved game stored on a Games Server, Middleware Server or Proxy Server through a user interface provided to the user when they access the games system, the user is operable to select a game using a remote control, games pad or any other form of control which then transmits a request to Games Server or Middleware Server to load the users saved game, the game is then loaded on the Games Server or Middleware Server and two-way communication is established facilitating the game play.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46
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214
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22
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36
47
RF Out 2
RF Out 1
VCR SCART
Telephone
Aerial In
230/ 50Hz
TV SCART
Data Input
Digital Interface
USB
37
50
38
Mains
39
23
51
43
52
42

Fig. 1

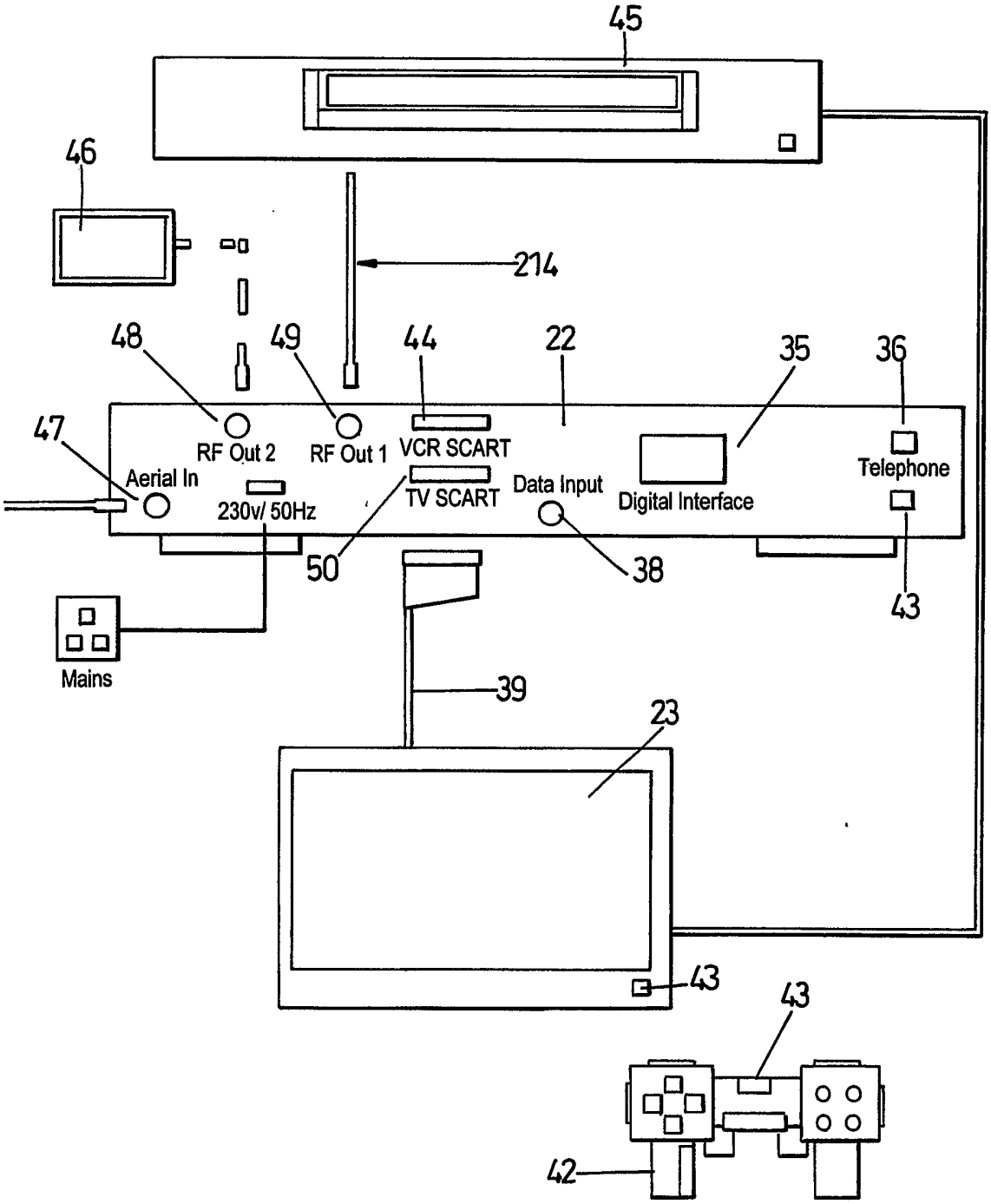

45
46
214
48
49
44
22
35
36
47
RF Out 2
RF Out 1
VCR SCART
Aerial In
230v/ 50Hz
TV SCART
Data Input
Digital Interface
Telephone
50
38
43
Mains
39
23
43
43
42

Fig. 2

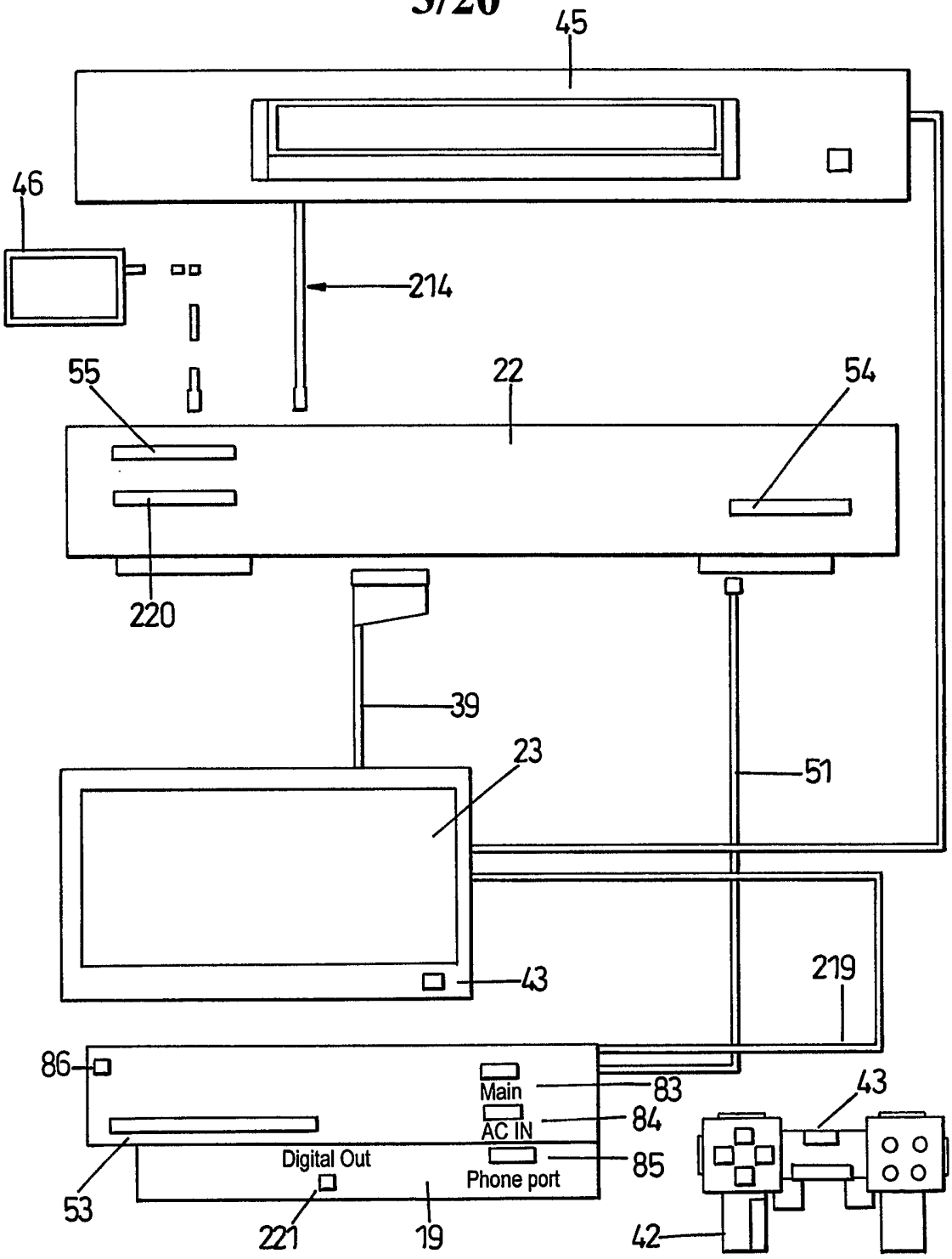

45
46
214
55
22
54
220
39
23
51
43
219
86
Main
83
AC IN
84
Digital Out
85
Phone port
53
221
19
43
42

Fig. 3

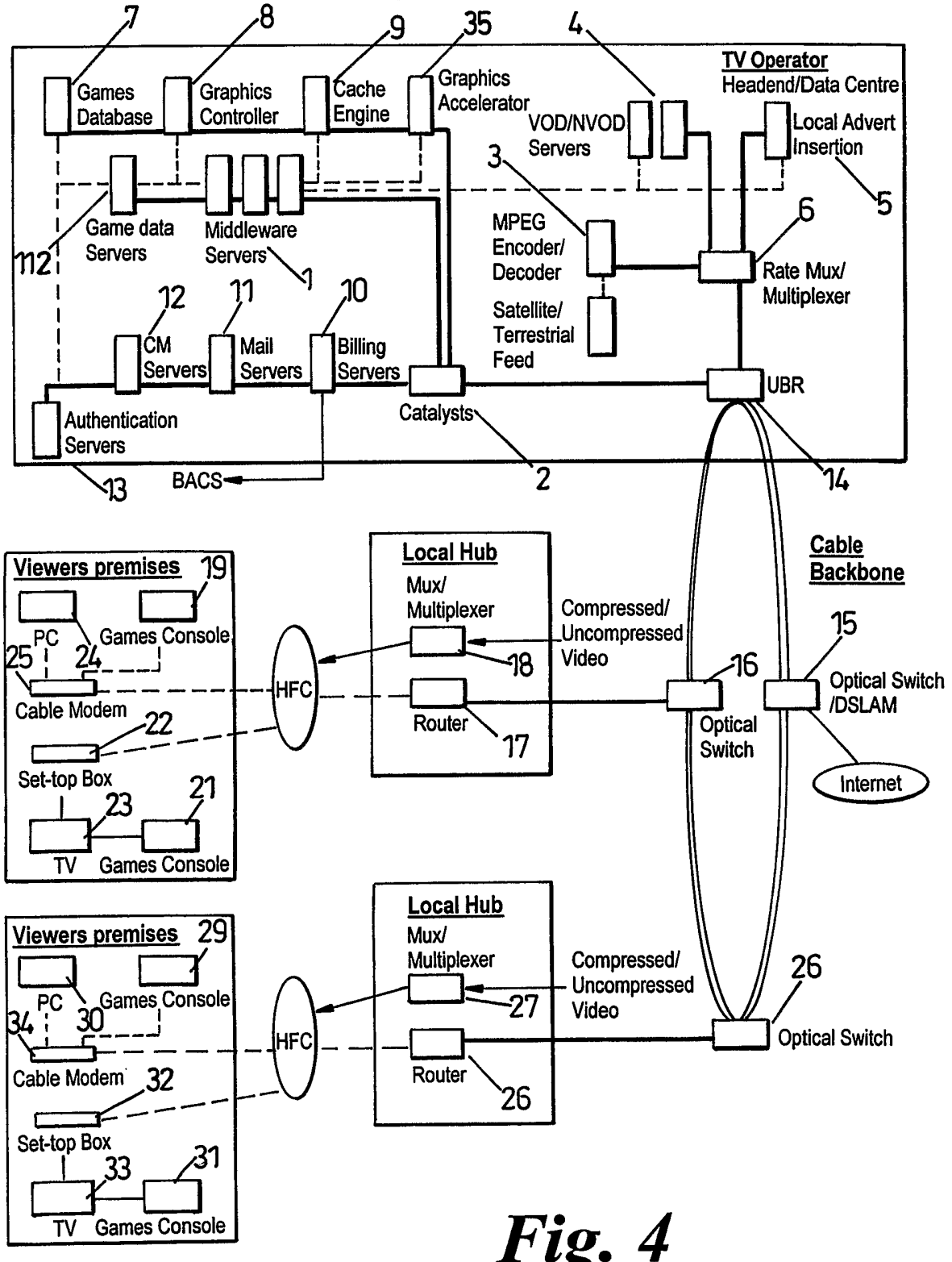

7
8
9
35
4
Games Database
Graphics Controller
Cache Engine
Graphics Accelerator
VOD/NVOD Servers
TV Operator
Headend/Data Centre
Local Advert Insertion
5
3
6
Game data Servers
112
Middleware Servers
1
MPEG Encoder/ Decoder
Rate Mux/ Multiplexer
Satellite/ Terrestrial Feed
12
11
10
CM Servers
Mail Servers
Billing Servers
UBR
Authentication Servers
Catalysts
13
BACS
2
14
Cable Backbone
Viewers premises
19
Local Hub
Mux/ Multiplexer
Compressed/ Uncompressed Video
15
PC
Games Console
25
24
18
16
Optical Switch /DSLAM
HFC
Cable Modem
22
Router
17
Optical Switch
Internet
Set-top Box
23
21
TV
Games Console
Viewers premises
29
Local Hub
Mux/ Multiplexer
Compressed/ Uncompressed Video
26
PC
Games Console
34
30
27
HFC
Optical Switch
Cable Modem
32
Router
26
Set-top Box
33
31
TV
Games Console

Fig. 4

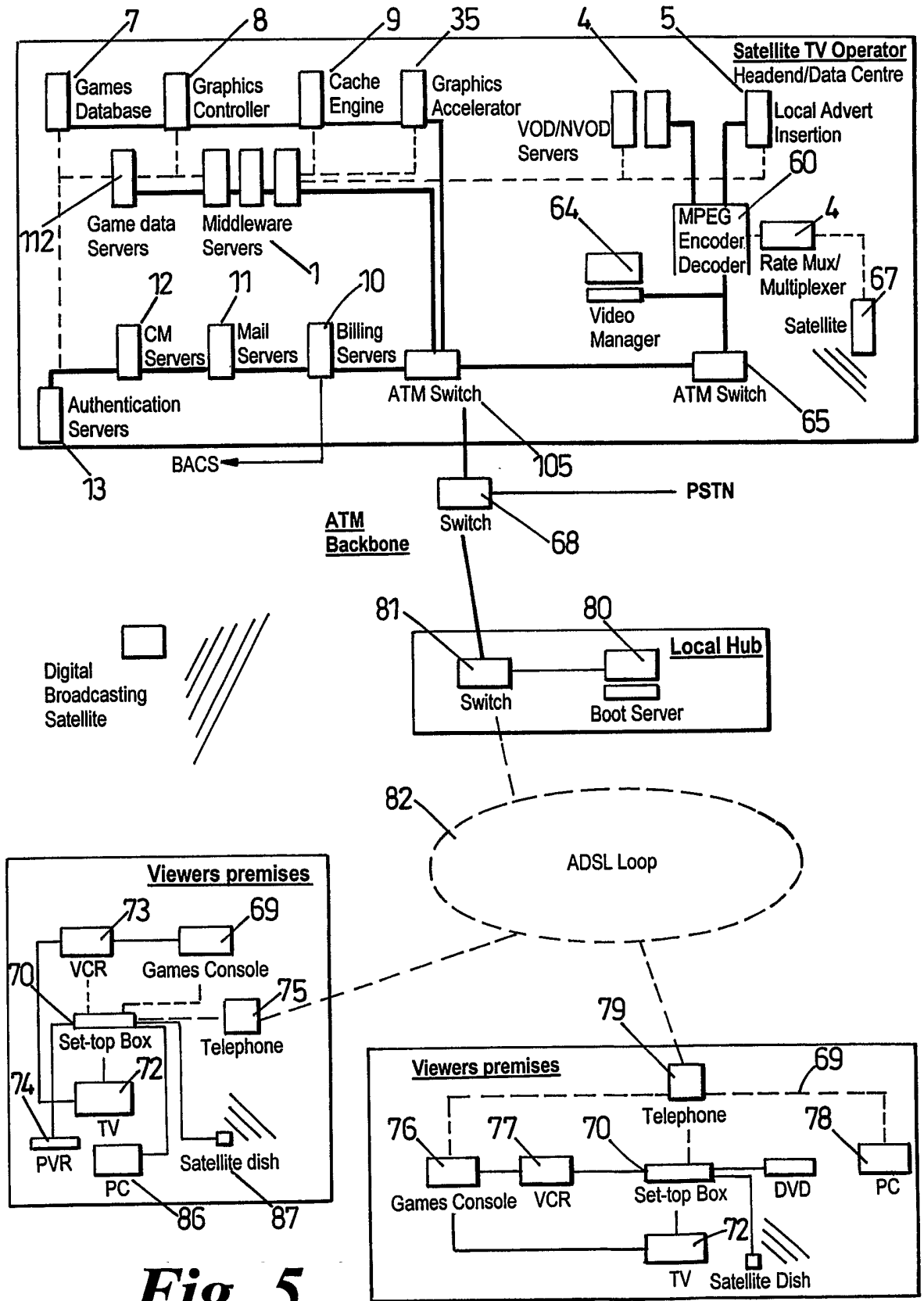

Satellite TV Operator
Headend/Data Centre
Games Database
Graphics Controller
Cache Engine
Graphics Accelerator
VOD/NVOD Servers
Local Advert Insertion
Game data Servers
Middleware Servers
MPEG Encoder Decoder
Rate Mux/ Multiplexer
Video Manager
Satellite
CM Servers
Mail Servers
Billing Servers
Authentication Servers
ATM Switch
ATM Switch
BACS
PSTN
Switch
ATM Backbone
Digital Broadcasting Satellite
Local Hub
Switch
Boot Server
ADSL Loop
Viewers premises
VCR
Games Console
Set-top Box
Telephone
TV
PVR
PC
Satellite dish
Viewers premises
Telephone
Games Console
VCR
Set-top Box
DVD
PC
TV
Satellite Dish

Fig. 5

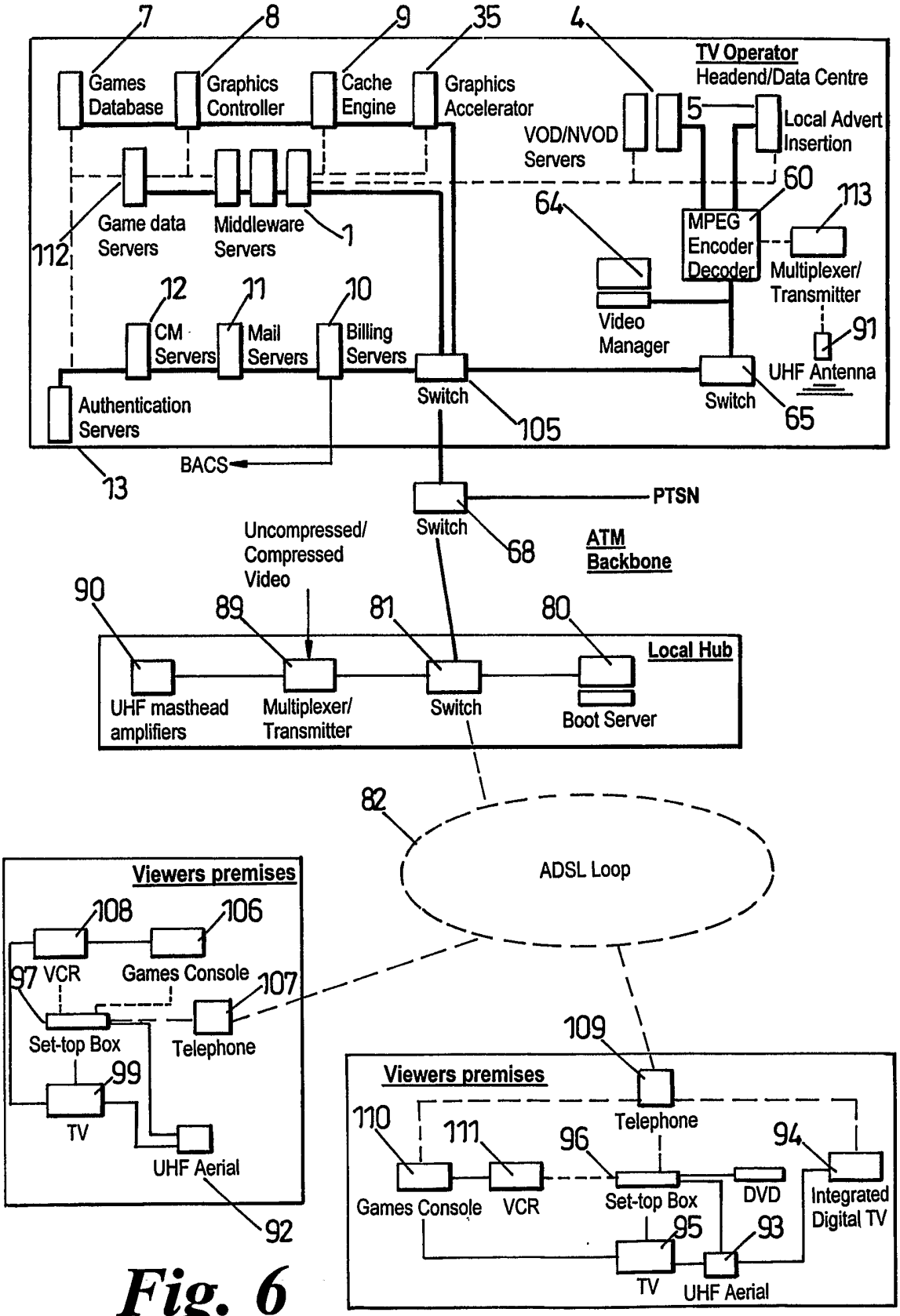

7
8
9
35
4
Games Database
Graphics Controller
Cache Engine
Graphics Accelerator
TV Operator
Headend/Data Centre
VOD/NVOD Servers
5
Local Advert Insertion
60
64
MPEG Encoder Decoder
113
Multiplexer/ Transmitter
112
Game data Servers
Middleware Servers
1
Video Manager
12
11
10
CM Servers
Mail Servers
Billing Servers
91
UHF Antenna
Switch
Switch
65
Authentication Servers
105
BACS
13
PTSN
Switch
68
ATM Backbone
Uncompressed/ Compressed Video
90
89
81
80
Local Hub
UHF masthead amplifiers
Multiplexer/ Transmitter
Switch
Boot Server
82
ADSL Loop
Viewers premises
108
106
97 VCR
Games Console
107
Set-top Box
Telephone
99
TV
UHF Aerial
92
109
Viewers premises
Telephone
110
111
96
94
Games Console
VCR
Set-top Box
DVD
Integrated Digital TV
95
93
TV
UHF Aerial

Fig. 6

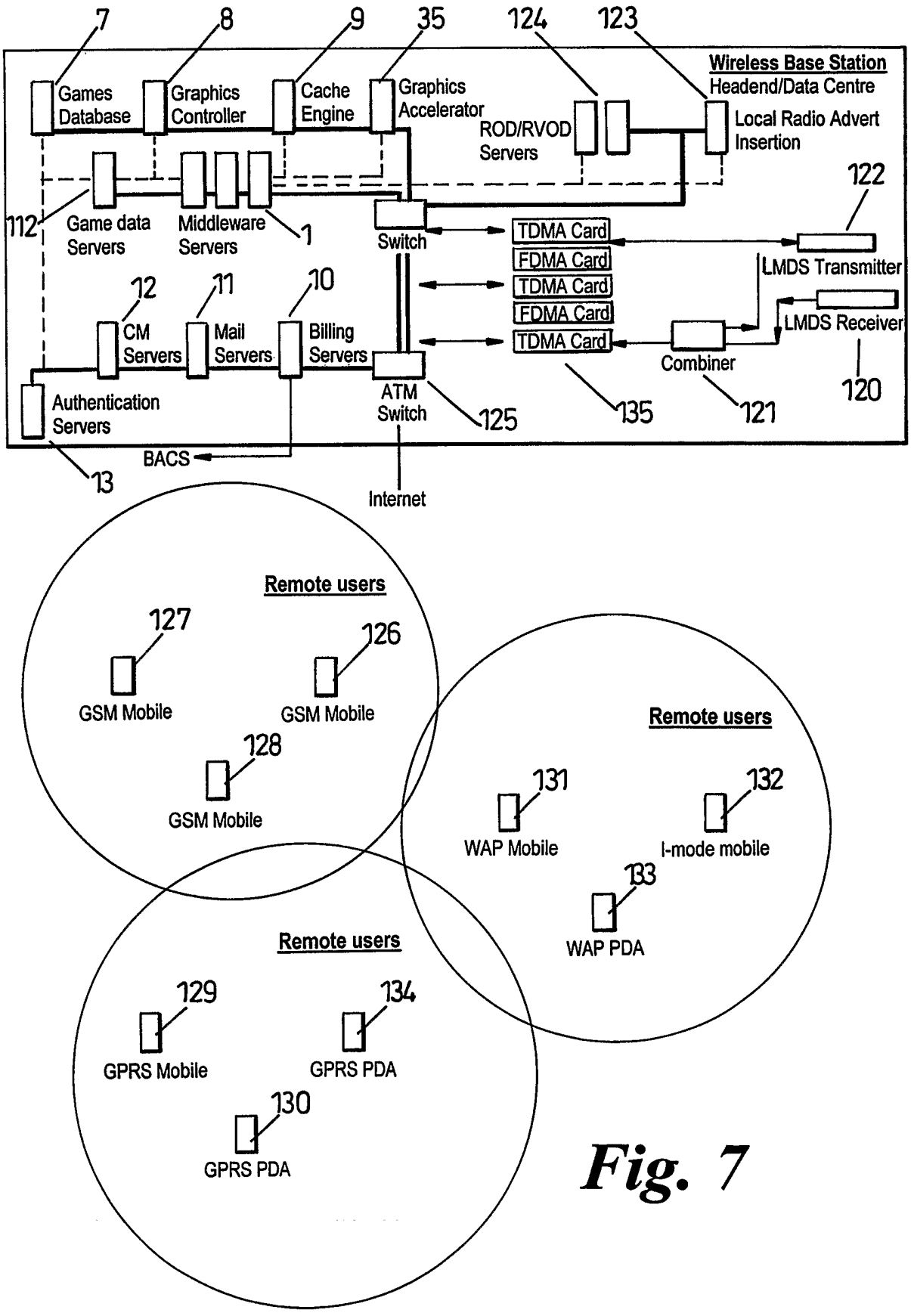

7
8
9
35
124
123
Games Database
Graphics Controller
Cache Engine
Graphics Accelerator
ROD/RVOD Servers
Wireless Base Station
Headend/Data Centre
Local Radio Advert Insertion
122
112
Game data Servers
Middleware Servers
1
Switch
TDMA Card
FDMA Card
TDMA Card
FDMA Card
TDMA Card
LMDS Transmitter
LMDS Receiver
12
11
10
CM Servers
Mail Servers
Billing Servers
Combiner
120
Authentication Servers
ATM Switch
125
135
121
BACS
13
Internet
Remote users
127
GSM Mobile
126
GSM Mobile
128
GSM Mobile
Remote users
131
WAP Mobile
132
I-mode mobile
133
WAP PDA
Remote users
129
GPRS Mobile
134
GPRS PDA
130
GPRS PDA

Fig. 7

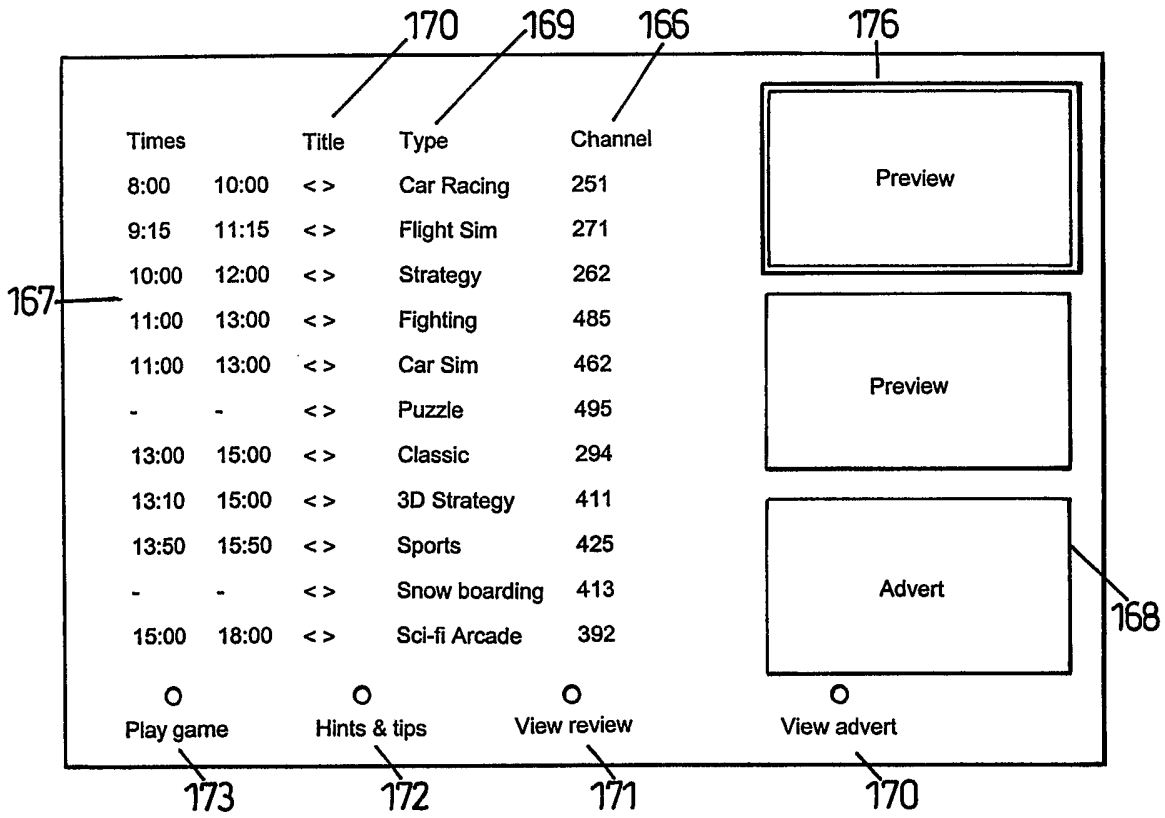

170
169
166
176
Times
Title
Type
Channel
8:00 10:00 < > Car Racing 251
9:15 11:15 < > Flight Sim 271
10:00 12:00 < > Strategy 262
11:00 13:00 < > Fighting 485
11:00 13:00 < > Car Sim 462
- - < > Puzzle 495
13:00 15:00 < > Classic 294
13:10 15:00 < > 3D Strategy 411
13:50 15:50 < > Sports 425
- - < > Snow boarding 413
15:00 18:00 < > Sci-fi Arcade 392
Preview
Preview
Advert
167
168
Play game
Hints & tips
View review
View advert
173
172
171
170

Fig. 8

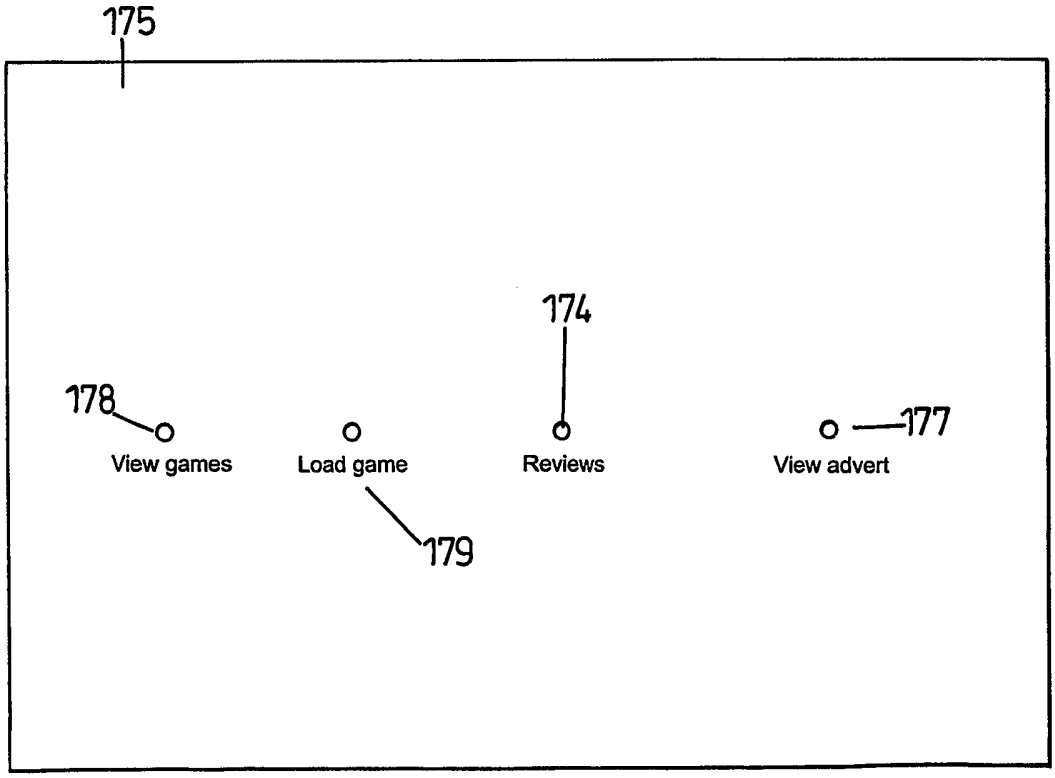

175
174
178
177
View games
Load game
Reviews
View advert
179

Fig. 9

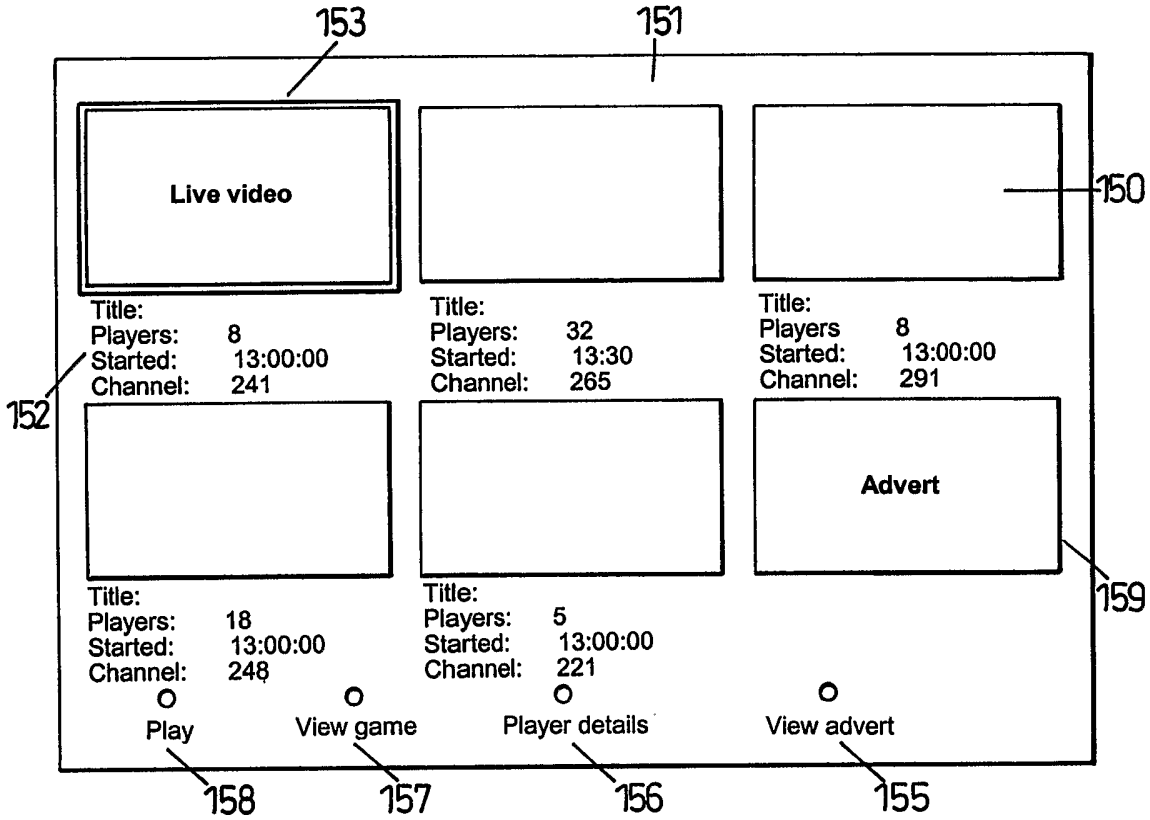

153
151
Live video
150
Title:
Players: 8
Started: 13:00:00
Channel: 241
152
Title:
Players: 32
Started: 13:30
Channel: 265
Title:
Players 8
Started: 13:00:00
Channel: 291
Advert
159
Title:
Players: 18
Started: 13:00:00
Channel: 248
Title:
Players: 5
Started: 13:00:00
Channel: 221
Play
View game
Player details
View advert
158
157
156
155

Fig. 10

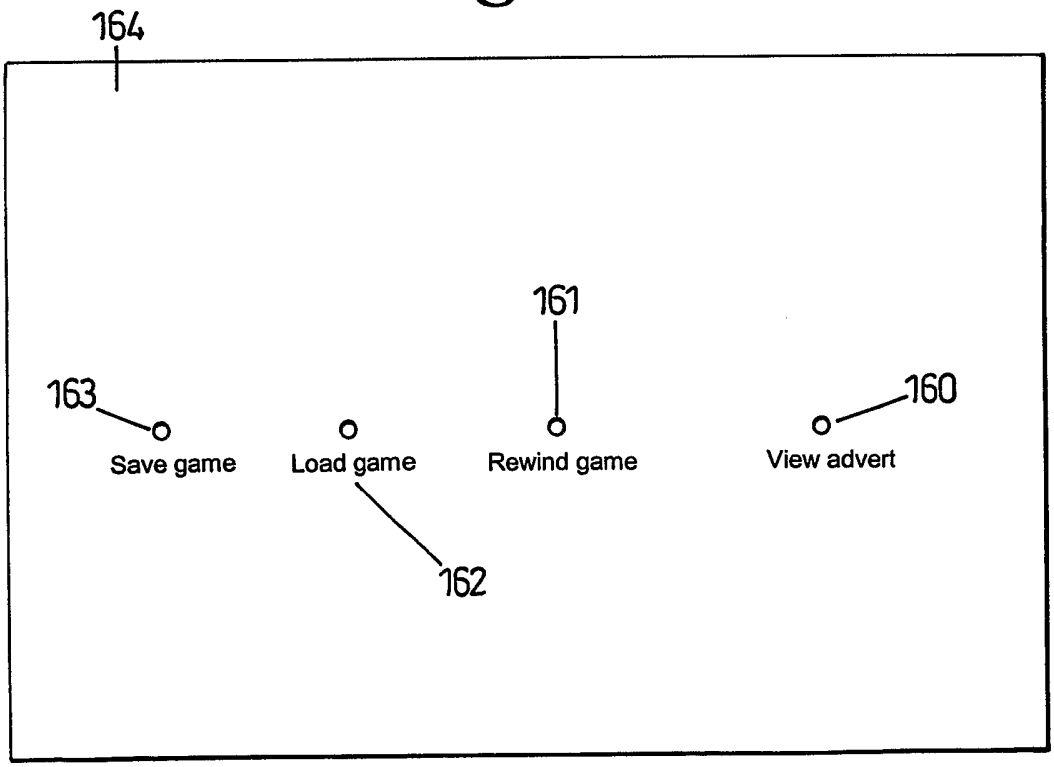

164
161
163
160
Save game
Load game
Rewind game
View advert
162

Fig. 11

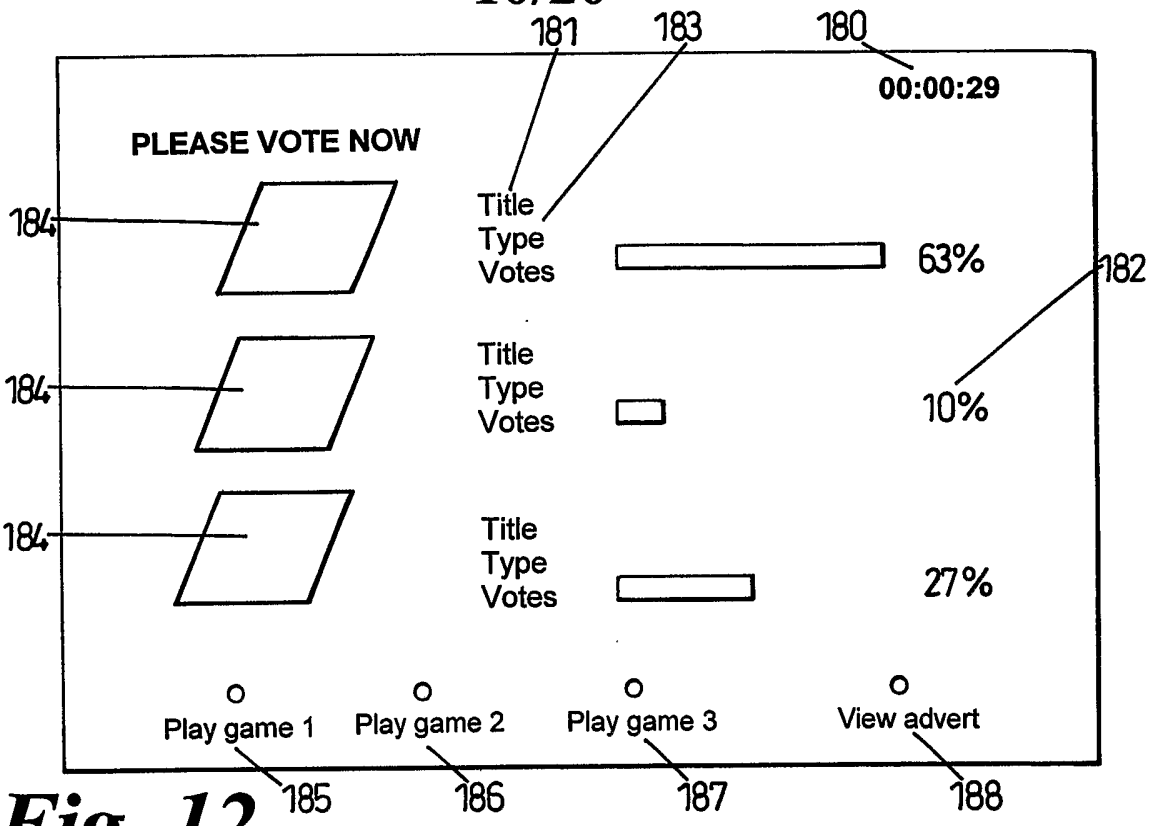

181
183
180
00:00:29
PLEASE VOTE NOW
184
Title
Type
Votes
63%
182
184
Title
Type
Votes
10%
184
Title
Type
Votes
27%
Play game 1
Play game 2
Play game 3
View advert
185
186
187
188

Fig. 12

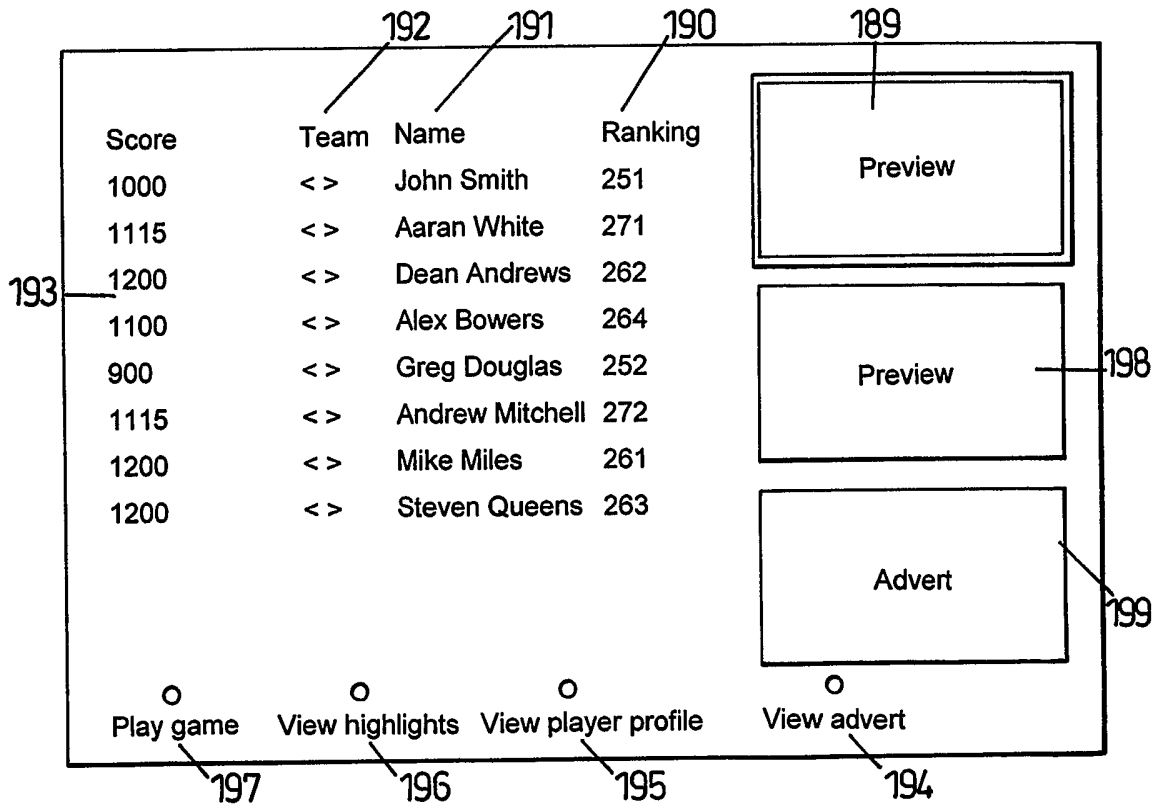

192
191
190
189
Score
Team
Name
Ranking
1000 < > John Smith 251
1115 < > Aaran White 271
193
1200 < > Dean Andrews 262
1100 < > Alex Bowers 264
900 < > Greg Douglas 252
1115 < > Andrew Mitchell 272
1200 < > Mike Miles 261
1200 < > Steven Queens 263
Preview
Preview
198
Advert
199
Play game
View highlights
View player profile
View advert
197
196
195
194

Fig. 13

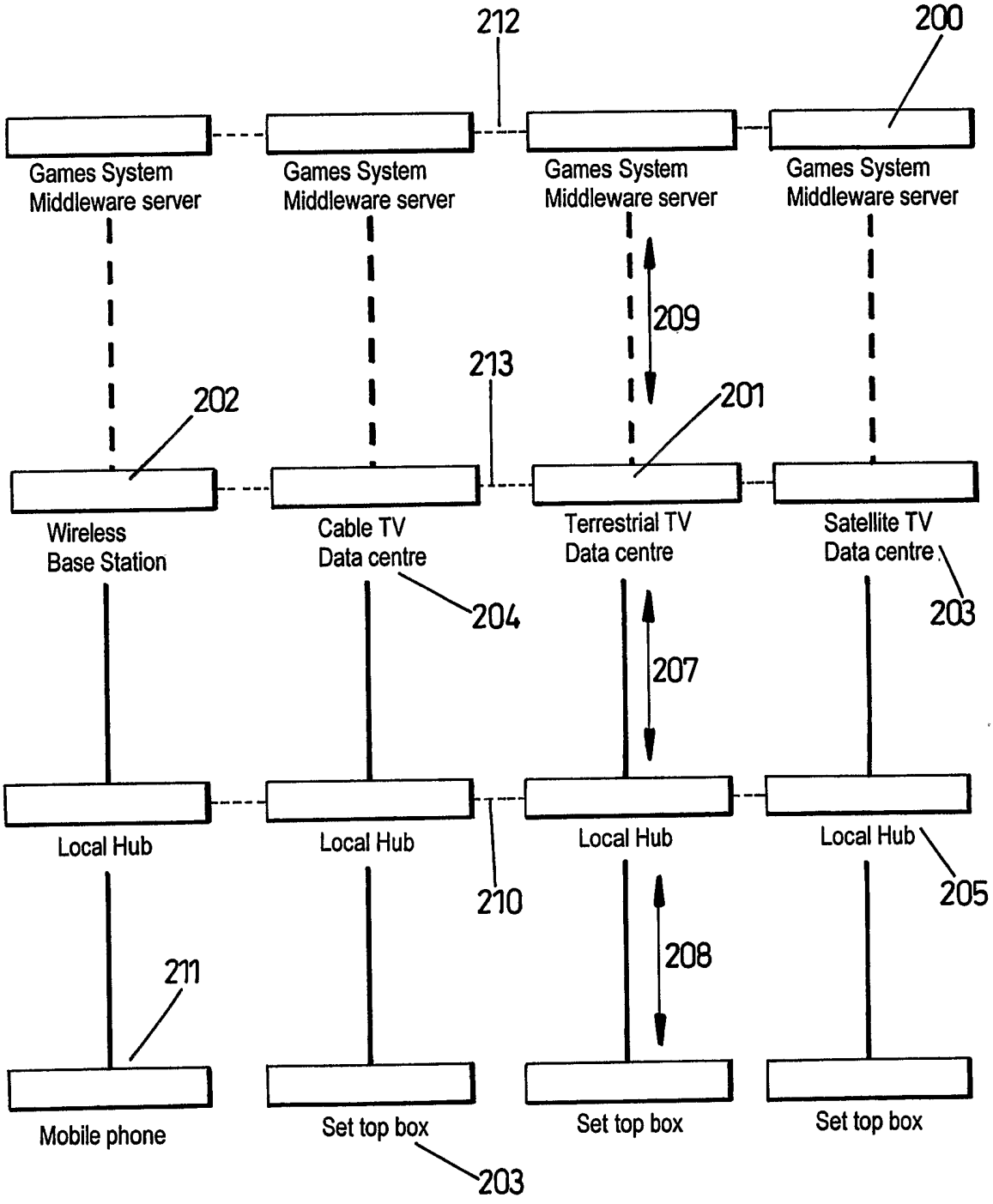
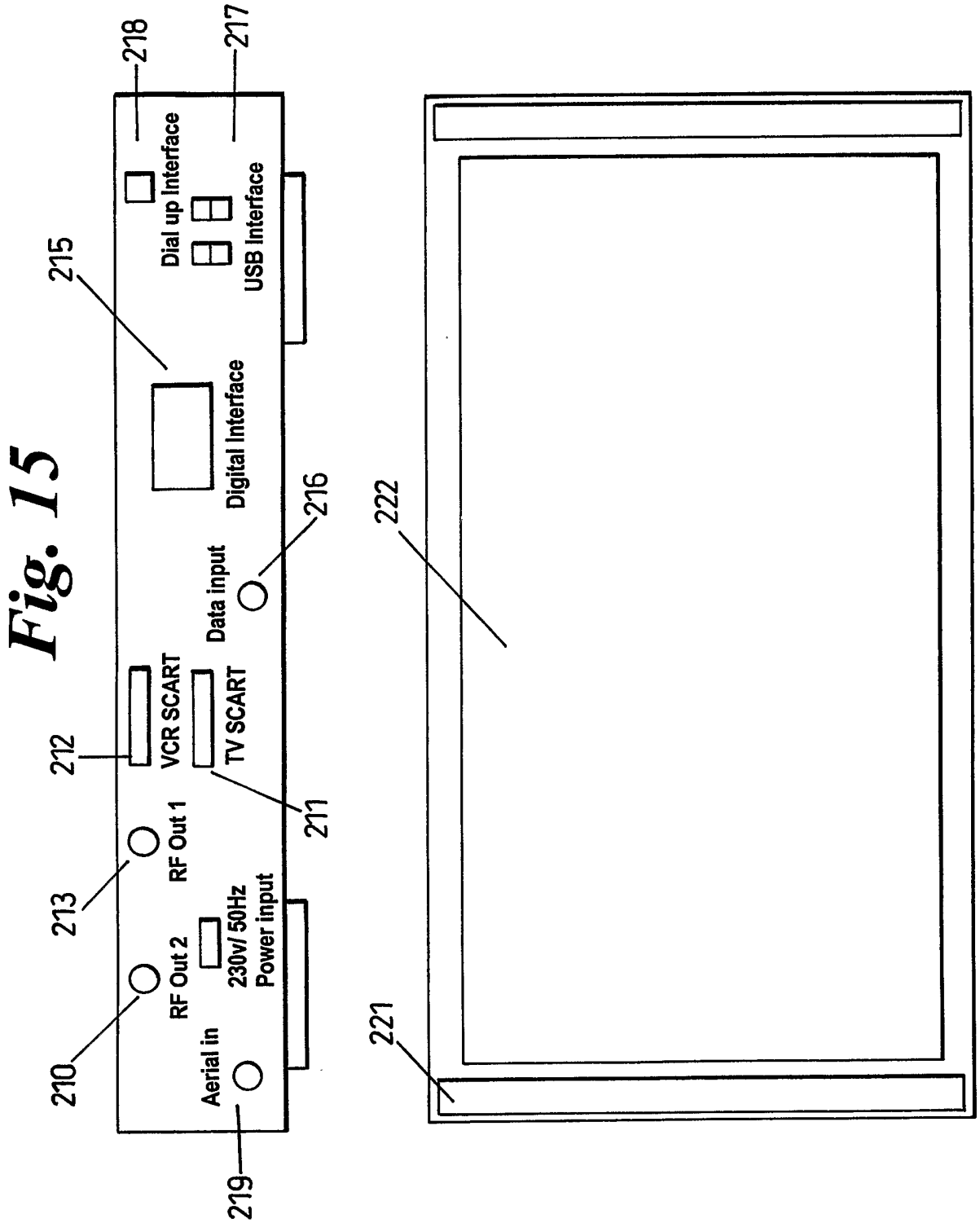

212
200
Games System Middleware server
Games System Middleware server
Games System Middleware server
Games System Middleware server
209
213
202
201
Wireless Base Station
Cable TV Data centre
Terrestrial TV Data centre
Satellite TV Data centre
204
203
207
Local Hub
Local Hub
Local Hub
Local Hub
210
205
208
211
Mobile phone
Set top box
Set top box
Set top box
203

Fig. 14

Fig. 15


218
217
Dial up Interface
USB Interface
215
Digital Interface
216
Data input
222
212
VCR SCART
TV SCART
211
213
RF Out 1
230v/ 50Hz
Power input
RF Out 2
210
Aerial in
219
221

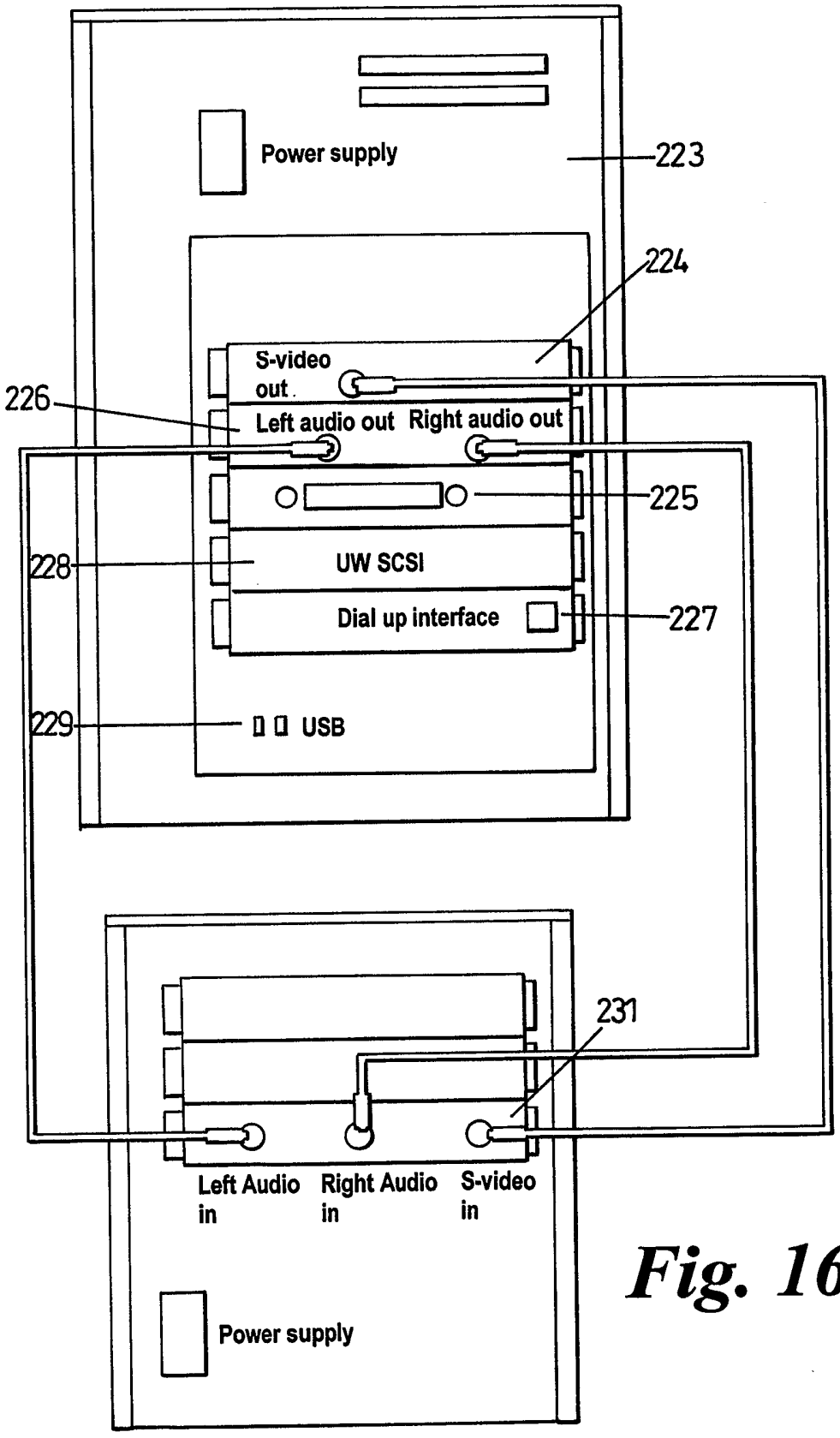

Power supply
223
224
S-video out
226
Left audio out
Right audio out
225
228
UW SCSI
Dial up interface
227
229
USB
231
Left Audio in
Right Audio in
S-video in
Power supply

Fig. 16

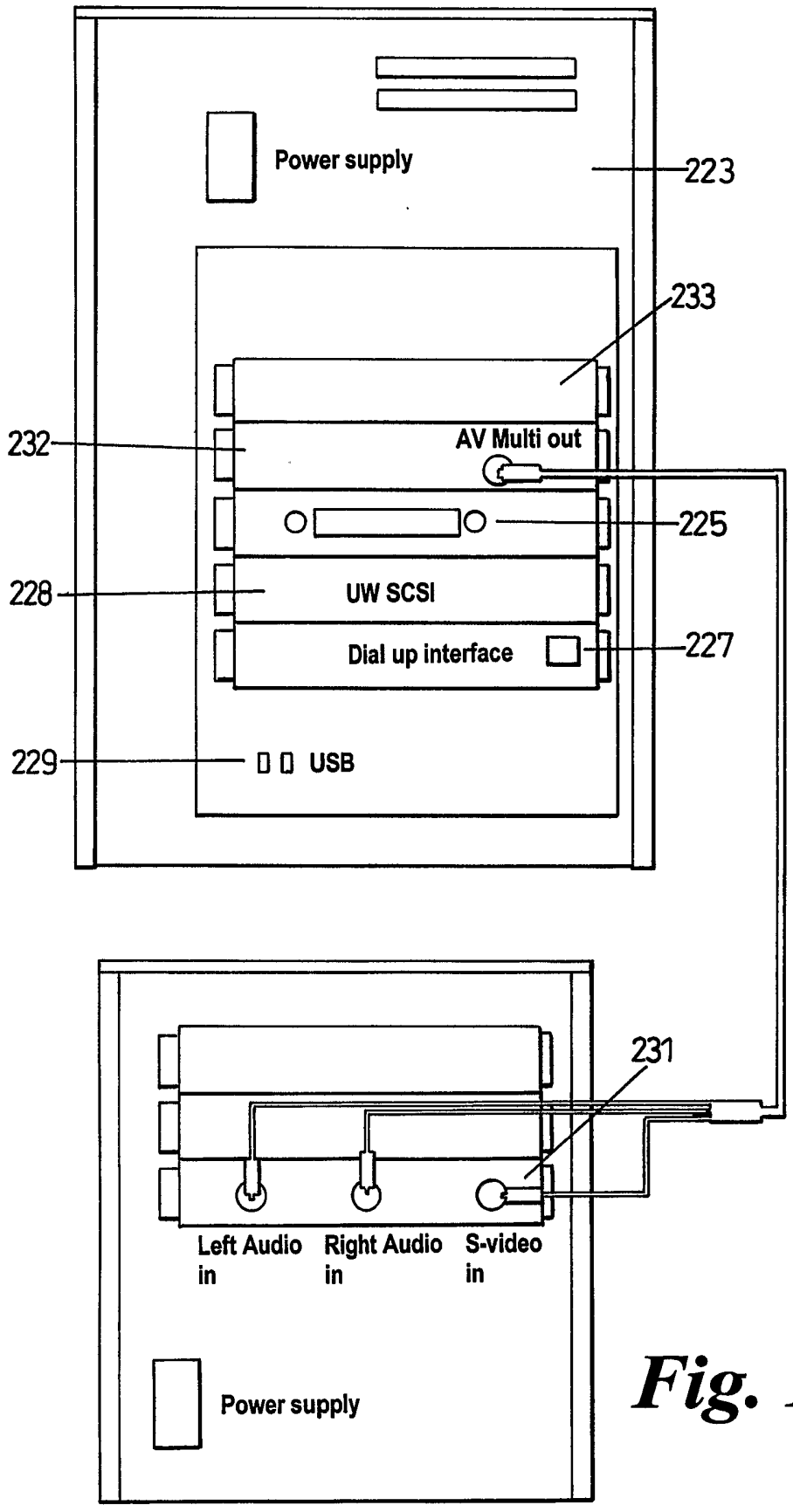

Power supply
223
233
232
AV Multi out
225
228
UW SCSI
Dial up interface
227
229
USB
231
Left Audio in
Right Audio in
S-video in
Power supply

Fig. 17

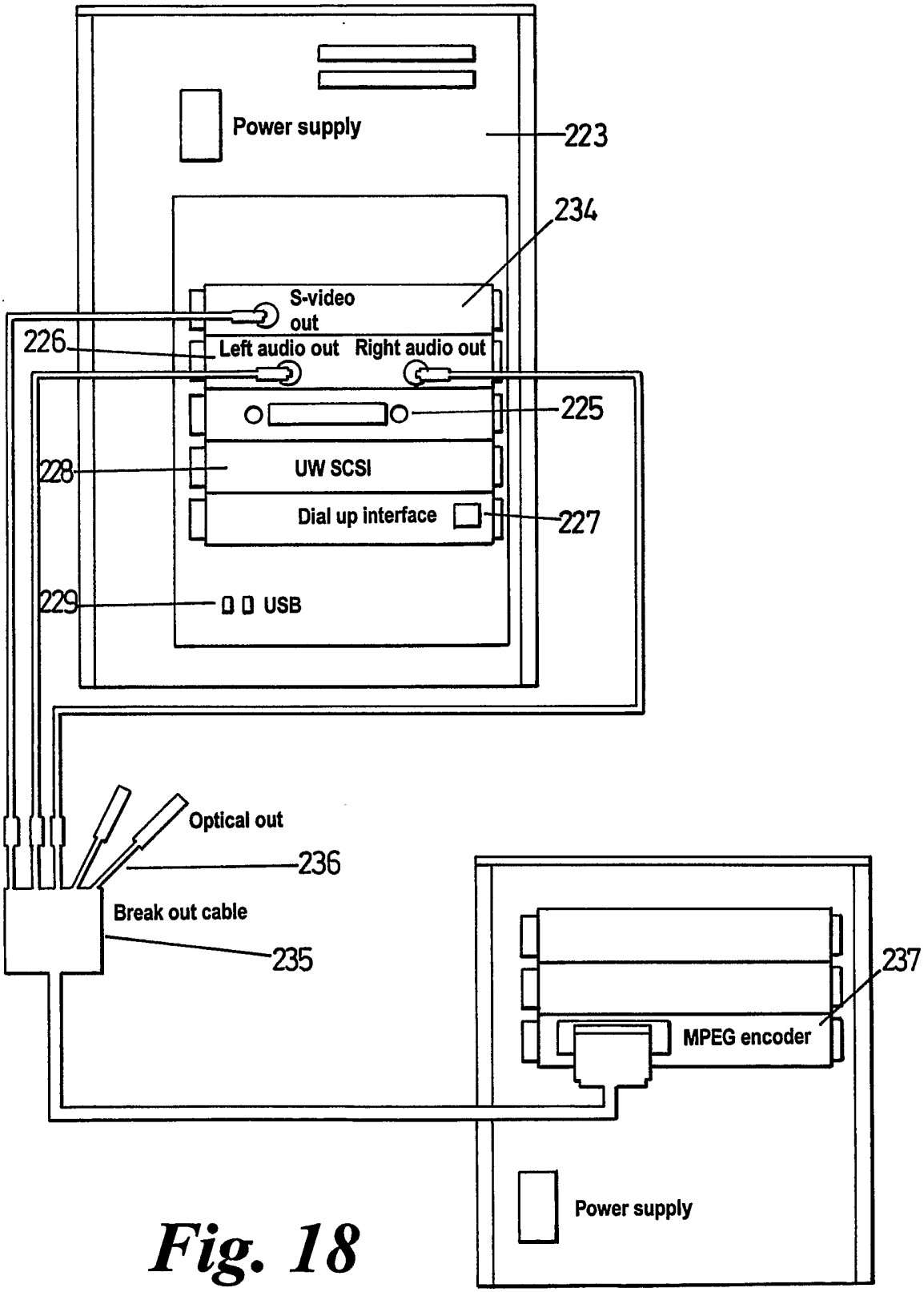

Power supply
223
234
S-video out
226
Left audio out
Right audio out
225
228
UW SCSI
Dial up interface
227
229
USB
Optical out
236
Break out cable
235
237
MPEG encoder
Power supply

Fig. 18

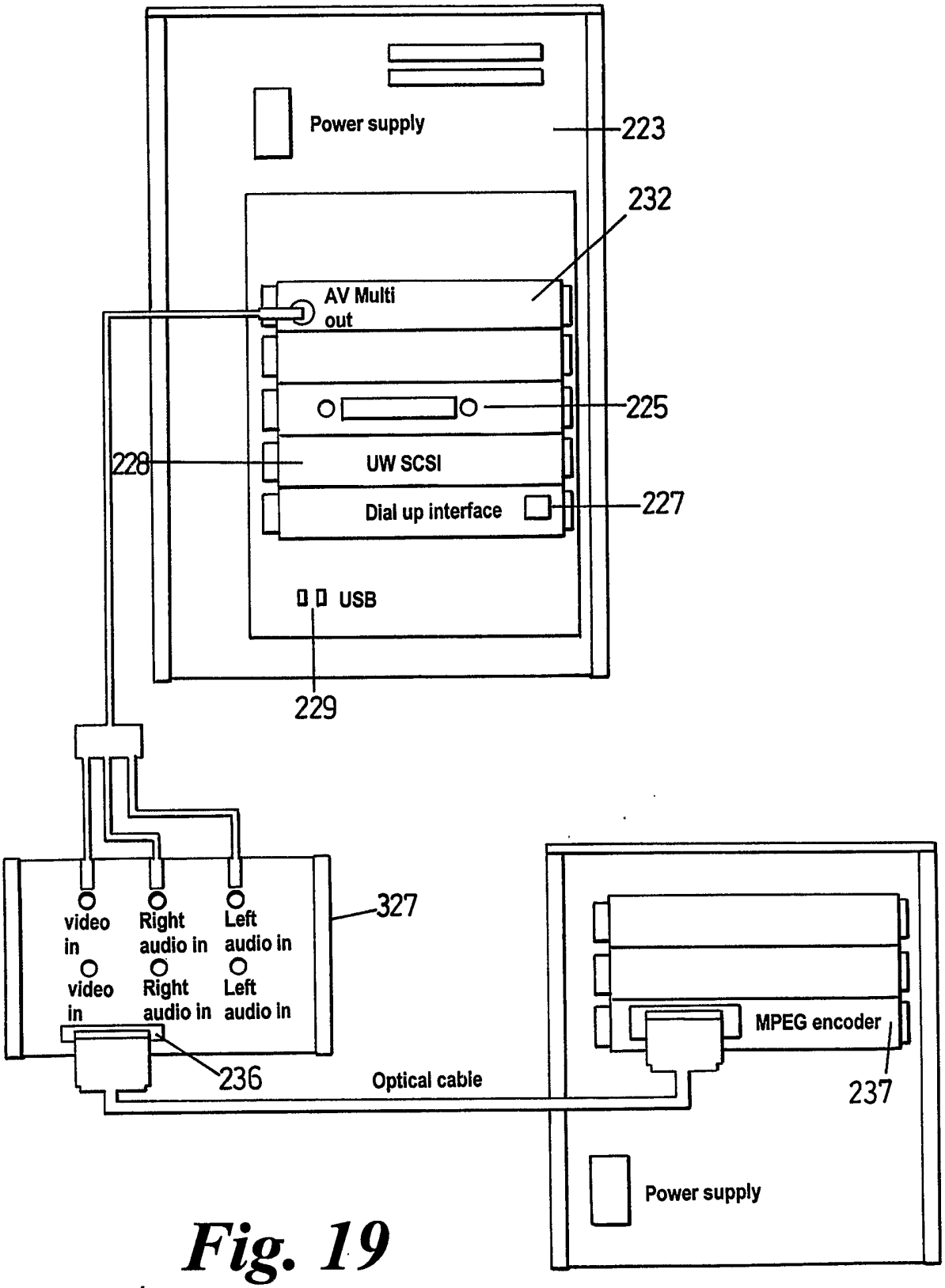

Power supply
223
232
AV Multi out
225
228
UW SCSI
Dial up interface
227
USB
229
video in
Right audio in
Left audio in
video in
Right audio in
Left audio in
327
236
Optical cable
MPEG encoder
237
Power supply

Fig. 19

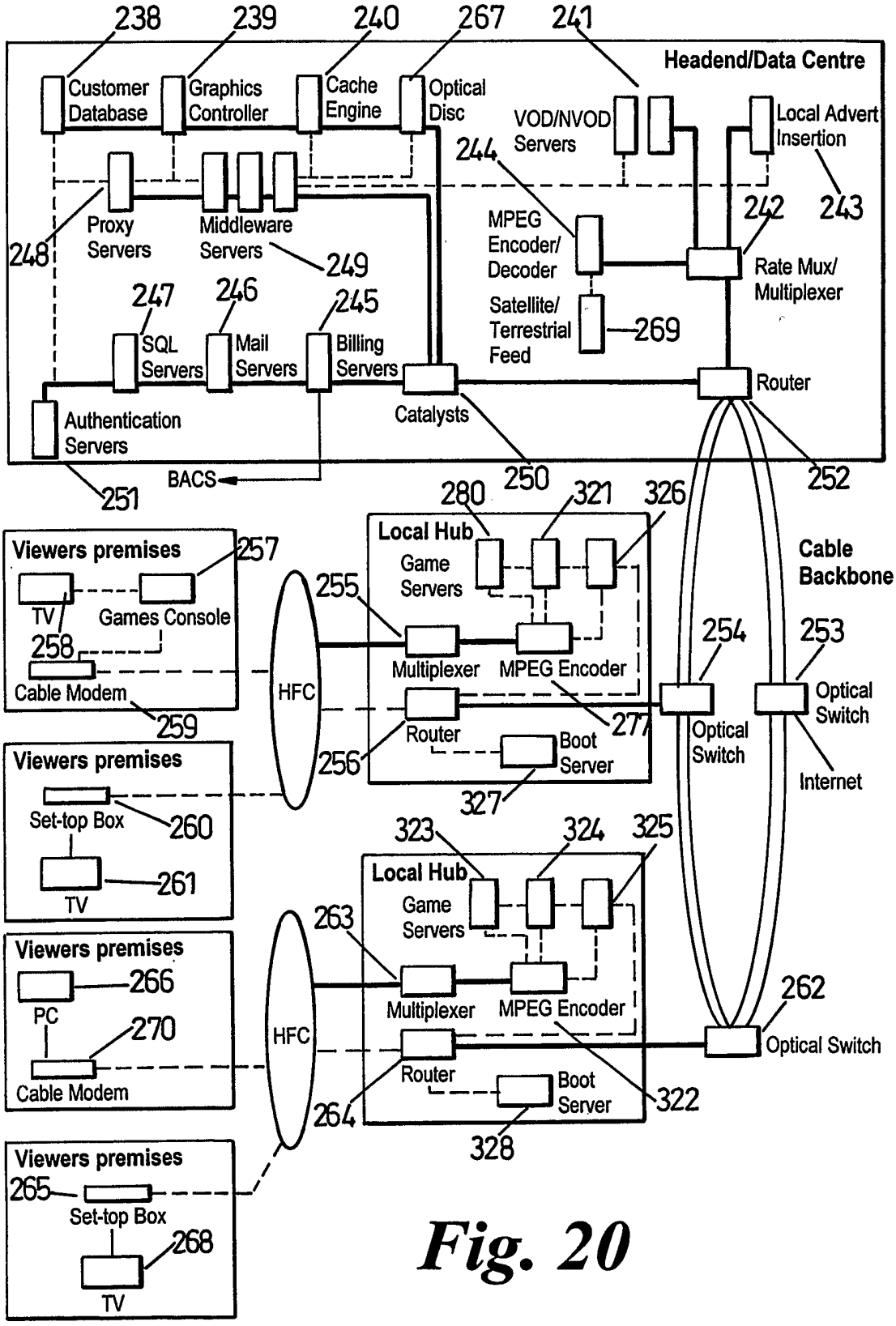

238
239
240
267
241
Headend/Data Centre
Customer Database
Graphics Controller
Cache Engine
Optical Disc
VOD/NVOD Servers
Local Advert Insertion
244
242
243
Proxy Servers
Middleware Servers
249
248
MPEG Encoder/ Decoder
Rate Mux/ Multiplexer
247
246
245
Satellite/ Terrestrial Feed
269
SQL Servers
Mail Servers
Billing Servers
Router
Authentication Servers
Catalysts
BACS
251
250
252
280
321
326
Local Hub
Game Servers
Cable Backbone
Viewers premises
257
255
TV
Games Console
254
253
258
Multiplexer
MPEG Encoder
Optical Switch
Cable Modem
HFC
259
Router
277
Optical Switch
Boot Server
256
Internet
327
Viewers premises
323
324
325
Local Hub
Set-top Box
260
Game Servers
TV
261
263
Viewers premises
262
266
Multiplexer
MPEG Encoder
PC
270
HFC
Optical Switch
Router
Cable Modem
Boot Server
322
264
328
Viewers premises
265
Set-top Box
268
TV

Fig. 20

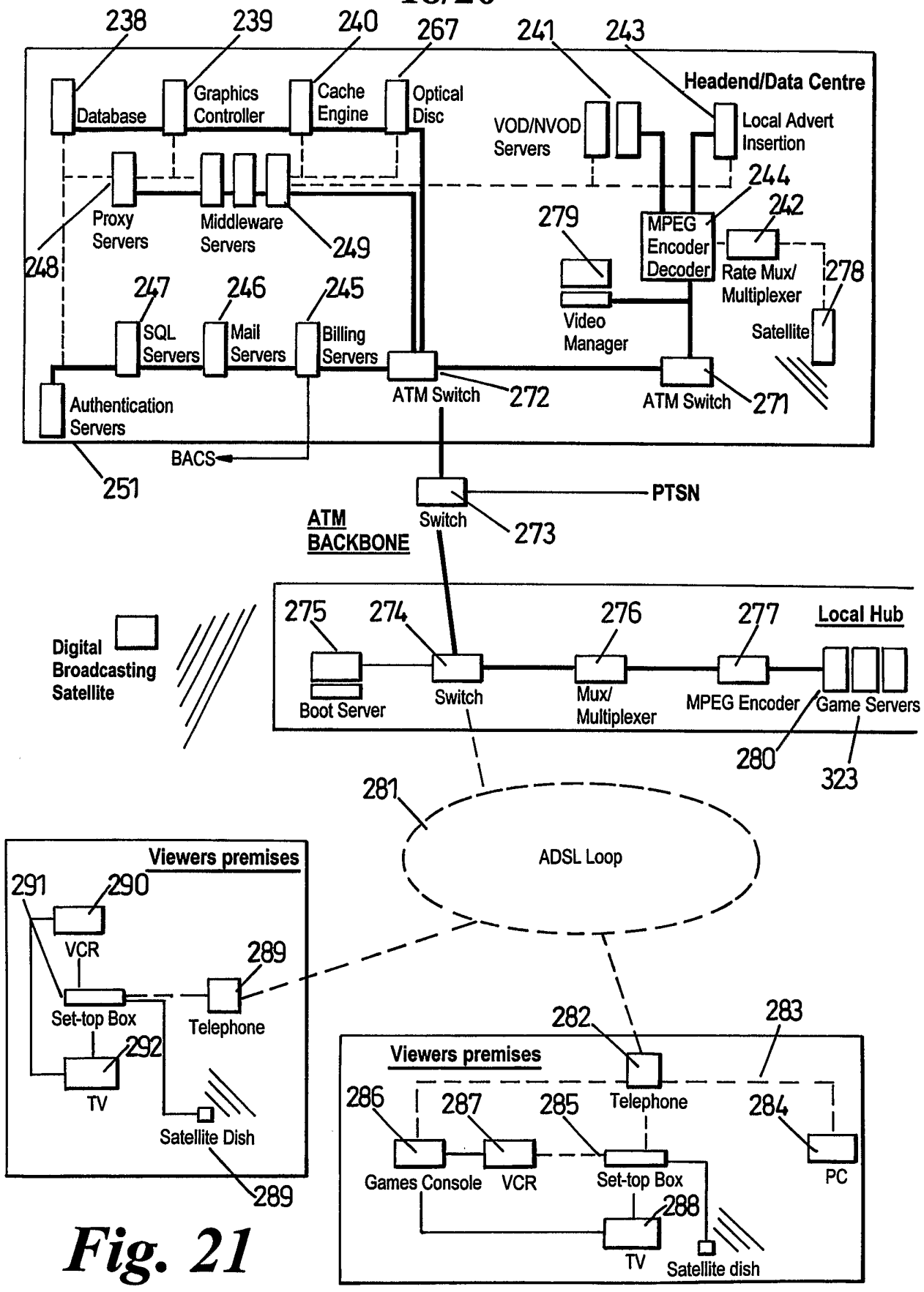

238
239
240
267
241
243
Database
Graphics Controller
Cache Engine
Optical Disc
VOD/NVOD Servers
Headend/Data Centre
Local Advert Insertion
244
242
Proxy Servers
Middleware Servers
249
248
279
MPEG Encoder Decoder
Rate Mux/ Multiplexer
278
247
246
245
SQL Servers
Mail Servers
Billing Servers
Video Manager
Satellite
Authentication Servers
ATM Switch
272
ATM Switch
271
BACS
251
PTSN
Switch
273
ATM BACKBONE
Digital Broadcasting Satellite
275
274
276
277
Local Hub
Boot Server
Switch
Mux/ Multiplexer
MPEG Encoder
Game Servers
280
323
281
ADSL Loop
Viewers premises
291
290
VCR
289
Set-top Box
Telephone
292
TV
Satellite Dish
289
282
283
Viewers premises
286
287
285
Telephone
284
Games Console
VCR
Set-top Box
PC
288
TV
Satellite dish

Fig. 21

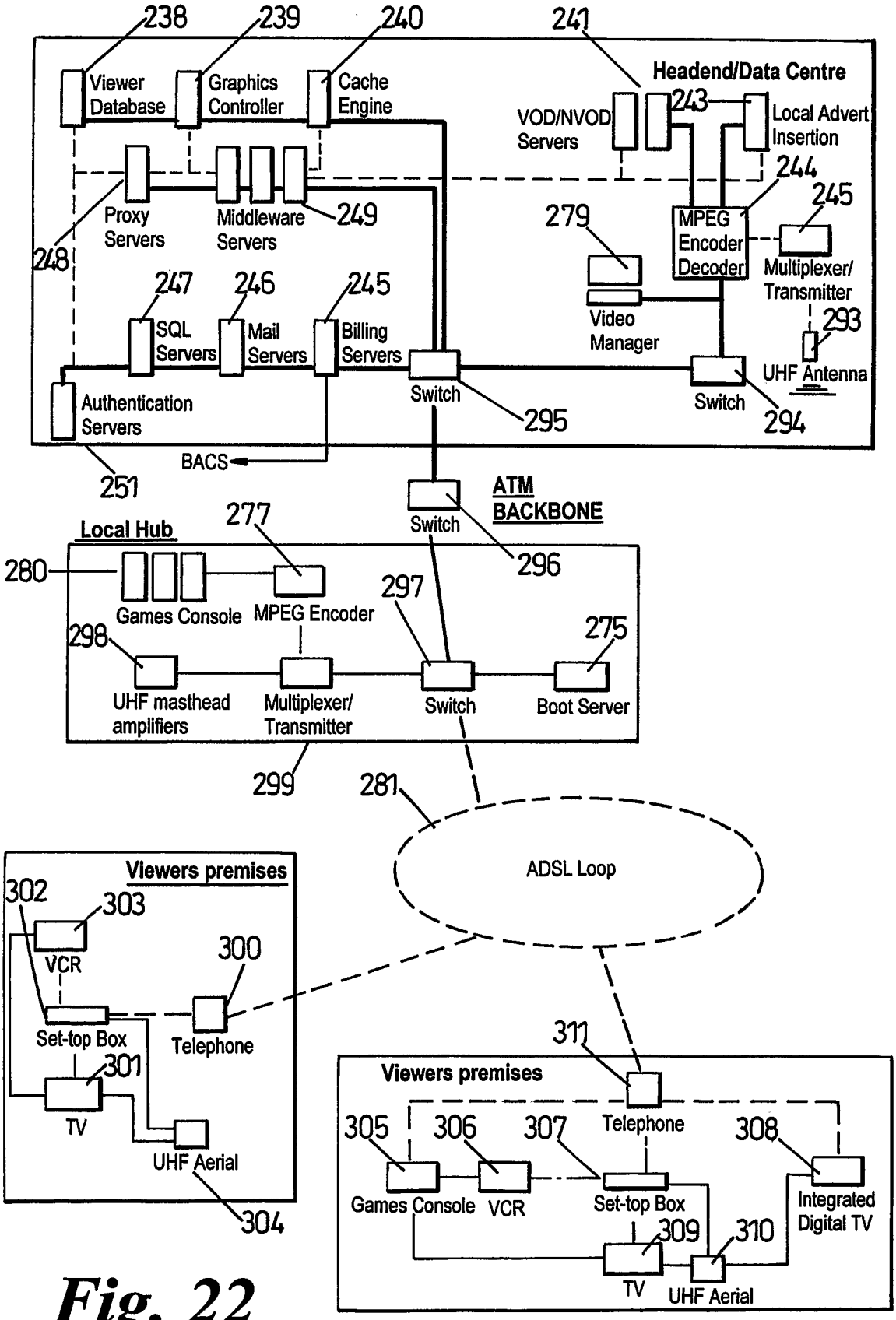
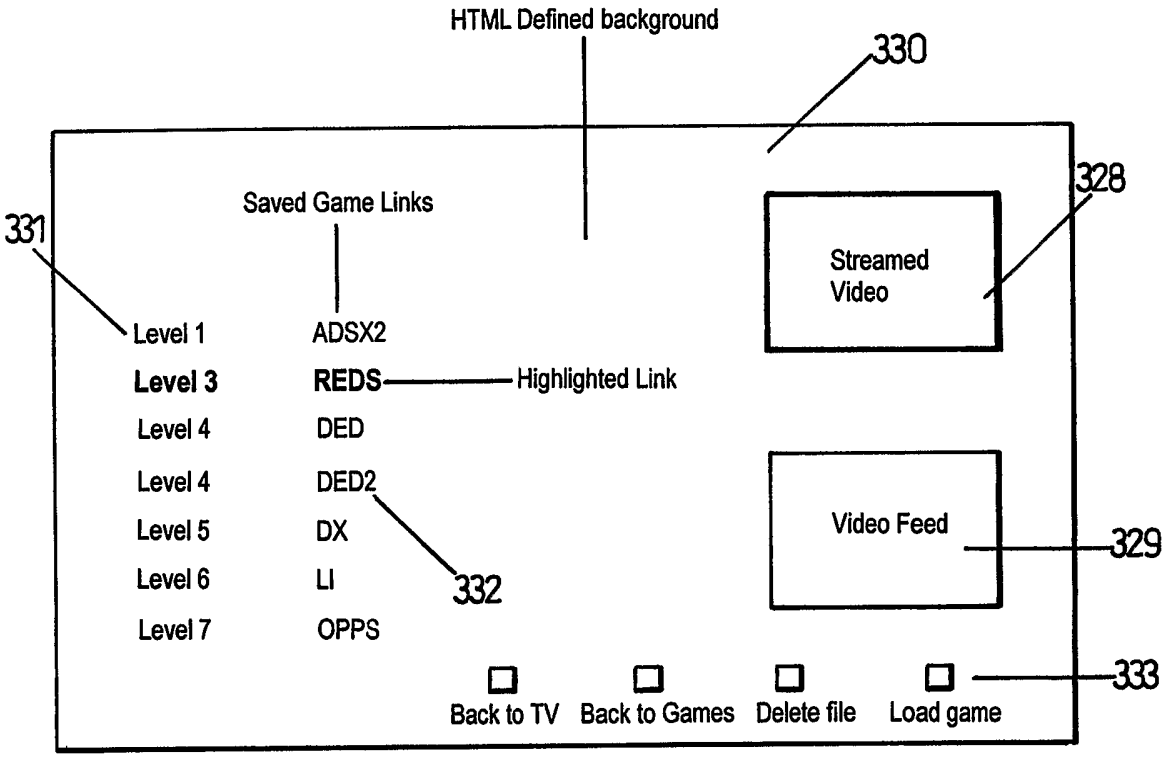

238
239
240
241
Viewer Database
Graphics Controller
Cache Engine
Headend/Data Centre
VOD/NVOD Servers
243
Local Advert Insertion
244
245
Proxy Servers
Middleware Servers
249
279
MPEG Encoder Decoder
Multiplexer/ Transmitter
248
247
246
245
SQL Servers
Mail Servers
Billing Servers
Video Manager
293
UHF Antenna
Authentication Servers
Switch
295
Switch
294
BACS
251
ATM BACKBONE
Switch
277
Local Hub
296
280
297
Games Console
MPEG Encoder
275
298
UHF masthead amplifiers
Multiplexer/ Transmitter
Switch
Boot Server
299
281
ADSL Loop
Viewers premises
302
303
VCR
300
Set-top Box
Telephone
301
TV
UHF Aerial
304
311
Viewers premises
305
306
307
Telephone
308
Games Console
VCR
Set-top Box
Integrated Digital TV
309
310
TV
UHF Aerial

Fig. 22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330
328
331
Saved Game Links
Streamed Video
Level 1 ADSX2
Level 3 REDS
Highlighted Link
Level 4 DED
Level 4 DED2
Level 5 DX
Level 6 LI
Level 7 OPPS
332
Video Feed
329
Back to TV
Back to Games
Delete file
Load game
333

Fig. 23

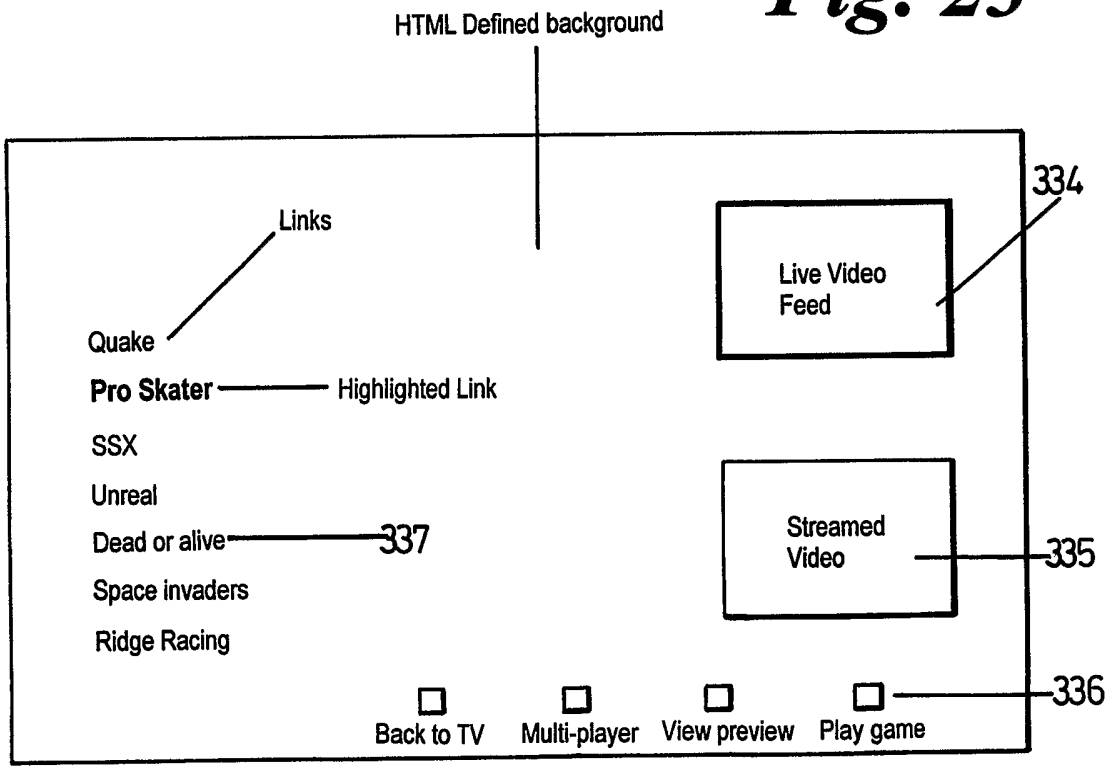
HTML Defined background
334
Links
Live Video Feed
Quake
Pro Skater
Highlighted Link
SSX
Unreal
Dead or alive
337
Space invaders
Ridge Racing
Streamed Video
335
Back to TV
Multi-player
View preview
Play game
336

Fig. 24