

[0072] What is claimed is:

1. In a client connected to a network and including a local storage device, a computer-implemented method of receiving and playing a media file comprising at least a first part and a second part, comprising:

- 5 receiving over the network and from a remote server in a first session the second part of the media file;
storing the second part at the local storage device;
receiving over the network and from a remote server in a second session subsequent to the first session the first part of the media file and not the
10 second part of the media file;
combining the first part received in the second session with the stored second part after the start of the second session; and
playing a representation of the media file at the local client after combining at least part of the first and second parts after the start of the second
15 session.

2. The computer-implemented method of claim 1, wherein the second part is not sufficient to properly play the representation of the media file back without being combined with the first part.

3. The computer-implemented method of claim 2, wherein the received parts
20 of the media file are encoded, and the second part may not be decoded without being combined with the first part.

4. The computer-implemented method of claim 1, wherein the representation of the media file may not be played back at the local client without authorization by a remote server.

5. The computer-implemented method of claim 4, wherein authorization comprises the reception over the network and from a remote server the first part of the
25 media file.

6. The computer-implemented method of claim 1, wherein the neither the first part nor the second part may be used independently to recreate a recognizable facsimile of the content of the media file.

7. The computer-implemented method of claim 1, wherein the media file is divided into a plurality of sections, each section comprising a plurality of bits, wherein the first part comprises a first subset of bits from each section, and the second part comprises the remaining bits from each section.

8. The computer-implemented method of claim 1, wherein the media file is divided into a plurality of sections, each section comprising a plurality of bits, wherein the first part comprises a first bit from each section, and the second part comprises the remaining bits from each section.

9. The computer-implemented method of claim 7 or 8, wherein one of the sections contains exactly X bits, and wherein each of the remaining sections contains exactly Y bits, wherein X is less than or equal to Y.

10. The computer implemented method of claim 9, wherein Y equals 20.

11. The computer implemented method of claim 1, wherein the first part comprises headers, compression table selectors and scale factors of the media file.

12. The computer-implemented method of claim 1, further comprising: receiving over the network and from a remote server during the first session the first part of the media file; and playing the representation of the media file back at the local client during the first session.

13. The computer-implemented method of claim 1 or 12, wherein the first part is not stored at the local storage device after the playing of the media file.

14. The computer-implemented method of claim 1 or 12, wherein the combined first and second parts are not stored at the local storage device after the playing of the media file.

15. The computer-implemented method of claim 1, wherein the played representation of the media file is an exact digital copy of the media file.

16. The computer implemented method of claim 1, wherein:
the media file further comprises a third part;
the first and second parts are combinable to form a representation of the media
file at a first quality level; and
10 the first, second, and third parts are combinable to form a representation of the
media file at a second quality level higher than the first quality level.

17. The computer implemented method of claim 16, further comprising:
receiving over the network and from a remote server the third part of the media file;
15 storing the third part at the local storage device;
combining the received third part with the stored first part and the stored second part to form the representation of the media file at the second
quality level; and
playing the representation of the media file after combining the first, second,
20 and third parts.

18. The computer implemented method of claim 17, wherein the third part is received over the network and from a remote server in a session other than the first session.

19. The computer implemented method of claim 17, wherein the third part
25 and not the second part is received over the network and from a remote server in a session other than the first session.

20. The computer-implemented method of claim 17, wherein the first part is not stored at the local storage device after the playing of the media file.

21. The computer-implemented method of claim 17, wherein the combined first, second, and third parts are not stored at the local storage device after the playing
5 of the representation of the media file.

22. In a client connected to a network and including a local storage device, a computer-implemented method of receiving and playing a media file comprising at least a first part and a second part, comprising:

receiving over the network and from a remote server in a first session the first
10 part of the media file, the first part of the media file a representation of the media file at a first quality level;
receiving over the network and from a remote server the second part of the media file, wherein the first and second parts are combinable to form a representation of the media file at a second quality level higher
15 than the first quality level;
storing the second part at the local storage device;
receiving over the network and from a remote server in a second session subsequent to the first session the first part of the media file and not the second part of the media file;
20 combining the received first part with the stored second part; and
playing a representation of the media file at the local client.

23. The computer-implemented method of claim 22, wherein the first part is not stored at the local storage device after the playing of the media file.

24. The computer-implemented method of claim 22, wherein the representation of the media file is played after combining the first and second parts.
25

25. The computer-implemented method of claim 22, wherein the representation of the media file is played in response to a command, and the representation of the media file is generated from at least the first part.
- 5 26. The computer-implemented method of claim 25, wherein the representation of the media file is generated from the second part as well as the first part if both the first part and the second part have been received at the time of playback.

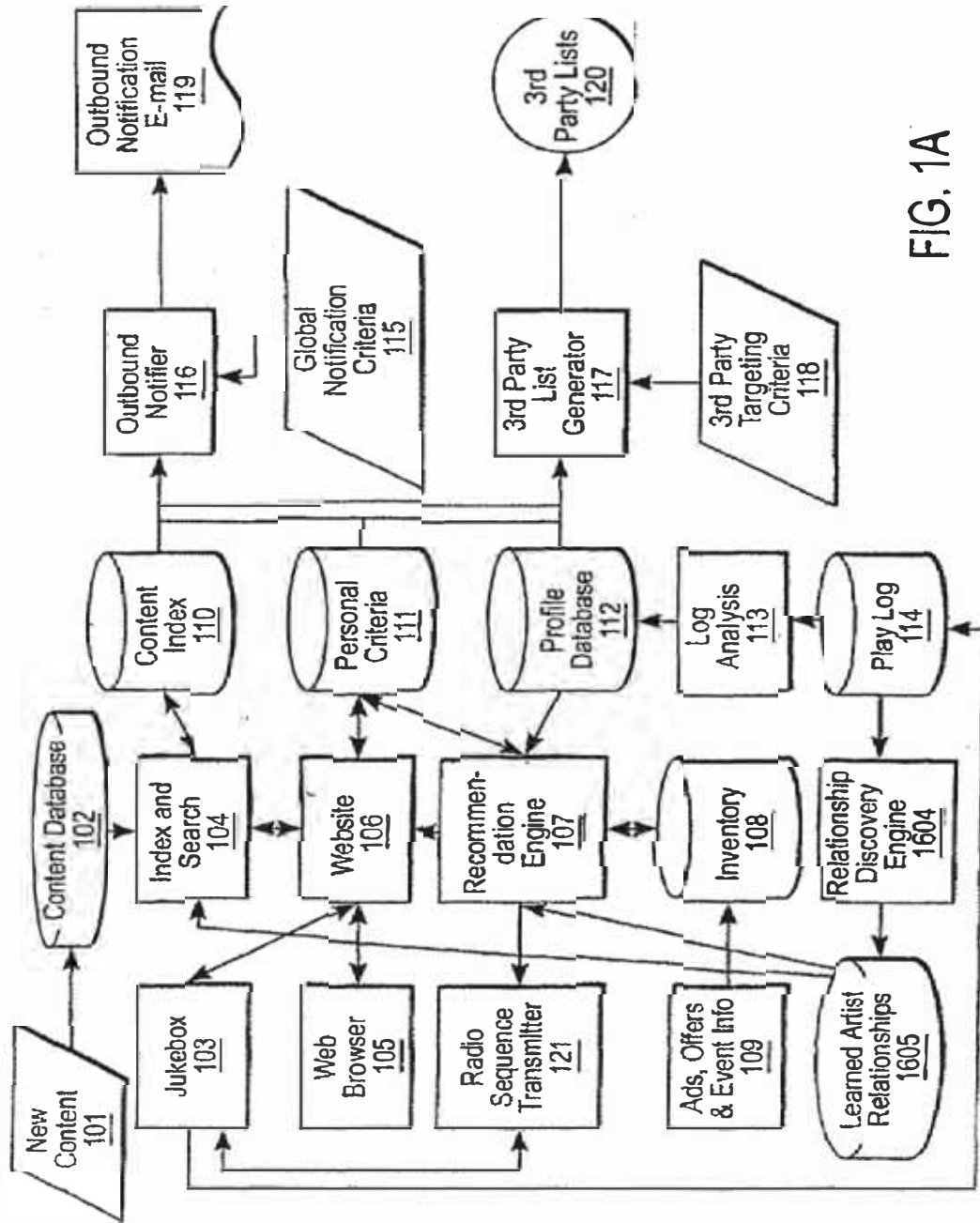


FIG. 1A

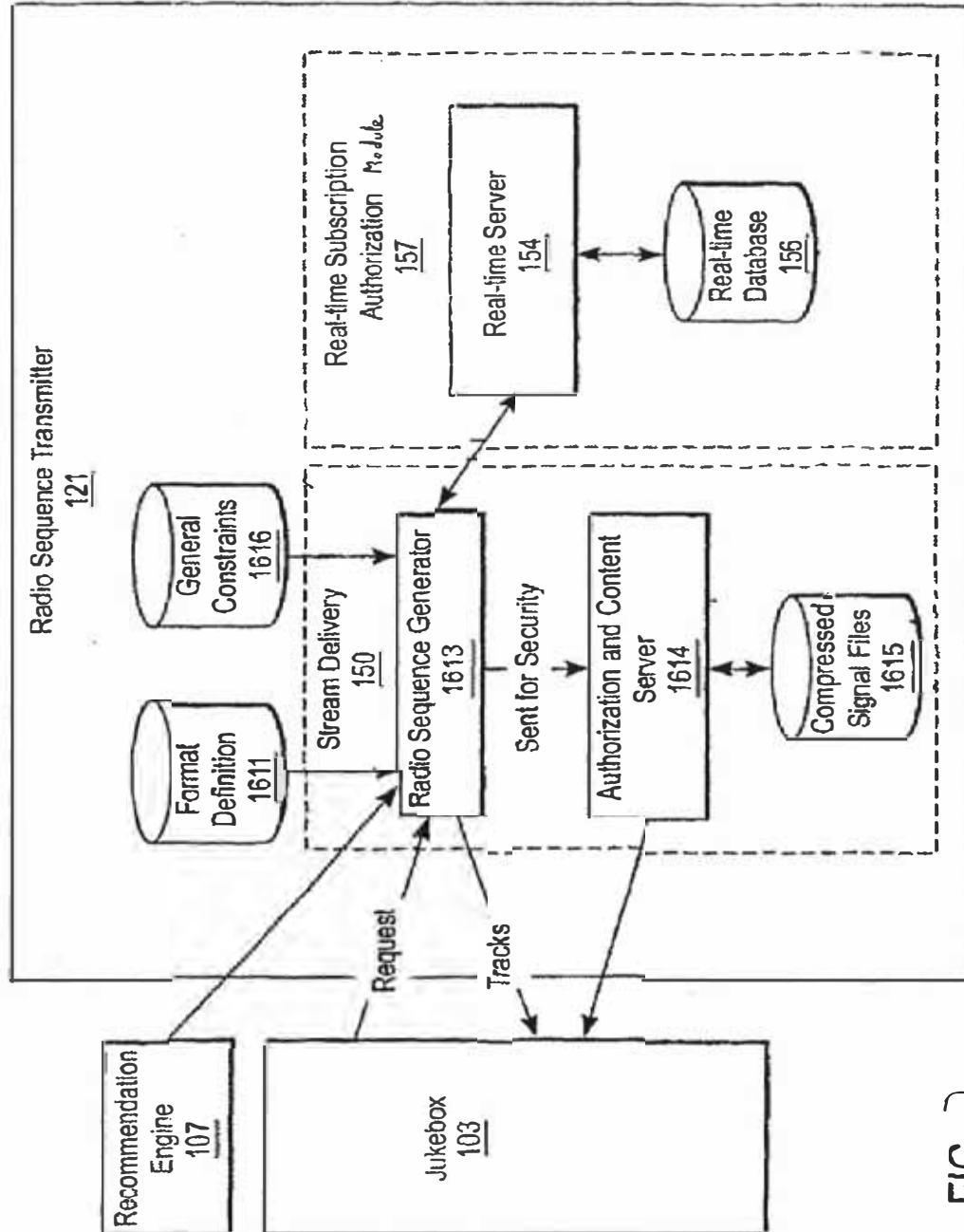


FIG. 2

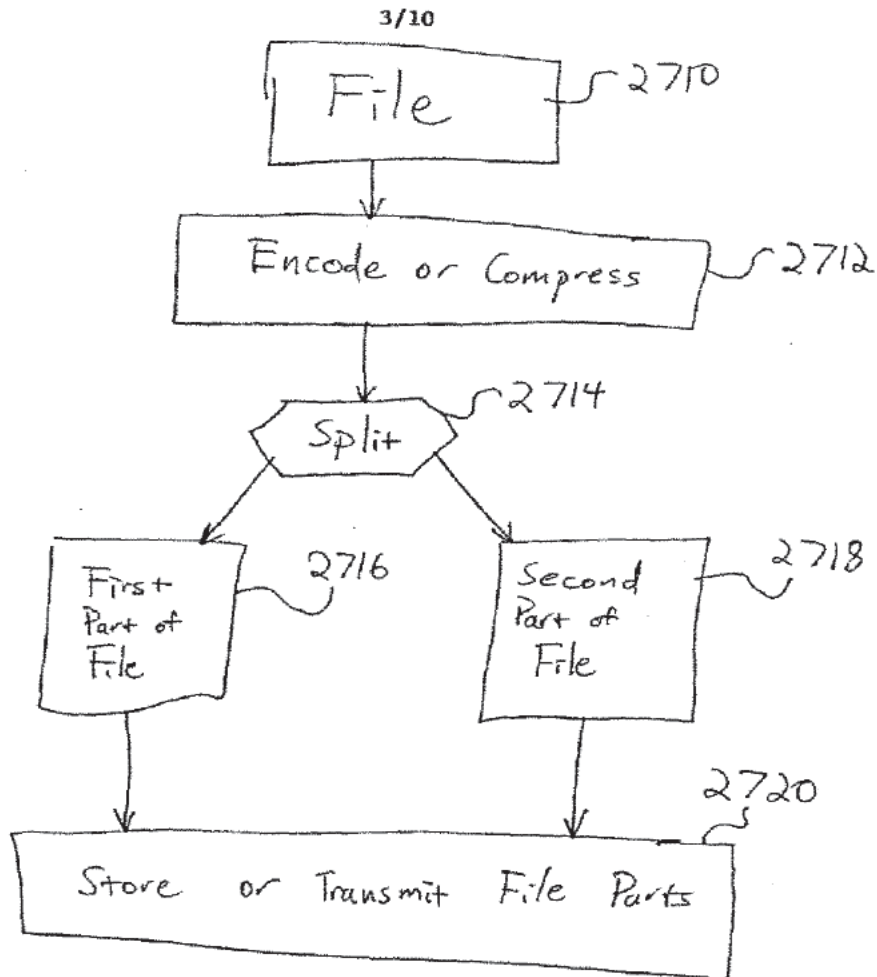


Fig. 3A

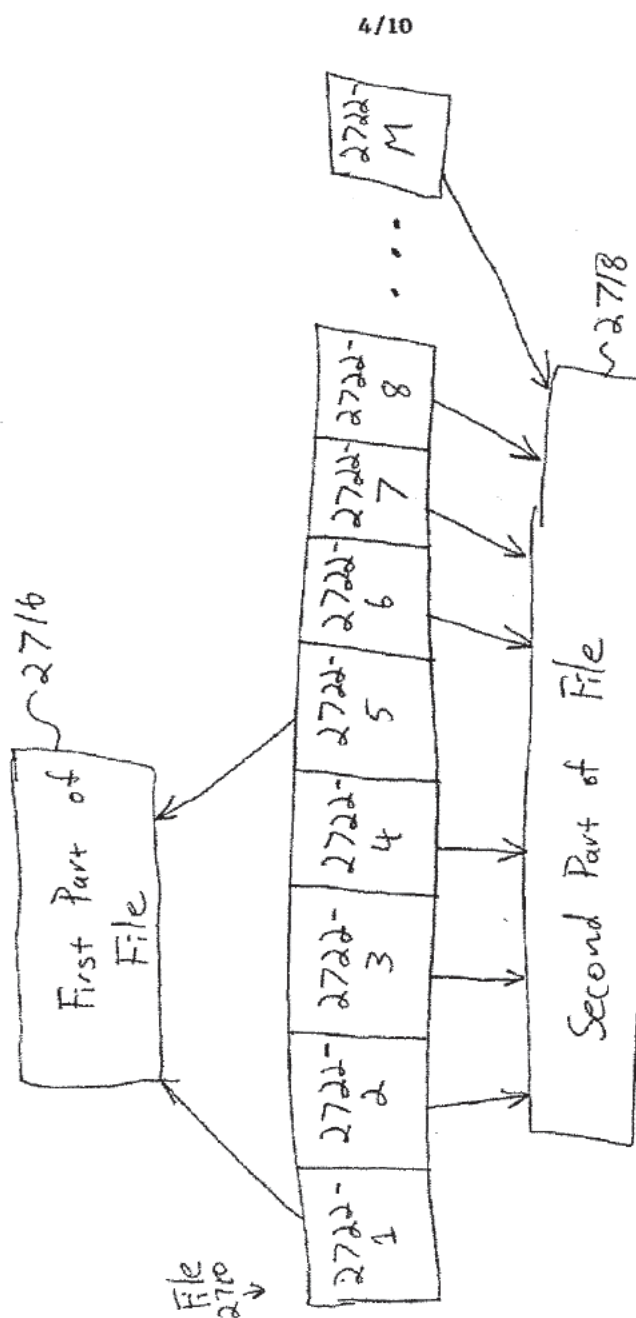


Fig. 3B

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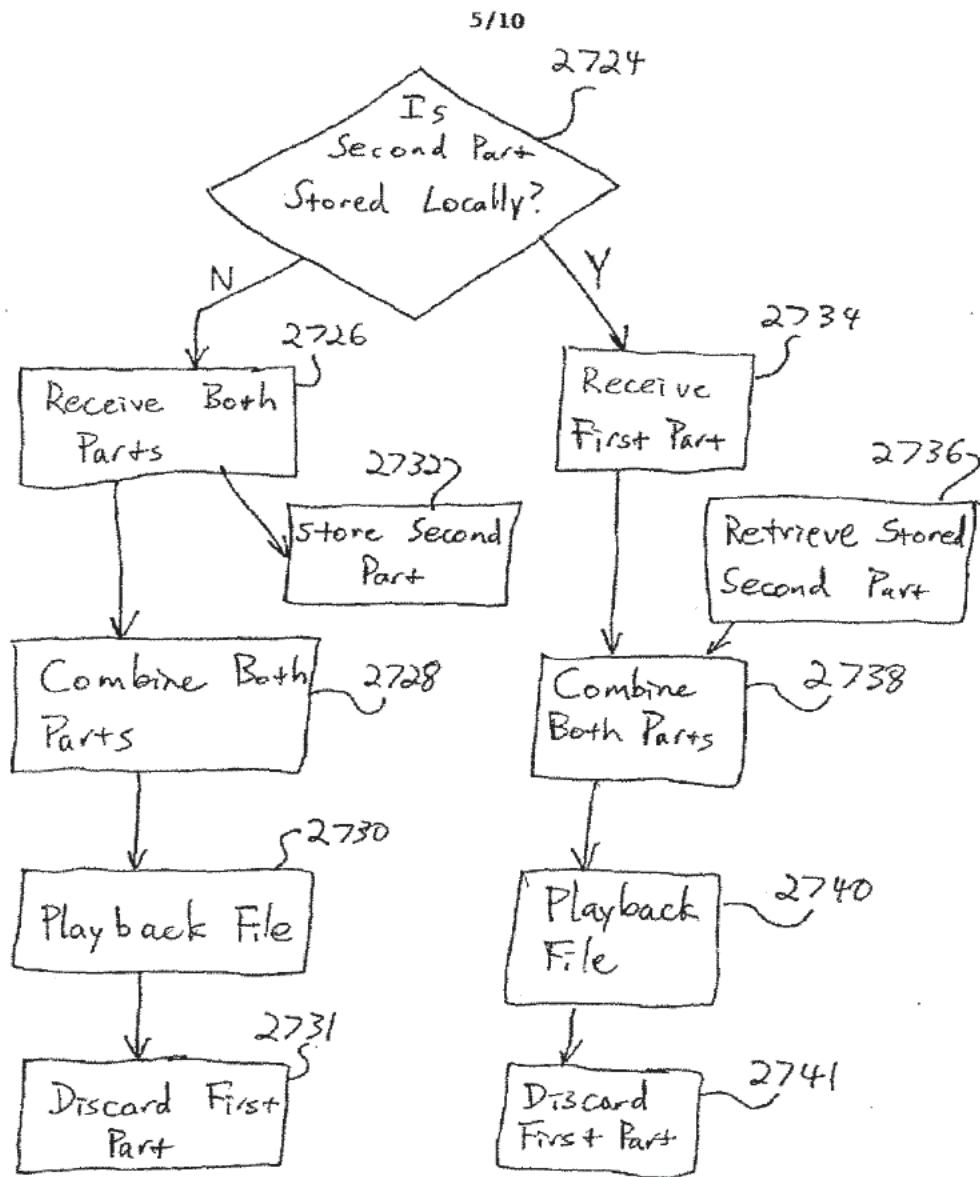


Fig. 3c

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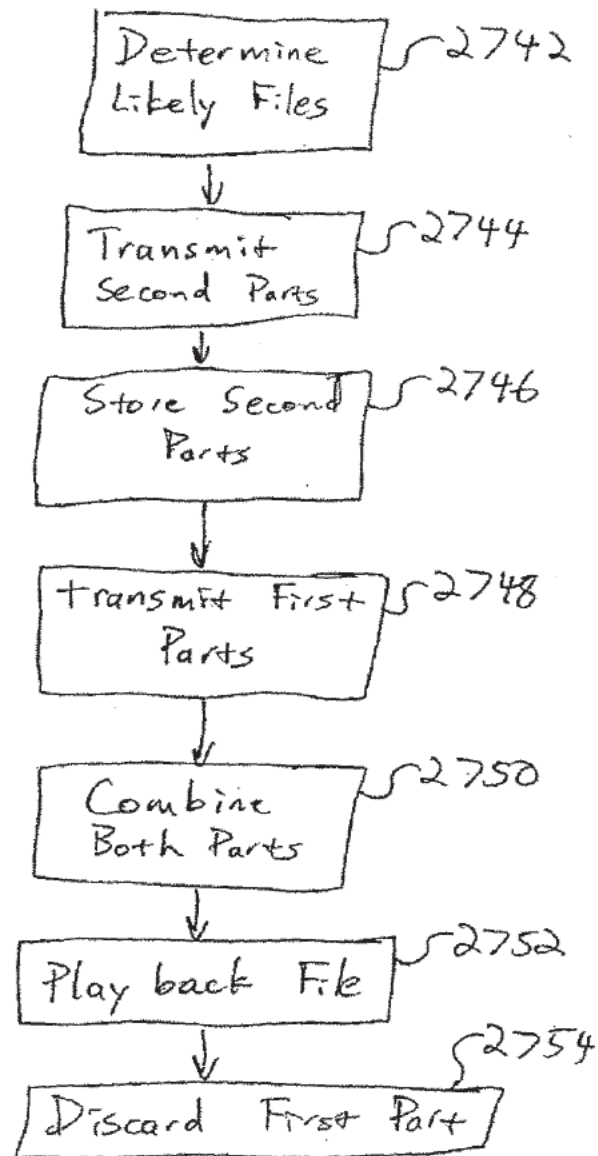


Fig. 3D

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Fig. 4A

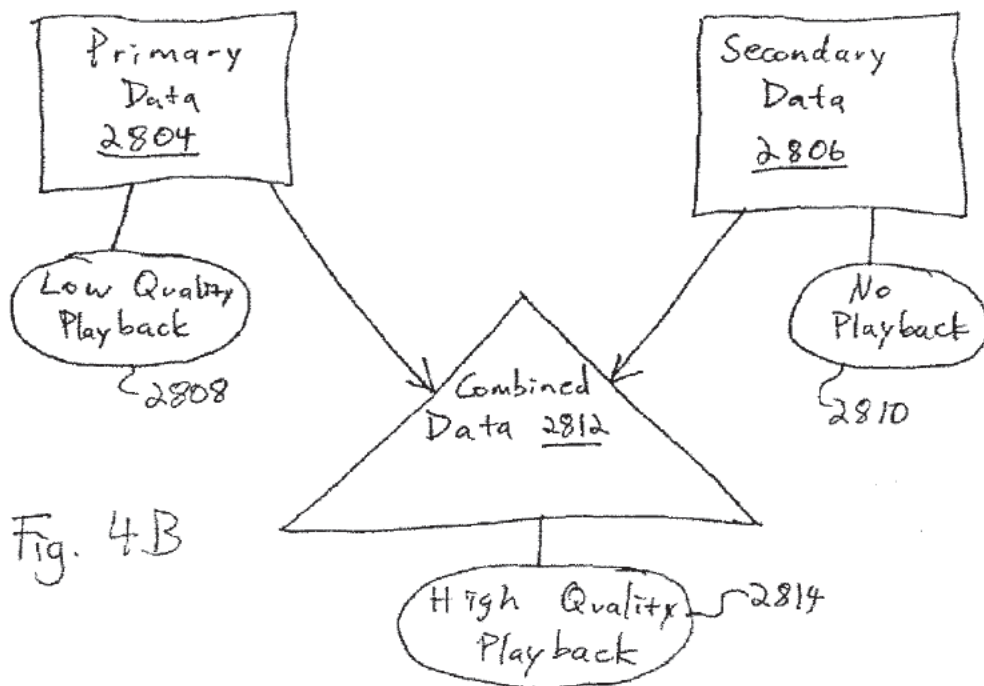
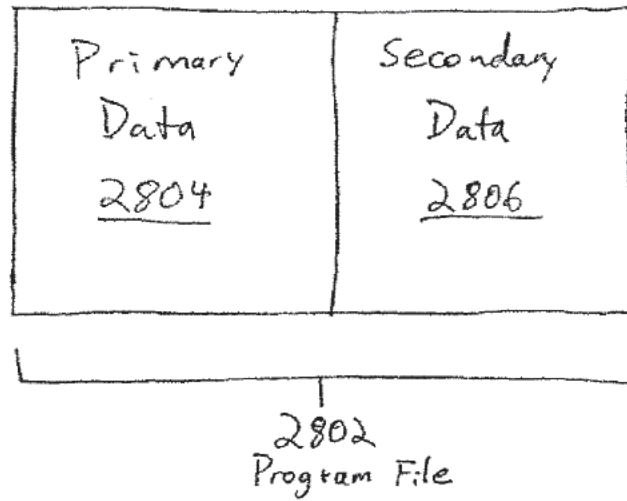
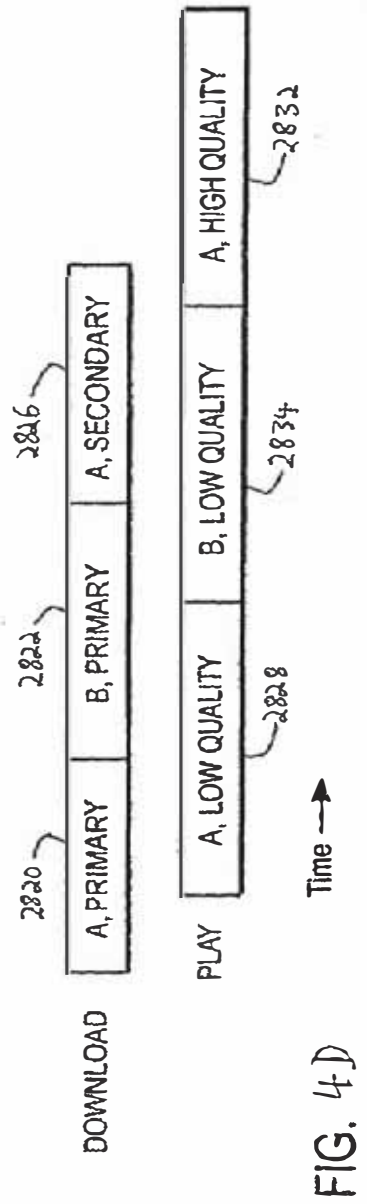
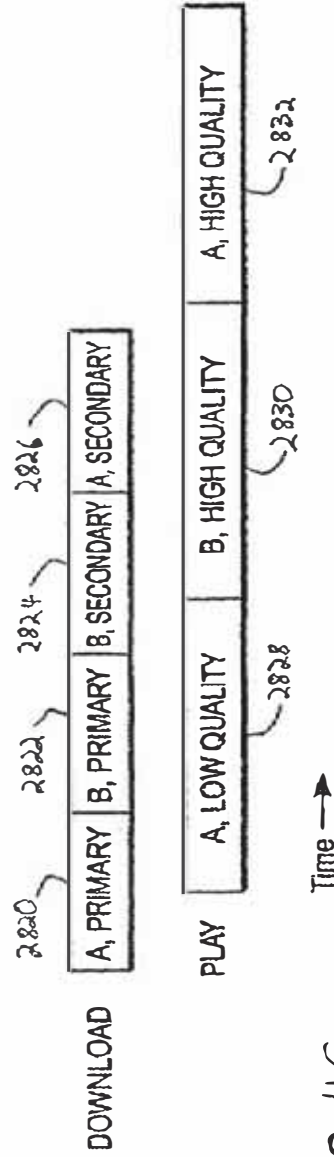


Fig. 4B



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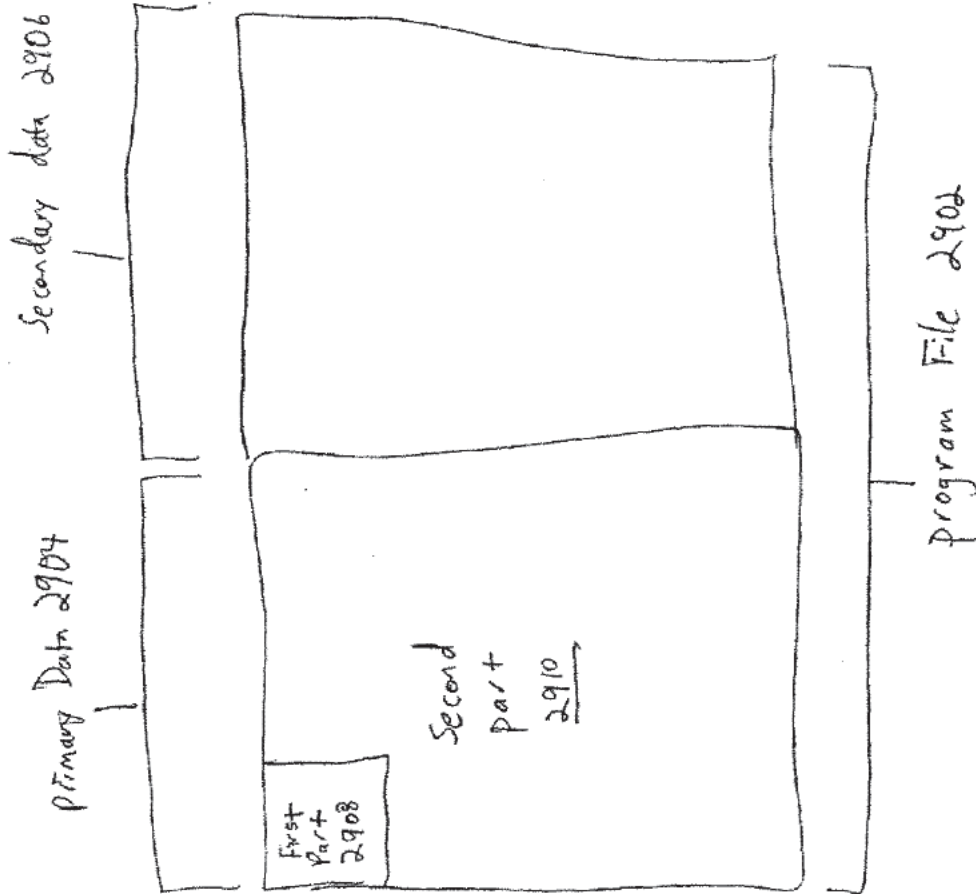


Fig. 5A

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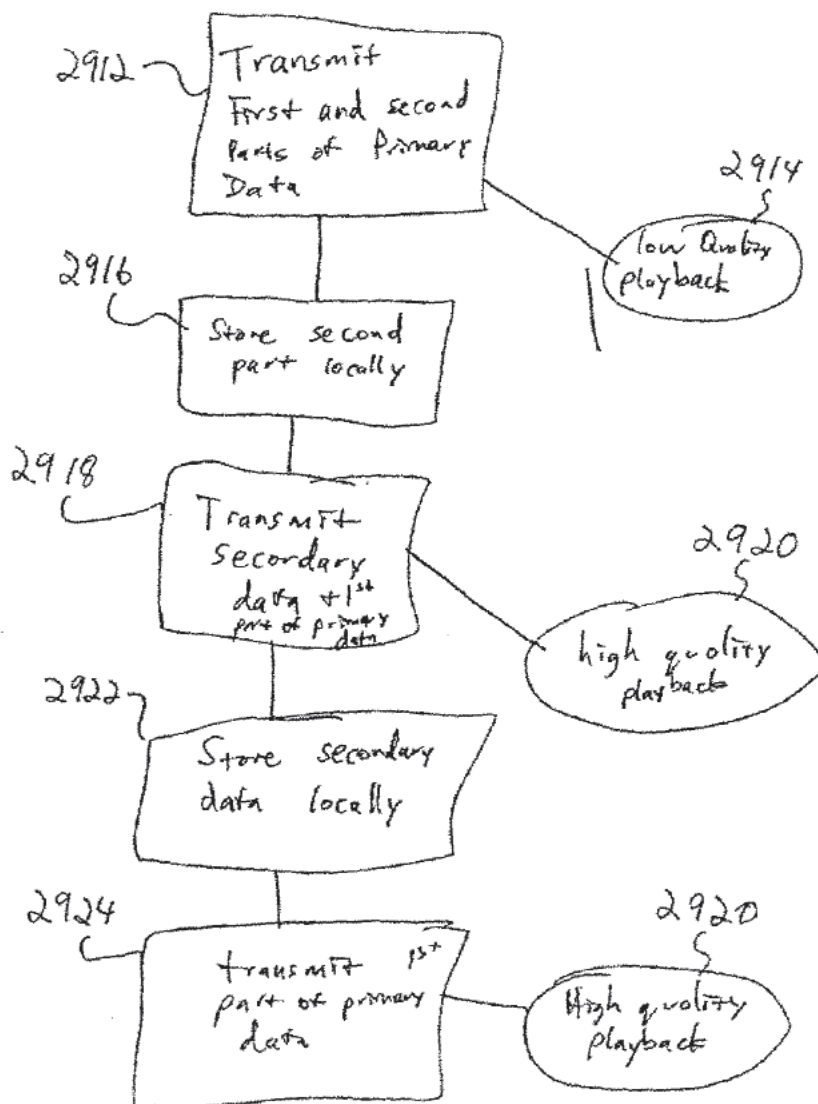


Fig. 5B

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

R. Drew Major

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METHOD FOR ADAPTIVE-RATE
SHIFTING OF STREAMING
CONTENT

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Sir:

Enclosed is a copy of Information Disclosure Citation Form PTO-1449 or PTO/SB/08 together with copies of the documents cited on that form. It is respectfully requested that the cited documents be considered and that the enclosed copy of Information Disclosure Citation Form PTO-1449 or PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

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/Kevin O. Grange/
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November 7, 2008
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Respectfully submitted,

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Dated: November 7, 2008

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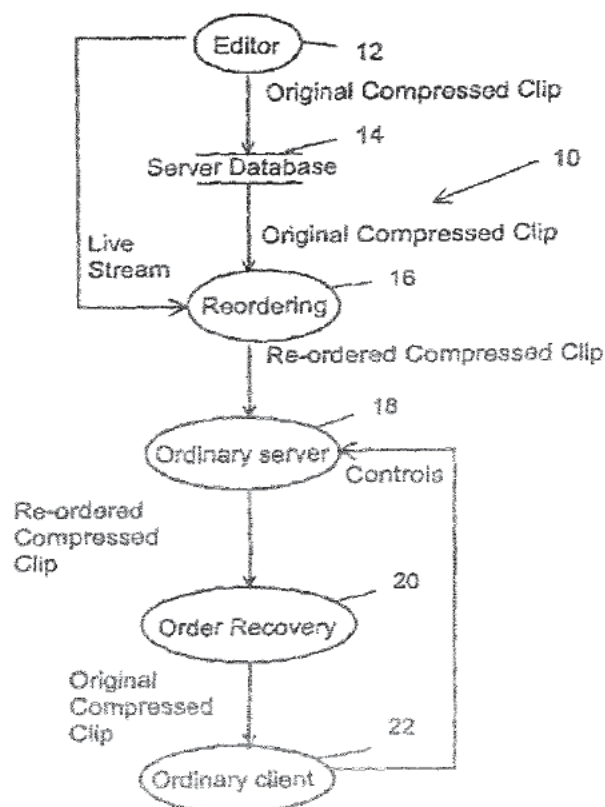


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(54) Title: DATA TRANSMISSION**(57) Abstract**

A data transmission system (10) is provided for transmitting a data signal between a server (12, 14, 16, 18) and a communications terminal (20, 22) over a transmission link having a variable bandwidth. The data signal is a scalable compressed multimedia clip comprising a sequence of images. Each image has a base layer and a number of enhancement layers. To cope with variability in the bandwidth, the sequence is re-ordered so that the base layers have greater safety times than the enhancement layers. This allows all of the base layers to arrive in time to be played at the expense of the enhancement layers.



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DATA TRANSMISSION

This invention relates to data transmission and is particularly, but not exclusively, related to transmission of data representative of picture sequences, such as video.

- 5 It is particularly suited to transmission over links susceptible to errors and loss of data.

During the past few years, the amount of multimedia content available through the Internet has increased considerably. Since data delivery rates to mobile terminals
10 are becoming high enough to enable such terminals to be able to retrieve multimedia content, it is becoming desirable to enable mobile terminals to retrieve video and other multimedia content from the Internet. An example of a high-speed data delivery system is the upcoming GSM phase 2+.

- 15 The term multimedia as used herein applies to both sound and pictures, to sound only and to pictures only. Sound may include speech and music.

Network traffic through the Internet is based on a transport protocol called the Internet Protocol (IP). IP is concerned with transporting data packets from one
20 location to another. It facilitates the routing of packets through intermediate gateways, that is, it allows data to be sent to machines that are not directly connected in the same physical network. The unit of data transported by the IP layer is called an IP datagram. The delivery service offered by IP is connectionless, that is IP datagrams are routed around the Internet independently
25 of each other. Since no resources are permanently committed within the gateways to any particular connection, the gateways may occasionally have to discard datagrams because of lack of buffer space or other resources. Thus, the delivery service offered by IP is a best effort service rather than a guaranteed service.

- 30 Internet multimedia is typically streamed over the User Datagram Protocol (UDP), the Transmission Control Protocol (TCP) or the Hypertext Transfer Protocol (HTTP).

UDP is a connectionless lightweight transport protocol. It offers very little above the service offered by IP. Its most important function is to deliver datagrams between specific transport endpoints. Consequently, the transmitting application
5 has to take care of how to packetize data to datagrams. Headers used in UDP contain a checksum that allows the UDP layer at the receiving end to check the validity of the data. Otherwise, degradation of IP datagrams will in turn affect UDP datagrams. UDP does not check that the datagrams have been received, does not retransmit missing datagrams, nor does it guarantee that the datagrams are
10 received in the same order as they were transmitted.

UDP introduces a relatively stable throughput having a small delay since there are no retransmissions. Therefore it is used in retrieval applications to deal with the effect of network congestion and to reduce delay (and jitter) at the receiving end.
15 However, the client must be able to recover from packet losses and possibly conceal lost content. Even with reconstruction and concealment, the quality of a reconstructed clip suffers somewhat. On the other hand, playback of the clip is likely to happen in real-time without annoying pauses. Firewalls, whether in a company or elsewhere, may forbid the usage of UDP because it is connectionless.

20 TCP is a connection-orientated transport protocol and the application using it can transmit or receive a series of bytes with no apparent boundaries as in UDP. The TCP layer divides the byte stream into packets, sends the packets over an IP network and ensures that the packets are error-free and received in their correct
25 order. The basic idea of how TCP works is as follows. Each time TCP sends a packet of data, it starts a timer. When the receiving end gets the packet, it immediately sends an acknowledgement back to the sender. When the sender receives the acknowledgement, it knows all is well, and cancels the timer. However, if the IP layer loses the outgoing segment or the return
30 acknowledgement, the timer at the sending end will expire. At this point, the sender will retransmit the segment. Now, if the sender waited for an acknowledgement for each packet before sending the next one, the overall

transmission time would be relatively long and dependent on the round-trip delay between the sender and the receiver. To overcome this problem, TCP uses a sliding window protocol that allows several unacknowledged packets to be present in the network. In this protocol, an acknowledgement packet contains a field filled with the number of bytes the client is willing to accept (beyond the ones that are currently acknowledged). This window size field indicates the amount of buffer space available at the client for storage of incoming data. The sender may transmit data within the limit indicated by the latest received window size field. The sliding window protocol means that TCP effectively has a slow start mechanism. At the beginning of a connection, the very first packet has to be acknowledged before the sender can send the next one. Typically, the client then increases the window size exponentially. However, if there is congestion in the network, the window size is decreased (in order to avoid congestion and to avoid receive buffer overflow). The details how the window size is changed depend on the particular TCP implementation in use.

A multimedia content creation and retrieval system is shown in Figure 1. The system has one or more media sources, for example a camera and a microphone. Alternatively, multimedia content can also be synthetically created without a natural media source, for example animated computer graphics and digitally generated music. In order to compose a multimedia clip consisting of different media types, such as video, audio, text, images, graphics and animation, raw data captured from the sources are edited by an editor. Typically the storage space taken up by raw (uncompressed) multimedia data is huge. It can be megabytes for a video sequence which can include a mixture of different media, for example animation. In order to provide an attractive multimedia retrieval service over low bit rate channels, for example 28.8 kbps and 56 kbps, multimedia clips are compressed in the editing phase. This typically occurs off-line. The clips are then handed to a multimedia server. Typically, a number of clients can access the server over one or more networks. The server is able to respond to the requests presented by the clients. The main task of the server is to transmit a desired multimedia clip to the client which the client decompresses and plays. During

playback, the client utilizes one or more output devices, such as a screen and a loudspeaker. In some circumstances, clients are able to start playback while data are still being downloaded.

- 5 It is convenient to deliver a clip by using a single channel which provides a similar quality of service for the entire clip. Alternatively different channels can be used to deliver different parts of a clip, for example sound on one channel and pictures on another. Different channels may provide different qualities of service. In this context, quality of service includes bit rate, loss or bit error rate and transmission
10 delay variation.

In order to ensure multimedia content of a sufficient quality is delivered, it is provided over a reliable network connection, such as TCP, which ensures that received data are error-free and in the correct order. Lost or corrupted protocol
15 data units are retransmitted. Consequently, the channel throughput can vary significantly. This can even cause pauses in the playback of a multimedia stream whilst lost or corrupted data are retransmitted. Pauses in multimedia playback are annoying.

- 20 Sometimes retransmission of lost data is not handled by the transport protocol but rather by some higher-level protocol. Such a protocol can select the most vital lost parts of a multimedia stream and request the retransmission of those. The most vital parts can be used for prediction of other parts of the stream, for example.

- 25 In order to understand the invention better, descriptions of the elements of the retrieval system, namely the editor, the server and the client, are set out below.

A typical sequence of operations carried out by the multimedia clip editor is shown in Figure 2. Raw data are captured from one or more data sources. Capturing is
30 done using hardware, device drivers dedicated to the hardware and a capturing application which controls the device drivers to use the hardware. Capturing hardware may consist of a video camera connected to a PC video grabber card,

for example. The output of the capturing phase is usually either uncompressed data or slightly compressed data with irrelevant quality degradations when compared to uncompressed data. For example, the output of a video grabber card could be in an uncompressed YUV 4:2:0 format or in a motion-JPEG format.

- 5 The YUV colour model and the possible sub-sampling schemes are defined in Recommendation ITU-R BT.601-5 "Studio Encoding Parameters of Digital Television for Standard 4:3 and Wide-Screen 16:9 Aspect Ratios". Relevant digital picture formats such as CIF, QCIF and SQCIF are defined in Recommendation ITU-T H.261 "Video Codec for Audiovisual Services at p x 64 kbits" (section 3.1
- 10 "Source Formats").

During editing separate media tracks are tied together in a single timeline. It is also possible to edit the media tracks in various ways, for example to reduce the video frame rate. Each media track may be compressed. For example, the

15 uncompressed YUV 4:2:0 video track could be compressed using ITU-T recommendation H.263 for low bit rate video coding. If the compressed media tracks are multiplexed, they are interleaved so that they form a single bitstream. This clip is then handed to the multimedia server. Multiplexing is not essential to provide a bitstream. For example, different media components such as sounds

20 and images may be identified with packet header information in the transport layer. Different UDP port numbers can be used for different media components.

A typical sequence of operations carried out by the multimedia server is shown in Figure 3. Typically multimedia servers have two modes of operation; they deliver

25 either pre-stored multimedia clips or a live (real-time) multimedia stream. In the first mode, clips are stored in a server database, which is then accessed on-demand by the server. In the second mode, multimedia clips are handed to the server as a continuous media stream that is immediately transmitted to clients. Clients control the operation of the server by an appropriate control protocol being

30 at least able to select a desired media clip. In addition, servers may support more advanced controls. For example, clients may be able to stop the transmission of a clip, to pause and resume transmission of a clip, and to control the media flow in

case of a varying throughput of the transmission channel in which case the server must dynamically adjust the bitstream to fit into the available bandwidth.

A typical sequence of operations carried out by the multimedia retrieval client is shown in Figure 4. The client gets a compressed and multiplexed media clip from a multimedia server. The client demultiplexes the clip in order to obtain separate media tracks. These media tracks are then decompressed to provide reconstructed media tracks which are played out with output devices. In addition to these operations, a controller unit is provided to interface with end-users, that is to control playback according to end-user input and to handle client-server control traffic. It should be noted that the demultiplexing-decompression-playback chain can be done on a first part of the clip while still downloading a subsequent part of the clip. This is commonly referred to as streaming. An alternative to streaming is to download the whole clip to the client and then demultiplex it, decompress it and play it.

A typical approach to the problem of varying throughput of a channel is to buffer media data in the client before starting the playback and/or to adjust the transmitted bit rate in real-time according to channel throughput statistics.

One way of tackling the problem of pauses is by using dynamic bit rate adjustment in the multimedia server. However, the server may not react to network congestion sufficiently quickly to avoid pausing in the client. In addition, the server cannot control the retransmission mechanism of TCP (or other underlying protocols, such as IP).

Even if dynamic bit rate adjustment is used, the client has to do some initial buffering in any case to avoid delivery delays caused by re-transmission. If a constant channel bit rate is assumed, one can calculate the point in time at which a data unit is supposed to have been completely received. In addition, one can calculate the point in time by which a data unit is supposed to have been played. The time difference between these two points in time is referred to as the safety

time. Another way of defining the safety time is to state that it is the maximum time between two consecutively received data units which does not cause pausing in the playback.

- 5 When calculating the safety times for a clip, each data unit has to be considered separately. The calculations assume that no throughput drops occur before the data unit that is currently being processed. If the maximum throughput of the channel is equal to the average bit rate of the multimedia clip, the client cannot recover from a drop in the amount of received bits after throughput has dropped.
- 10 The only way to guarantee some protection against throughput drops is to buffer some data before starting playback. If the channel stops providing data, the client can still play the stream while there are data in a buffer. Thus, the average safety time is approximately equal to the initial buffering time. Since the bit rate of the clip may vary, the safety time also may vary and the minimum safety time is thus equal
- 15 to or less than the initial buffering delay.

HTTP, the Hypertext Transfer Protocol, is the basis of the World Wide Web (WWW). It is a simple protocol. A client establishes a TCP connection to a server, issues a request, and reads back the server's response. The server denotes the

20 end of its response by closing the connection. The arrangement of protocol layers is typically HTTP on TCP which is on IP.

The most common HTTP request is called GET. The GET request is associated with a universal resource identifier (URI) which uniquely specifies the requested

25 item. The server responds to the GET request by returning the file corresponding to the specified URI. The file returned by the server normally contains pointers (hypertext links) to other files that can reside on other servers. A user can therefore easily follow the links from file to file.

30 Servers used for Internet multimedia retrieval are either dedicated multimedia servers or normal WWW servers.

Dedicated multimedia servers are typically capable of transmission over HTTP, TCP and UDP protocols. They may be able to readjust the contents of media clips dynamically to meet the available network bandwidth and to avoid network congestion. They may also support fast forward and fast rewind operations as well
5 as live multimedia streaming. They can provide a number of streams simultaneously.

Multimedia servers based on normal WWW servers are also referred to as server-less or HTTP multimedia solutions. The multimedia clips are streamed over HTTP.
10 Since this type of server has no control over the contents of the stream, no flow (bandwidth) control can be applied, and it cannot respond to network congestion. Therefore, sudden pauses in the playback can occur. Consequently there must be a relatively long initial buffering delay in the client before starting the playback to avoid such sudden pauses. Fast-forwarding a multimedia stream from a standard
15 WWW server is not possible. Live multimedia streaming must be implemented using special tricks, such as Java programming.

When a streamed multimedia clip is received, a suitable independent media player application or a browser plug-in can be used to play it. Such multimedia players
20 differ largely from browser to browser. Newer browsers may have some integrated plug-ins for the most popular streaming video players.

There are a number of different data transmission methods available for transmitting data between mobile terminals and their networks. One of the best
25 known methods is GSM (Global System for Mobile communications).

The current GSM data service called Circuit Switched Data (CSD) offers a 9.6 kbps circuit-switched channel. It is intended for GSM to provide a 14.4 kbps data channel having forward error correction (FEC) and status information. High Speed
30 Circuit Switched Data (HSCSD) provides multiple 9.6 kbps or 14.4 kbps time slots for a single user at the same time. There are symmetric and asymmetric connections. In a symmetric connection, the air interface resources are allocated

symmetrically, and provide the same data transmission rate in both directions. In an asymmetric connection, different data rates are supported for up-link and for down-link. However, asymmetric air interface connections are applicable only in non-transparent mode (see below).

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- Circuit-switched GSM data systems, CSD and HSCSD, offer two basic connection types, namely transparent (T) and non-transparent (NT). These are distinguished by the way they correct transmission errors. In a transparent connection, error correction is done solely by a forward error correction mechanism provided by the radio interface transmission scheme. The connection is considered as a synchronous circuit. The available throughput is constant, and the transmission delay is fixed. The transmitted data are likely to contain bit inversion errors. In a non-transparent connection, the GSM circuit connection is regarded as a packet (or frame) data flow although the end-to-end service is circuit-switched. Each frame includes redundancy bits to enable a receiver to detect remaining errors. There are two sources of error, packet drops and corruption due to interference in the radio frequency path. The latter can be recovered by redundancy checking. The Radio Link Protocol (RLP) is used to provide retransmission in case of remaining errors in frame. If a frame is found to be correct, the receiver acknowledges this fact. If it is found not to be correct, a negative acknowledgement is sent and the indicated frame is retransmitted. Consequently, a non-transparent connection is error-free but throughput and transmission delay vary.
- 25 Other network types exist, for example GPRS (General Packet Radio System). In GPRS the transmissions are truly packet based.

- A video sequence consists of a series of still pictures. Video compression methods are based on reducing redundant and perceptually irrelevant parts of video sequences. The redundancy in video sequences can be categorised into spatial, temporal and spectral redundancy. Spatial redundancy means the correlation between neighbouring pixels. Temporal redundancy means that the same objects

appear in consecutive pictures. Reducing the temporal redundancy reduces the amount of data required to represent a particular image sequence and thus compresses the data. This can be achieved by generating motion compensation data, which describe the motion between the current and a previous (reference) picture. In effect, the current picture is predicted from the previous one. Spectral redundancy means the correlation between the different colour components of the same picture.

Simply reducing the redundancy of the sequence does not usually compress it enough. Therefore, some video encoders try to reduce the quality of those parts of a video sequence which are subjectively the least important. In addition, the redundancy of the encoded bitstream is reduced by means of efficient lossless coding of compression parameters and coefficients. The main technique is to use variable length codes.

Video compression methods typically differentiate between pictures that can use temporal redundancy reduction and those that cannot. Compressed pictures, which do not use temporal redundancy reduction methods, are usually called INTRA or I-frames whereas temporally predicted pictures are called INTER or P-frames. In the INTER frame case, the predicted (motion-compensated) picture is rarely precise enough, and therefore a spatially compressed prediction error picture is also associated with each INTER frame.

Temporal scalability provides a mechanism for enhancing perceptual quality by increasing the picture display rate. This is achieved by taking a pair of consecutive reference pictures and bi-directionally predicting a B-picture from either one or both of them. The B-picture can then be played in sequence between the two anchor pictures. This is illustrated in Figure 5. Bi-directional temporal prediction yields a more accurately predicted picture than uni-directional prediction. Thus, for the same quantization level, B-pictures yield increased compression as compared to forwardly predicted P-pictures. B-pictures are not used as reference pictures, that is other pictures are never predicted from them. Since they can be discarded

without impacting the picture quality of future pictures, they provide temporal scalability. It should be noted that while B-pictures provide better compression performance than P-pictures, they are more complex to construct and require more memory. Furthermore they introduce additional delays because bi-directional
5 interpolation requires both reference pictures to have been received and additional calculations are required. In addition, B-pictures require more side information in the bitstream.

The term scalability refers to the capability of a compressed sequence to be
10 decoded at different data rates. In other words, a scalable multimedia clip can be edited relatively easily while it is compressed so that it can be streamed over channels with different bandwidths and still be decoded and played back in real-time.

15 Scalable multimedia is typically ordered so that there are hierarchical layers of data. A base layer contains a basic representation of the multimedia clip whereas enhancement layers contain refinement data on top of underlying layers. Consequently, the enhancement layers improve the quality of the clip.

20 Scalability is a desirable property for heterogeneous and error prone environments. This property is desirable in order to counter limitations such as constraints on bit rate, display resolution, network throughput, and decoder complexity.

25 Scalability can be used to improve error resilience in a transport system where layered coding is combined with transport prioritisation. The term transport prioritisation here refers to various mechanisms to provide different qualities of service in transport, including unequal error protection, to provide different channels having different error/loss rates. Depending on their nature, data are
30 assigned differently, for example, the base layer may be delivered through a channel with high degree of error protection, and the enhancement layers may be transmitted through more error-prone channels.

Generally, scalable multimedia coding suffers from a worse compression efficiency than non-scalable coding. In other words, a multimedia clip coded as a scalable multimedia clip with all enhancement layers requires greater bandwidth than if it
5 had been coded as a non-scalable single-layer clip with equal quality. However, exceptions to this general rule exist, for example the temporally scalable B-frames in video compression.

In the following, scalability is discussed with reference to the ITU-T H.263 video
10 compression standard. H.263 is an ITU-T recommendation for video coding in low bit rate communication which generally means data rates below 64 kbps. The recommendation specifies the bitstream syntax and the decoding of the bitstream. Currently, there are two versions of H.263. Version 1 consists of the core algorithm and four optional coding modes. H.263 version 2 is an extension of version 1
15 providing twelve new negotiable coding modes.

Pictures are coded as luminance and two colour difference (chrominance) components (Y , C_b and C_r). The chrominance pictures are sampled with a half of the pixels along the both co-ordinate axes when compared to the luminance
20 picture.

The scalability mode (Annex O) of H.263 specifies syntax to support temporal, signal-to noise ratio (SNR), and spatial scalability capabilities.

25 Spatial scalability and SNR scalability are closely related, the only difference being the increased spatial resolution provided by spatial scalability. An example of SNR scalable pictures is shown in Figure 6. SNR scalability implies the creation of multi-rate bit streams. It allows for the recovery of coding errors, or differences between an original picture and its reconstruction. This is achieved by using a finer
30 quantizer to encode the difference picture in an enhancement layer. This additional information increases the SNR of the overall reproduced picture.

Spatial scalability allows for the creation of multi-resolution bit streams to meet varying display requirements and/or constraints. A spatially scalable structure is illustrated in Figure 7. It is essentially the same as in SNR scalability except that a spatial enhancement layer attempts to recover the coding loss between an up-sampled version of the reconstructed reference layer picture and a higher resolution version of the original picture. For example, if the reference layer has a quarter common intermediate format (QCIF) resolution, and the enhancement layer has a common intermediate format (CIF) resolution, the reference layer picture must be scaled accordingly such that the enhancement layer picture can be predicted from it. The QCIF standard allows the resolution to be increased by a factor of two in the vertical direction only, horizontal direction only, or both the vertical and horizontal directions for a single enhancement layer. There can be multiple enhancement layers, each increasing the picture resolution over that of the previous layer. The interpolation filters used to up-sample the reference layer picture are explicitly defined in the H.263 standard. Aside from the up-sampling process from the reference to the enhancement layer, the processing and syntax of a spatially scaled picture are identical to those of an SNR scaled picture.

In either SNR or spatial scalability, the enhancement layer pictures are referred to as EI- or EP-pictures. If the enhancement layer picture is upwardly predicted from a picture in the reference layer, then the enhancement layer picture is referred to as an Enhancement-I (EI) picture. In this type of scalability, the reference layer means the layer "below" the current enhancement layer. In some cases, when reference layer pictures are poorly predicted, over-coding of static parts of the picture can occur in the enhancement layer, causing an unnecessarily excessive bit rate. To avoid this problem, forward prediction is permitted in the enhancement layer. A picture that can be predicted in the forward direction from a previous enhancement layer picture or, alternatively, upwardly predicted from the reference layer picture is referred to as an Enhancement-P (EP) picture. Note that computing the average of the upwardly and forwardly predicted pictures can provide bi-directional prediction for EP-pictures. For both EI- and EP-pictures, upward prediction from the reference layer picture implies that no motion vectors are

required. In the case of forward prediction for EP-pictures, motion vectors are required.

5 In multi-point and broadcast multimedia applications, constraints on network throughput may not be foreseen at the time of encoding. Thus, a scalable bitstream should be used. Figure 8 shows an IP multicasting arrangement where each router can strip the bitstream according to its capabilities. It shows a server S providing a bitstream to a number of clients C. The bitstreams are routed to the clients by routers R. In this example, the server is providing a clip which can be
10 scaled to at least three bit rates, 120 kbit/s, 60 kbit/s and 28 kbit/s.

If the client and server are connected via a normal uni-cast connection, the server may try to adjust the bit rate of the transmitted multimedia clip according to the temporary channel throughput. One solution is to use a layered bit stream and to
15 adapt to bandwidth changes by varying the number of transmitted enhancement layers.

According to a first aspect of the invention there is provided a method of transmitting a data signal having a sequence of data units in a predetermined
20 order over a transmission link between a data source and a data sink comprising the step of sending the data units in an order determined by their relative importance rather than their predetermined order.

According to a second aspect of the invention there is provided a data
25 transmission system for transmitting a data signal having a sequence of data units in a predetermined order over a transmission link between a data source and a data sink the data units being sent in an order determined by their relative importance rather than their predetermined order.

30 According to a third aspect of the invention there is provided a server for transmitting a data signal having a sequence of data units in a predetermined

order over a transmission link the data units being sent in an order determined by their relative importance rather than their predetermined order.

Preferably the server comprises re-ordering means. Preferably the server
5 comprises an editor for providing a scalable data signal.

According to a fourth aspect of the invention there is provided a computer program product stored on a computer usable medium comprising computer readable
10 program means for causing transmission of a data signal having a sequence of data units in a predetermined order over a transmission link the data units being sent in an order determined by their relative importance rather than their predetermined order.

Preferably the computer program product comprises a server. In this sense it is
15 meant that the when the computer program is loaded into hardware it causes the hardware to operate as a server device. Preferably the computer program product comprises an editor for providing a scalable data signal. Preferably the computer program product comprises re-ordering means for re-ordering the data units.

20 According to a fifth aspect of the invention there is provided a data signal having a sequence of data units for transmission over a transmission link between a data source and a data sink the data units being in an order determined by their relative importance rather than their predetermined order.

25 Preferably where the data units or layers of the data units are ordered into a sequence other than their original sequence, the invention also includes means or a step for returning the data units or layers of the data units into their original sequence.

30 The transmission link may simply be a bottleneck where congestion is occurring and the invention is used to overcome the bottleneck.

An advantage of the invention is that it can provide larger safety times than prior art arrangements with the same initial buffering. In addition, it provides some degree of protection against decreased transmission throughput. Therefore it helps in reducing the occurrence of pauses without sacrificing compression efficiency.

The invention also helps in transmitting over a unreliable network connection using transmission protocols which do not automatically retransmit but only retransmit those missing parts chosen by a higher level function, for example in response to feedback. In this case, it provides more time for retransmission of the vital parts of a data signal than prior art arrangements. Thus, vital parts of a stream are more likely to be transmitted successfully and the ultimate end user of the data signal is likely to perceive a better output quality.

Preferably the bandwidth of the transmission link available to the data signal is variable. This may be because the amount of data traffic using the link is variable, for example due to the need to re-transmit lost or corrupted data.

The invention provides a way of altering a data signal so that it can be transmitted over a transmission link having a bandwidth which would otherwise not be sufficient for it or for allowing certain of the bandwidth of its transmission link to be made available for other data, for example control information.

Preferably the effect of the invention is to increase the safety times of some data units relative to, or even at the expense of, the safety times of other data units.

Preferably the data signal is arranged in a hierarchy having a base layer and at least one enhancement layer. The term base layer means a most fundamental layer. The base layer may represent the least refined version of the data signal. In each unit, the (or each) enhancement layer, when combined with the base layer, refines the base layer to make it more like the data unit. Each enhancement layer

may add more refinement to the base layer. Preferably the safety time of the base layer is increased relative to the safety times of the enhancement layers.

5 Preferably the data signal is scalable. The base layer and the or each enhancement layer may have a scaled relationship with respect to each other. The signal may be scalable in the temporal, the spatial, the spectral or the SNR domains.

10 Preferably by virtue of re-ordering the sequence the layers have safety times which depend on their position in the hierarchy. For example the base layer of a particular data unit may have a greater safety time than enhancement layers. Advantageously, the finer the level of refinement represented by a layer, the shorter its safety time.

15 Preferably the source is a server. Alternatively it is an editor.

Preferably the sink is a client. It may be a destination of the data signal such as a mobile terminal, for example a mobile telephone.

20 Preferably the data units are frames. In one embodiment the data units represent a sequence of pictures. Conveniently it is a video sequence. Most preferably, it comprises multimedia data.

25 It should be understood that the terms "layer" and "layers" are being used figuratively and refer to blocks of data which can be applied to each other rather than to a strictly positional relationship.

The invention will now be described by way of example only with reference to the accompanying drawings in which:

30 Figure 1 shows a multimedia content creation and retrieval system;
Figure 2 shows operations of a multimedia clip editor;
Figure 3 shows operations of a multimedia server;

Figure 4 shows operations of a multimedia retrieval client;

Figure 5 shows an illustration of B picture prediction;

Figure 6 shows an illustration of SNR scalability;

Figure 7 shows an illustration of spatial scalability;

5 Figure 8 shows scalable multimedia being used in an IP multicast system;

Figure 9 shows mobile multimedia retrieval system according to the invention;

Figure 10 shows operations of an editor according to the invention;

Figure 11 shows operations of a client according to the invention;

Figure 12 shows safety times of a re-ordered sequence and an original sequence;

10 Figure 13 shows receiving and playback of a re-ordered sequence;

Figure 14 also shows receiving and playback of a re-ordered sequence; and

Figure 15 shows another multimedia content creation and retrieval system.

Figures 1 to 8 have been discussed above.

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A mobile multimedia retrieval system 10 according to the invention is shown in Figure 9. Although only a single client 22 is shown it will be appreciated that there can be, and in preferred embodiments will be, a number of such clients. It will also be appreciated that at least part of the transmission link connecting a server 18 and the client 22 will be wireless.

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The system 10 comprises an editor 12 which produces a compressed clip, a server database 14 for storing the compressed clip, re-ordering means 16 for re-ordering the sequence of the compressed clip, a server 18 for sending the re-ordered compressed clip and a client comprising order recovery means 20 to recover the original sequence of the compressed clip. The client 22 controls the operation of the server, for example by specifying which data are sent and how they are sent. Clearly, the re-ordering means 16 and the order recovery means 20 need to be compatible so that the latter can recover the original order. The re-ordering means 16 could be located to operate on data before they reach the server database 14 rather than the embodiment shown in Figure 9. Certain types of data, such as a live stream, may by-pass the database 14 and be sent by the

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editor 12 directly to the re-ordering means 16. Although they are shown separately in Figure 9, the editor 12, the server database 14, the re-ordering means 16 and the server 18 can all be configured into a single unit or entity which can also be referred to as a server.

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Figure 10 shows operation of an editor according to the invention. Raw data captured in the form of one or more uncompressed streams are edited to produce one or more uncompressed tracks. These tracks are compressed in a compression step to produce compressed tracks. The compressed tracks are multiplexed together to produce a compressed multimedia clip. The multimedia clips are coded scalably. The resulting bitstream consists of basic units, such as frames in video compression. These basic units are not all of equal importance; some are primary basic units which are vital to decode the bitstream and some are secondary basic units which improve the quality of the bitstream. Elimination of the secondary basic units causes only a quality loss in the decoded multimedia clip. In effect, the primary basic units are a base layer of the bitstream and the secondary units are enhancement layers.

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Instead of organising the basic units into the original transmission order, that is the sequence in which they are produced by editing and compression of raw data, the invented method re-orders their sequence by prioritising the primary basic units so that they pre-empt the secondary basic units in the transmission order. Reordering can take place before or after the multiplexing process depending on the nature of the system and the data. In Figure 10 it is shown as taking place after multiplexing.

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A re-ordering algorithm is used to re-order the sequence. In a preferred embodiment, the algorithm conducts stream analysis to identify primary and secondary basic units and to collect bit rate statistics. These may include the number of bits per frame. The bitstream is then re-ordered with iterative re-ordering steps to minimise the initial buffering time needed for full-quality playback with full channel throughput and reduced-quality playback with a reduced channel throughput. An example of such a re-ordering algorithm is given below. It should

be noted that the expected reduced channel throughput has to be estimated in advance since it is one of the input parameters of the algorithm. The estimation can be based on the statistics obtained from the channel behaviour, for example.

- 5 Re-ordering of the basic units means that the primary basic units are likely to be received earlier than indicated in their playback time even though some decrease in the channel throughput occurs. However, secondary basic units are vulnerable to transmission delay variations since the method schedules them to be received just before their indicated playback time. In this way the client is still likely to be
- 10 able to play the primary basic units without pausing the playback, even if the channel throughput decreases considerably. The secondary basic units, on the other hand, may arrive later than their scheduled playback time and will not be used in playback.
- 15 Figure 11 shows operation of a client according to the invention. The bitstream is received by the client, re-ordered to produce the original compressed clip, demultiplexed to produce the compressed tracks and then decompressed to reconstruct the tracks. The basic unit order recovery step in the client can be applied either before or after demultiplexing (depending in when it occurs in the
- 20 content editor). In Figure 11 it is shown as occurring before demultiplexing, to correspond to the order described in Figure 10. In this way re-ordering and order recovery are both applied to the multiplexed bitstream. Order recovery organises the basic units back into their natural sequence for decompression and discards all late-arriving secondary basic units.
- 25
- On receipt of a basic unit by the client, it is time-stamped with a time by which it should be played. This time-stamp is compared with the current playback time. If the time-stamp is greater than the current playback time the basic unit is not decompressed and it is discarded. If the time-stamp is less than the current
- 30 playback time the basic unit is decompressed and the two times are compared after decompression. If the time stamp is less than the current playback time the basic unit is played. Otherwise, it is discarded.

In the particular case in which re-ordering is performed after multiplexing, the multiplexing/demultiplexing format used needs to allow re-ordering of the basic units and recovery of the original order.

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Figure 15 shows another view of a multimedia content creation and retrieval system according to the invention. The system 50 comprises an editor 52, a server 54 and a client 56.

10 The editor comprises a compressor 58 for compressing a raw data stream typically being in the form of a sequence of images into a form suitable for transmission, a multiplexer 60 for multiplexing the compressed raw data stream with other compressed data streams together to produce a compressed bitstream and a layer generation means 62 for producing primary basic frames which are vital to
15 decode the bitstream and secondary basic frames which improve the quality of the bitstream.

The server 54 comprises re-ordering means 64 for arranging the frames in an order which depends on their importance in helping to reconstruct the raw data
20 stream at the client 56 rather than their natural sequential order.

The server 54 and the client 56 each comprise transmitting/receiving means 66 and 70 respectively for data transmission over a transmission link 68 between the server 54 and the client 56.

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The client 56 comprises order recovery means 72 for putting the frames back into their natural sequential order, a demultiplexer 74 for demultiplexing the bitstream and a decompressor 76 for decompressing the compressed data streams to reproduce the raw data stream. The client comprises playing/output means 78 for
30 playing or otherwise outputting the raw data stream. The client also comprises a controller 80 which applies a control signal to the server 54 to control the re-ordering means in response to receipt of frames in the client 56.

Example

An embodiment of the invention was tested using an H.263 compliant encoder and a frame re-ordering tool. The encoder was capable of producing B-frames. The re-ordering tool comprised a re-ordering algorithm and could be adjusted to produce frame ordering for different decreased channel data rates.

A standard ITU-T test sequence of video frames called Glasgow was used. The sequence had a QCIF resolution, that is a luminance picture size of 176 x 144 pixels and a chrominance picture size of 88 x 72 pixels.

The first 297 frames of the Glasgow sequence were compressed to produce a temporally scalable bitstream comprising INTRA (I) frames, INTER (P) frames and bi-directionally predicted (B) frames. The I and P frames are referred to as primary frames and the B frames are referred to as secondary frames. The frame rate of the original (default) sequence was 12.5 frames per second (fps) and so the compressed sequence corresponded to 23.68 seconds. Each frame was compressed. The first frame was an INTRA frame, and the second one was an INTER frame. After that, there were alternate INTER frames and B-frames. A constant quantizer was used to produce a bitstream having an average bit rate of 41073 bps consisting of an average bit rate for the primary frames of 28984 bps and an average bit rate for the secondary frames of 12089 bps.

For the sake of simplicity, the example does not include multiplexing of the bitstream with another bitstream.

Re-ordering of the frame sequence was optimised separately for bit rates corresponding to sums of the primary frame bit rate (A) and (i) 25%; (ii) 50%; and (iii) 75 % of the secondary frame bit rate (B). It should be noted that 100% of the secondary bit rate (B) corresponds to the average bit rate required in order to obtain full quality playback. The summed bit rates were 32007, 35029 and 38051 bps respectively. For convenience, in the following description, these bit rates are

referred to as 25% ($A+0.25B$), 50% ($A+0.5B$) and 75% ($A+0.75B$), and the corresponding re-ordered sequences are referred to as 25-ordered, 50-ordered and 75-ordered. It was expected that the full rate of the channel would be the average bit rate of the sequence.

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The reordering algorithm used two values:

FQFR (full quality full rate), which is the minimum initial buffering time to ensure full-quality playback assuming a full rate channel; and

10 RQRR (reduced quality reduced rate) which is the minimum initial buffering time to ensure reduced-quality playback in which the primary frames are played and some or all secondary frames may not be played (assuming a reduced secondary bit rate of 25%, 50% or 75%).

15 In calculating FQFR and RQRR for a particular channel, the algorithm assumes that it has a constant bit rate. Using the bit rate statistics the likely number of bits per frame is calculated. The time instant at which a particular frame is to be played is known from the time stamp. A time is determined by which a frame will be ready for display as a picture (allowing, of course, for the time needed to receive the bits for a frame and to prepare them) and this time is compared with the time stamp of the frame. If the frame will be received after it is to be displayed, the buffering time is increased, if it is received in time then the next frame can be dealt with. Once
20 the algorithm has compared the likely times of receipt of all of the frames against their playback times and adjusted to buffering time accordingly so that they should all be received in time, the minimum buffering time has been calculated.

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The algorithm was applied to a sequence having its original order. In this case, FQFR is smaller than RQRR because in order to obtain full quality playback, you have to wait longer in starting playback if you have a reduced rate channel. The algorithm seeks to minimise the initial buffering time needed for full-quality
30 playback with full channel throughput and at the same time for reduced-quality playback with a reduced channel throughput. In other words, the algorithm seeks to find a value where FQFR and RQRR are approximately equal. It should be

noted that the algorithm is not optimal, that is the algorithm does not necessarily re-order the sequence so that the minimum initial buffering delay is found. The algorithm consists of the following steps:

1. Calculate FQFR and RQRR.

5 2. If FQFR is greater than or equal to RQRR, stop re-ordering. The minimum initial buffering delay is the greater of FQFR or RQRR. Otherwise, continue with the next step.

3. Shift all primary frames towards the beginning of the sequence by one frame step. For example, if the initial sequence is:

10 I0, P1, P2, B3, P4, B5, P6, B7, P8, B9, P10, ...,

shifting changes the sequence to:

I0, P1, P2, P4, B3, P6, B5, P8, B7, P10, B9, ...

where I0 is the first frame. It can be seen that where a secondary frame is earlier in sequence than an adjacent primary frame, the positions of the primary and

15 secondary frames are exchanged.

4. Continue from step 1.

The buffering time needed to ensure pause-less playback in the reduced bit rate channel is greater for the original sequence than for the re-ordered sequence. It is desirable to have a short initial buffering time. The re-ordering process makes a
20 trade-off between the minimum buffering time needed for a full-rate channel and the minimum buffering time needed for expected reduced-rate channels. Without re-ordering, less initial buffering time would have been needed to provide full-quality playback in the full-rate channel. However, without re-ordering, more initial buffering time would have been required to provide reduced-quality playback in the
25 reduced-rate channel.

In the example, safety times were also investigated. Initial buffering time was set to be the minimum for reduced quality playback of the re-ordered sequence at 25% secondary bit rate. Figure 12 shows how safety time varies with playback of
30 the 25-ordered sequence and the original order sequence. It shows that throughout playback, the 25-ordered sequence (represented by the upper line) has a longer safety time than the original order sequence.

Results were also obtained for the 50% and 75% secondary bit rates. The average safety times (in seconds) for all primary frames in a sequence are shown in the following table for all three reduced bit rates. The safety times are characterised by
 5 minimum safety time and average safety time.

		25%	50%	75%
Minimum	Re-ordered	4.79	2.51	1.06
	Default	3.46	1.63	0.64
	Difference	1.33	0.88	0.42
Average	Re-ordered	5.90	3.51	2.12
	Default	4.66	2.83	1.84
	Difference	1.24	0.67	0.28

It can be seen that both the minimum and average safety times of the re-ordered sequences are longer than those of the original sequence.

10

In contrast, set out below is a table showing the required buffering delays in seconds for full-quality playback at different average bit rates. This is to minimise pauses in playback.

	25%	50%	75%
Re-ordered	10.04	6.03	3.53
Default	7.02	4.64	3.02

15

It can be seen that the re-ordered sequence needs a longer buffering delay for full-quality playback because the secondary frames are transmitted out of their natural order and time is required to put all the frames back into their natural order. However, this is not important because the invention sets out to provide reduced
 20 quality playback with minimal initial buffering delay. To illustrate this, the following

table shows the buffering delays required to ensure pause-less reduced quality playback:

	25%	50%	75%
Re-ordered	5.28	3.49	2.47
Default	6.91	4.46	2.84

These results show that where the bit rate of the transmission channel is reduced, the invented method requires a shorter buffering delay before playback can be started.

The effect of the invention is illustrated in Figure 13 which shows playback of the 25-ordered sequence at 25% bit rate (that is $A+0.25B$ as discussed above). Playback times, that is the times at which the frames are intended or supposed to be played to a viewer, are represented as a straight line. To be played in sequence, without requiring pauses, each frame must be received before its playback time. Any symbol located below the playback time line represents a frame which is received before its scheduled playback time and any symbol located above the playback time line represents a frame which is received after its scheduled playback time. In the example of Figure 13, the primary frames were all received in time to be played and the secondary frames were all received too late. Therefore the secondary frames were all discarded without being played.

It should be understood that if the sequence had not been re-ordered, there is a likelihood that some of the primary frames would have arrived after their playback times and so would have required playback to be paused (since a primary frame cannot be discarded without also discarding all of the frames predicted from it).

Figure 14 shows how the 25-ordered sequence is received and played when the channel throughput is not reduced. It can be seen that all frames are received in time to be played. Again, the upper line represents when secondary frames are received and the lower line represents when primary frames are received.

Of course, the exact appearance of Figures 13 and 14 depends on the nature of the original sequence, as well as the bit rate and the re-ordering that is performed. Differences can be expected in other systems which re-order data in different
5 ways.

In use, the invention can be applied on-line to prepare a bitstream for transmission at some future point. For example, assuming that there may be considerable variation in the available bandwidth of a given transmission channel, the algorithm
10 may be applied to a bitstream and re-ordered sequences may be calculated for several alternative bandwidths, such as 25%, 50% and 75%. In transmission, if problems are encountered, for example with pausing, the re-ordered sequence currently being used may be changed to one better suited to a lower available bandwidth. Equally, if transmission is proceeding better than expected, a
15 sequence better suited for a higher bandwidth may be used. The invention may check the progress of transmission and/or playback a number of times during transmission and adjust the sequence accordingly. It is advantageous if this adjustment can be programmed dynamically whilst transmission is occurring. In this way, intermittent problems can be dealt with.

20 The part of the invention which re-orders a bitstream is located in an editor or in a server. The part of the invention which recovers the order is located in a client.

A further improvement is provided if the proportion of bits belonging to the primary
25 frames is reduced by replacing some of the primary frames with B-frames. This reduces the compression efficiency slightly because B-frames are predicted from reference frames (P-frames) which are further away in time and so the B-frames and P-frames are less alike. This yields a poorer predicted B-frame and so more bits must be used to code the corresponding prediction error image. Since in this
30 arrangement there are now more bits belonging to secondary frames which can be discarded, re-ordering the frames can provide even better protection against transmission delays and pauses.

One way of looking at the invention is to say that it sacrifices the safety times of the secondary frames in order to maintain maximum safety times for the primary frames.

5

The invention is particularly suitable for streaming-type multimedia retrieval.

While preferred embodiments of the invention have been shown and described, it will be understood that such embodiments are described by way of example only.

- 10 For example, although the invention has been described applied to a temporally scalable bitstream, it can also be applied to other types of scalability, including spatial, spectral and SNR. Numerous variations, changes and substitutions will occur to those skilled in the art without departing from the scope of the present invention. Accordingly, it is intended that the following claims cover all such
- 15 variations as fall within the spirit and scope of the invention.

Claims

1. A server for transmitting a data signal having a sequence of data units in a predetermined order over a transmission link the data units being sent in an order determined by their relative importance rather than their predetermined order.
5
2. A server according to claim 1 in which the data units represent a base layer and at least one enhancement layer.
- 10 3. A server according to claim 2 comprising re-ordering means to change the order of the data units.
4. A server according to any preceding claim in which the data signal is scalable.
- 15 5. A server according to claim 4 in which the signal is scalable in a domain selected from a group consisting of the temporal, the spatial, the spectral and the SNR domains.
6. A server according to any preceding claim which comprises an editor for providing the data signal.
20
7. A server according to any preceding claim in which the data signal represents a sequence of pictures to produce a moving image.
- 25 8. A server according to claim 7 in which the data signal represents a video sequence.
9. A server according to any preceding claim in which the data signal comprises multimedia data.
30
10. A data transmission system for transmitting a data signal having a sequence of data units in a predetermined order over a transmission link between a data

source and a data sink the data units being sent in an order determined by their relative importance rather than their predetermined order.

- 5 11. A transmission system according to claim 10 in which the data units each comprise a base layer and at least one enhancement layer and when re-ordered the base layer of a particular data unit has a greater safety time than of the or each enhancement layer of the particular data unit.
- 10 12. A transmission system according to claim 10 or claim 11 in which the source is a server.
13. A transmission system according to any of claims 10 to 12 in which the source is an editor.
- 15 14. A transmission system according to any of claims 10 to 13 in which the sink is a client.
15. A transmission system according to any of claims 10 to 14 in which the sink is a mobile terminal.
- 20 16. A transmission system according to claims 10 to 15 in which the sink is a mobile telephone.
- 25 17. A transmission system according to claims 10 to 16 in which means are provided to check the progress of transmission and to change the order being used to one better suited to available bandwidth.
- 30 18. A method of transmitting a data signal having a sequence of data units in a predetermined order over a transmission link between a data source and a data sink comprising the step of sending the data units in an order determined by their relative importance rather than their predetermined order.

19. A method according to claim 18 in which the data units are returned to their original sequence once they have been transmitted over the transmission link.
20. A method according to claim 18 or claim 19 in which the progress of transmission is checked and the order being used is changed to one better suited to available bandwidth.
21. A computer program product stored on a computer usable medium comprising computer readable program means for causing transmission of a data signal having a sequence of data units in a predetermined order over a transmission link the data units being sent in an order determined by their relative importance rather than their predetermined order.
22. A computer program product according to claim 21 comprising a server.
23. A computer program product according to claim 21 or claim 22 comprising an editor for providing a scalable data signal.
24. A computer program product according to any of claims 22 to 23 comprising re-ordering means for providing the layers of the or each data units with different safety times.
25. A data signal having a sequence of data units for transmission over a transmission link between a data source and a data sink the data units being in an order determined by their relative importance rather than their predetermined order.

1/13

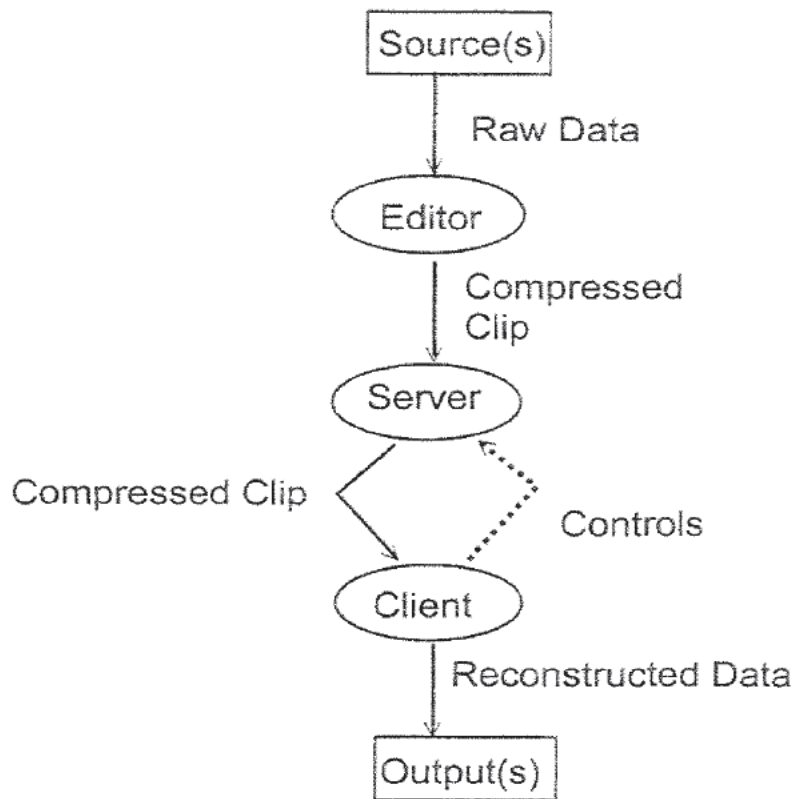


Fig. 1

2/13

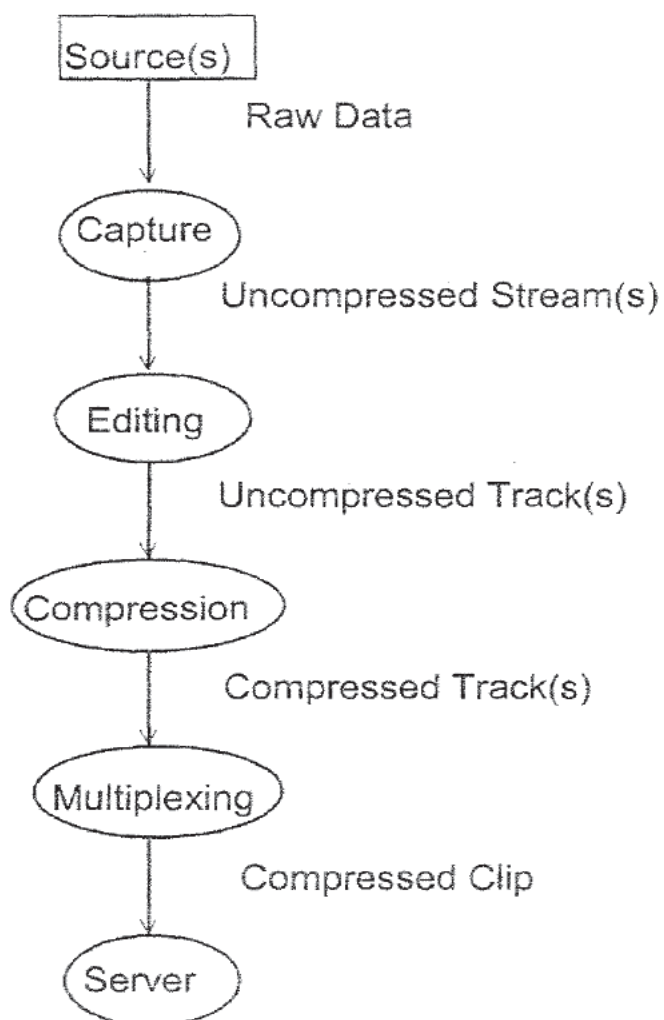


Fig. 2

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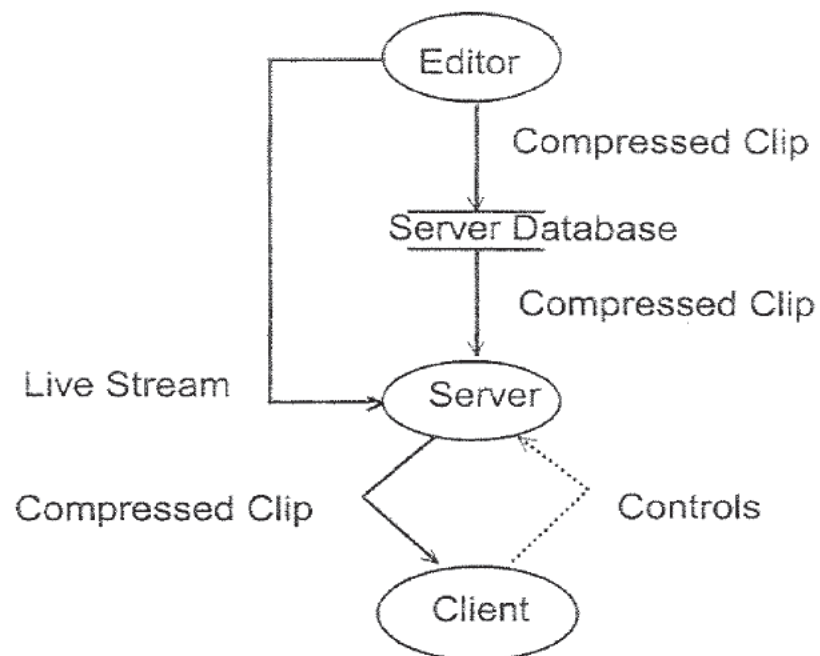


Fig. 3

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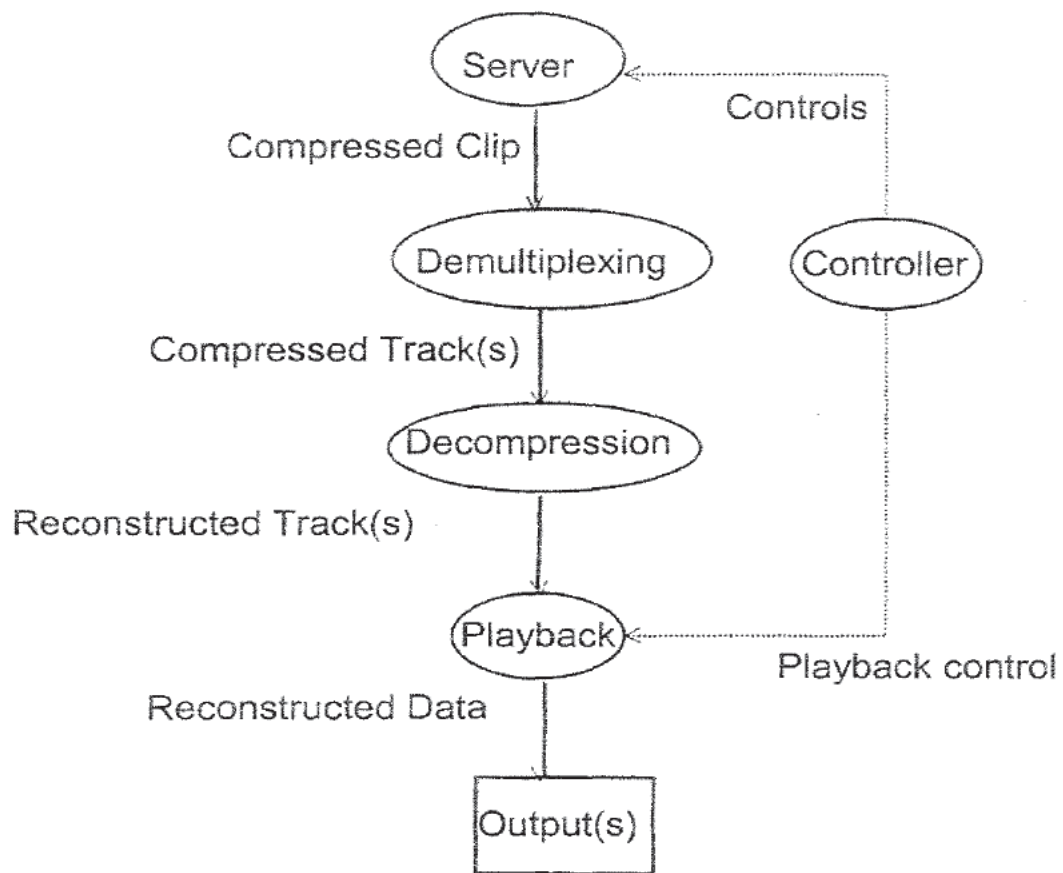


Fig. 4

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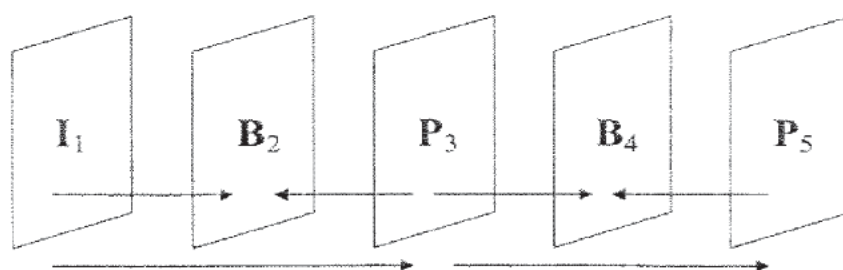


Fig. 5

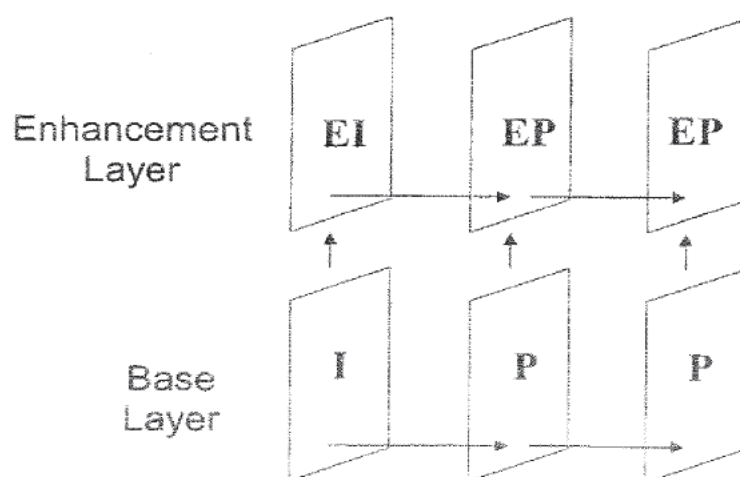


Fig. 6

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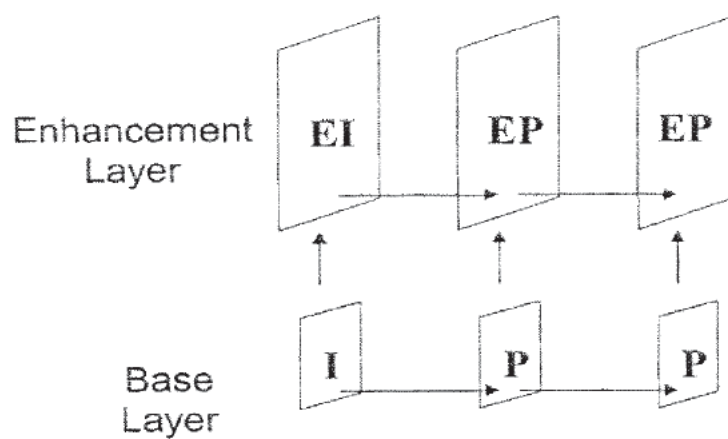


Fig. 7

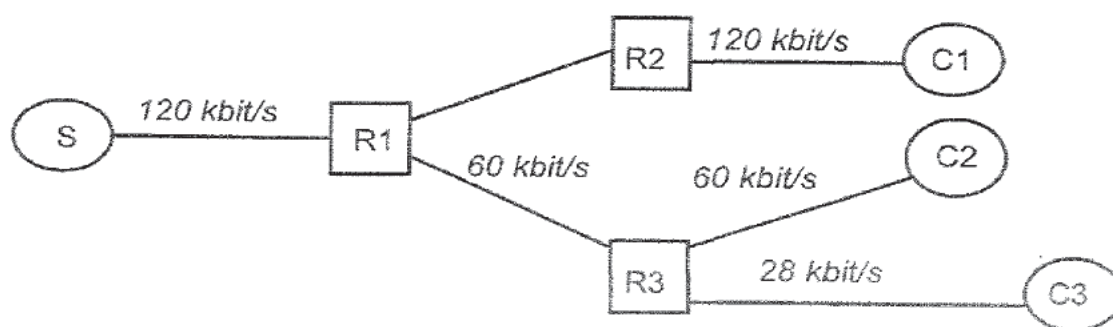


Fig. 8

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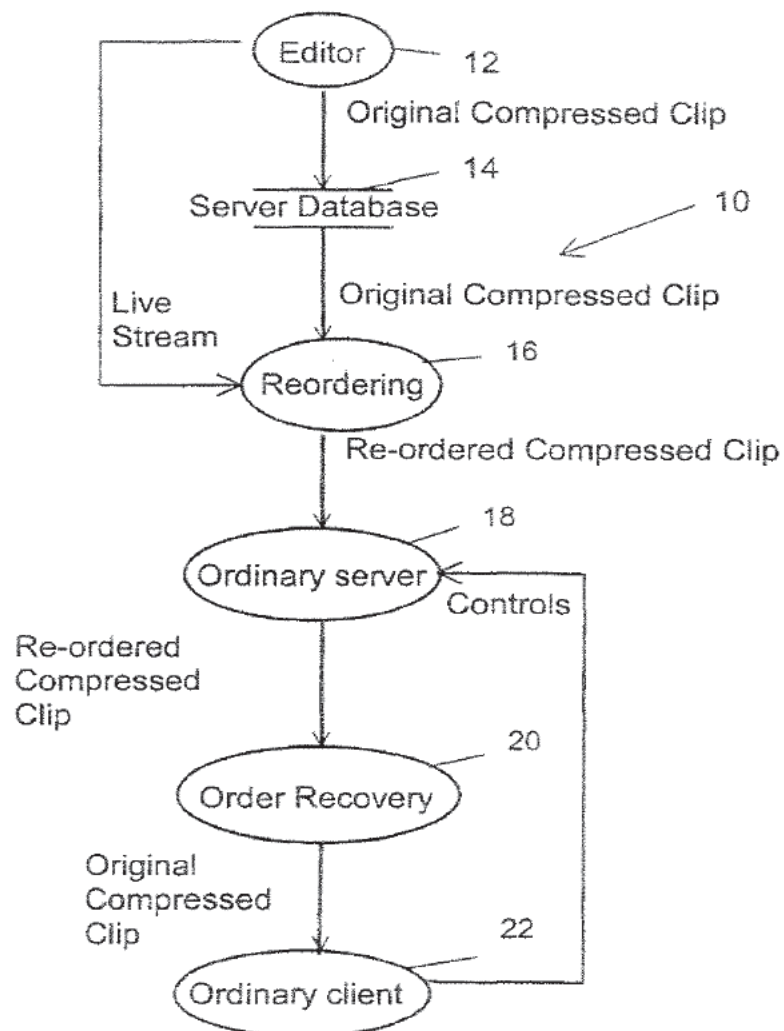


Fig. 9

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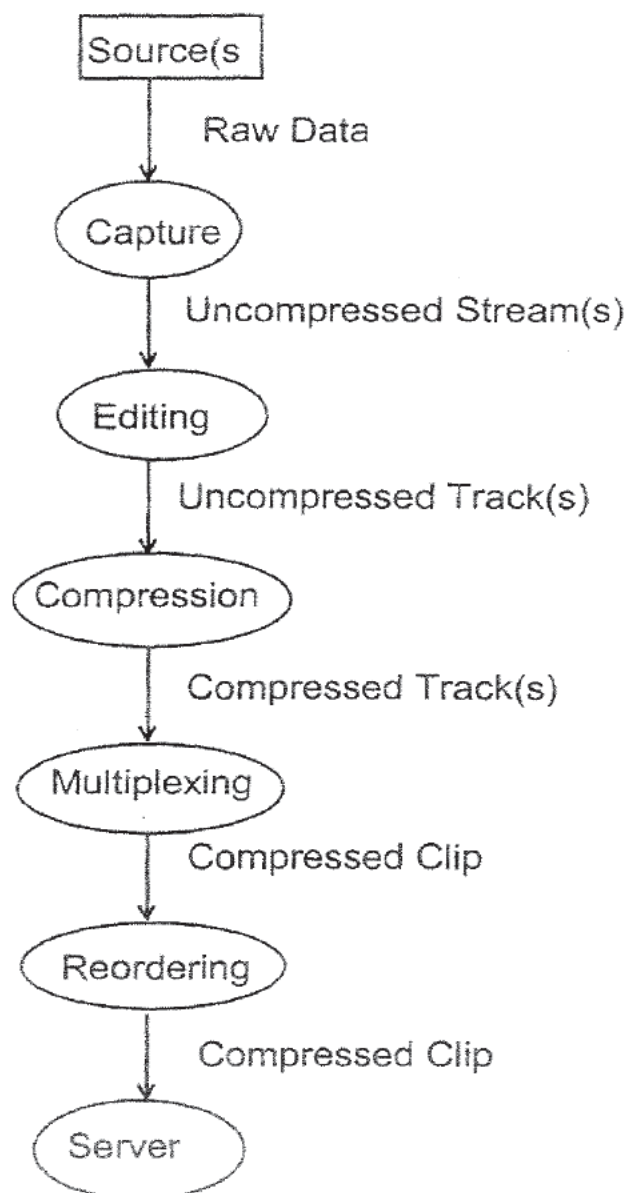


Fig. 10

9/13

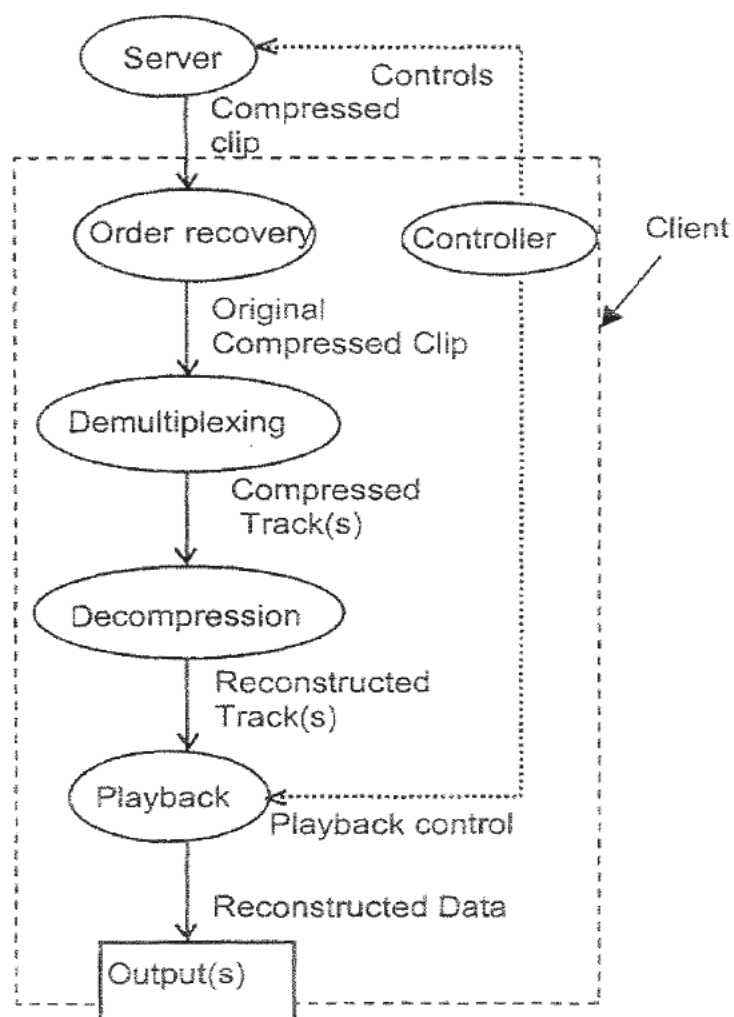


Fig. 11

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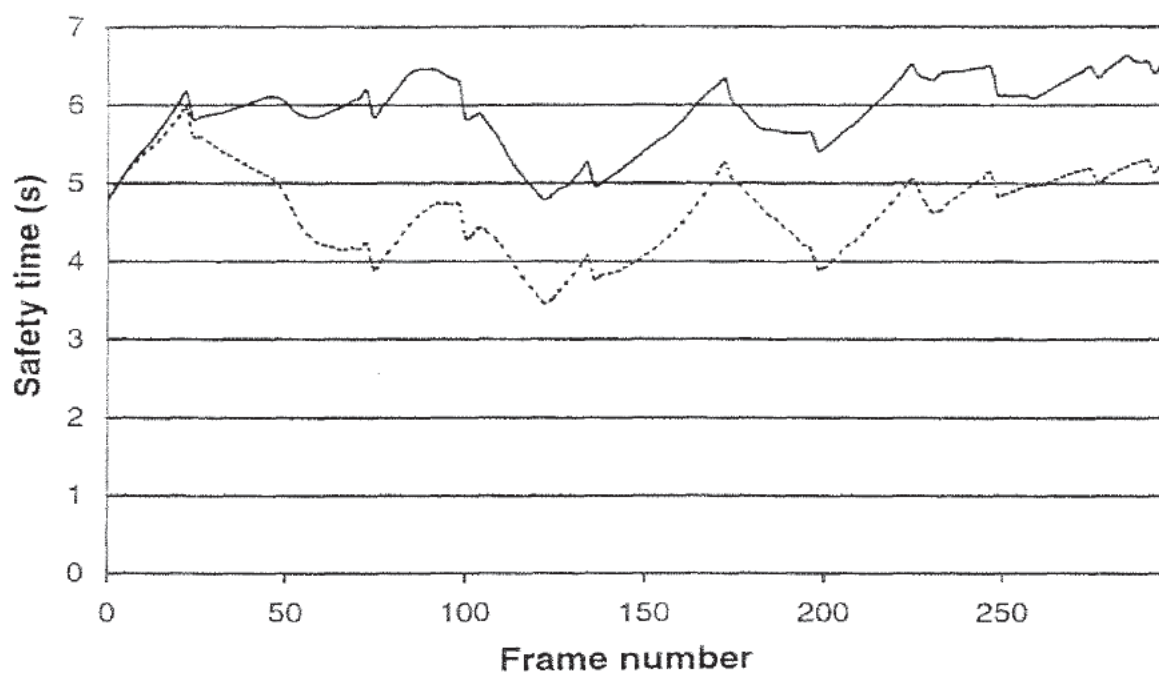


Fig. 12

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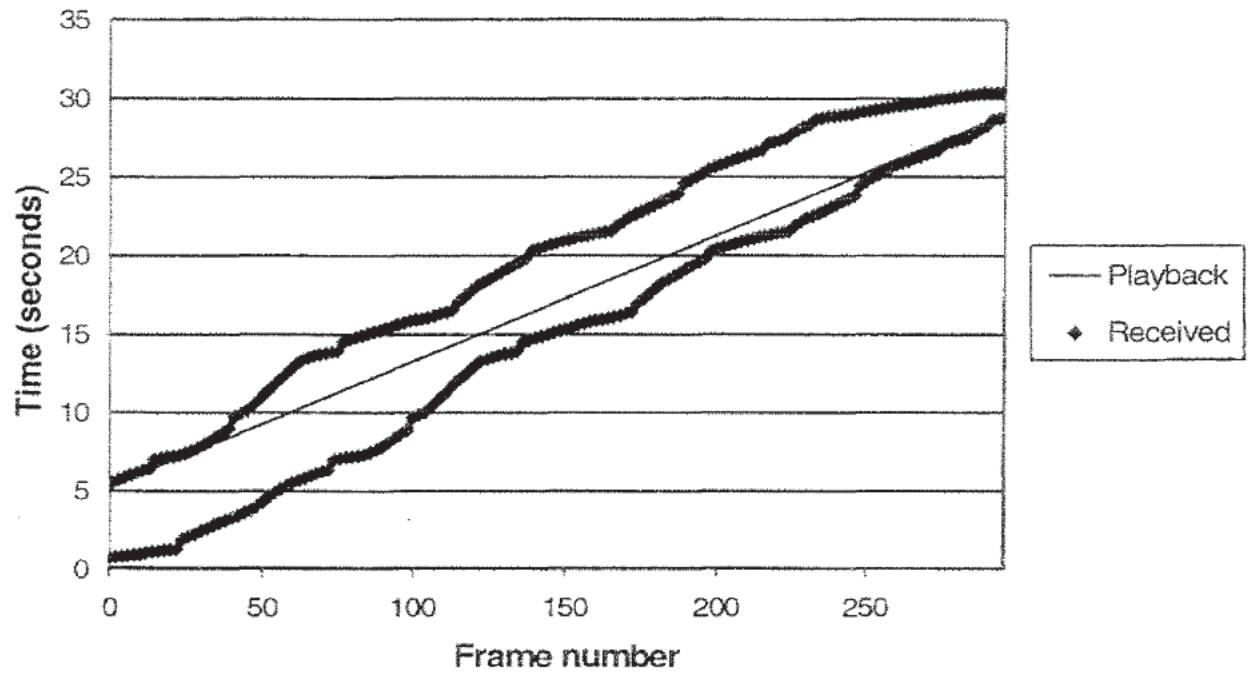


Fig. 13

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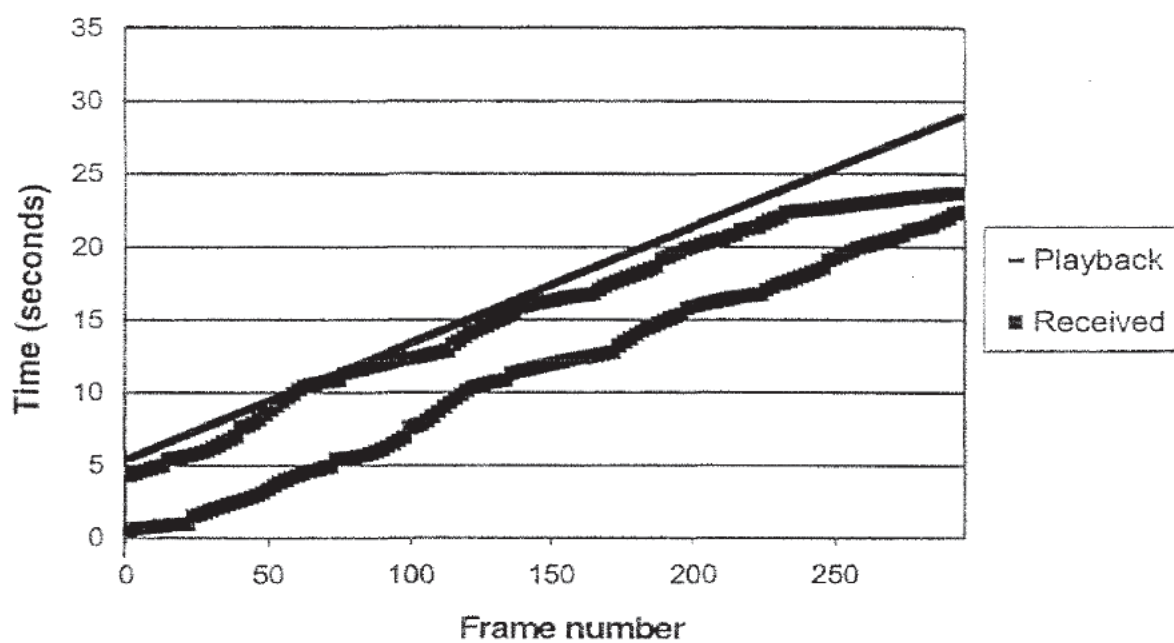


Fig. 14

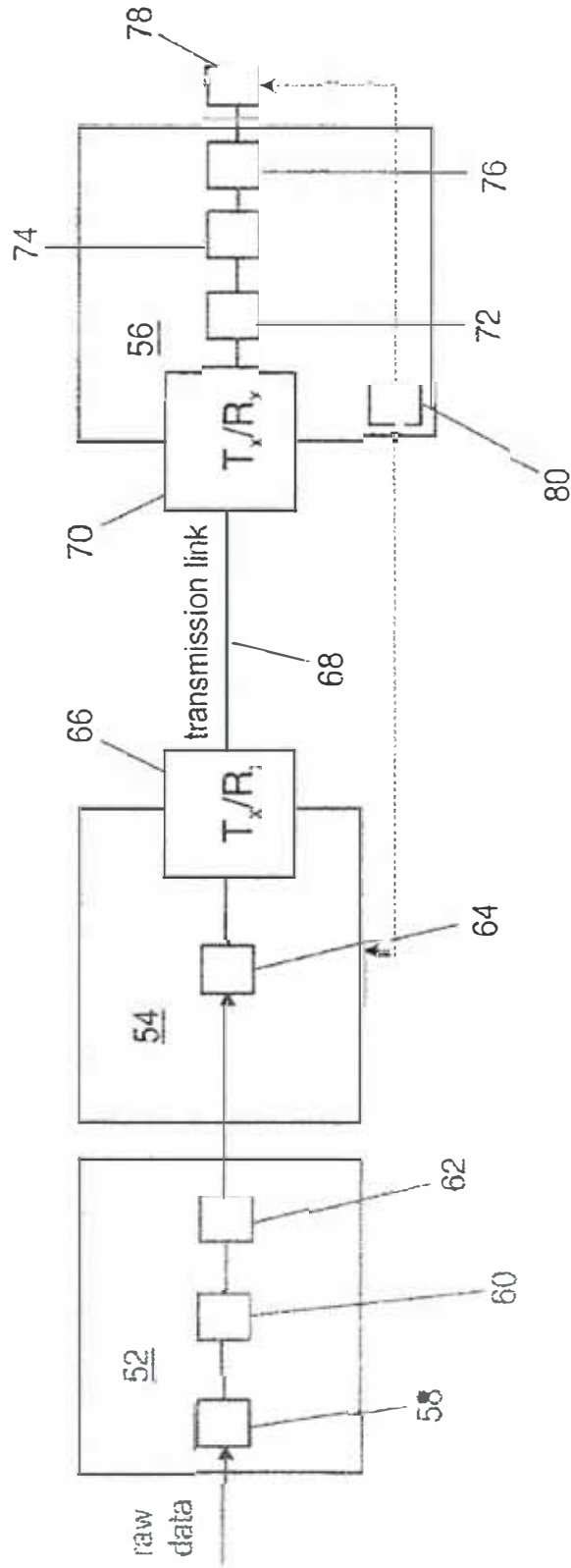


Fig. 15

INTERNATIONAL SEARCH REPORT

International Application No
PCT/FI 00/00363

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04N5/00 H04N7/26

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

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

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

WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 018, no. 566 (E-1622), 28 October 1994 (1994-10-28) & JP 06 205384 A (NEC CORP), 22 July 1994 (1994-07-22) abstract	1,6-10, 12-23,25
Y	---	2-5,11, 24
Y	US 5 564 001 A (LEWIS SCOTT W) 8 October 1996 (1996-10-08) column 2, line 58 - column 3, line 30 column 4, line 58 - line 65 column 7, line 4 - line 14 column 7, line 43 - line 47 abstract	2-5,11, 24
A	---	1,6-10, 12-23,25
	--- -/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

9 August 2000

Date of mailing of the international search report

- 9. 10. 2000

Name and mailing address of the ISA

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Authorized officer

Jesper Bergstrand

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/FI 00/00363

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 634 871 A (AT & T CORP) 18 January 1995 (1995-01-18) the whole document -----	1-25

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

page 2 of 2

ENSGOCCID: <WO.....0067460A1 | >

Ex. 1018-372

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/FI 00/00363

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 06205384 A	22-07-1994	JP 2833950 B	09-12-1998
US 5564001 A	08-10-1996	US 5325423 A	28-06-1994
		AU 693426 B	02-07-1998
		AU 5605394 A	08-06-1994
		AU 8787298 A	03-12-1998
		BR 9307442 A	01-06-1999
		CA 2148090 A	26-05-1994
		EP 0746937 A	11-12-1996
		JP 8503585 T	16-04-1996
		NZ 258406 A	24-11-1997
		RU 2110162 C	27-04-1998
		WO 9411981 A	26-05-1994
EP 0634871 A	18-01-1995	CA 2126467 A	14-01-1995
		JP 7170514 A	04-07-1995
		US 5742343 A	21-04-1998

Form PCT/ISA/210 (patent family annex) (July 1992)

BNSDOCID: <WO..... 0067488A1.1 >

Search Notes 	Application/Control No. 11116783	Applicant(s)/Patent Under Reexamination MAJOR ET AL.
	Examiner NINOS DONABED	Art Unit 2444

SEARCHED			
Class	Subclass	Date	Examiner
709	246	05/07/2008	ND

SEARCH NOTES		
Search Notes	Date	Examiner
See EAST Search History	05/07/2008	ND
Conducted double patenting search	05/07/2008	ND
Consulted with SPE William Vaughn	11/13/2008	ND

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/116,783	04/28/2005	R. Drew Major	8532P001	5535
8791 7590 11/28/2008 BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP 1279 OAKMEAD PARKWAY SUNNYVALE, CA 94085-4040			EXAMINER DONABED, NINOS J	
			ART UNIT 2444	PAPER NUMBER
			MAIL DATE 11/28/2008	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

**Notice of Non-Compliant
Amendment (37 CFR 1.121)**

Application No.

11/116,783

Examiner

NINOS DONABED

Applicant(s)

MAJOR ET AL.

Art Unit

2444

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

The amendment document filed on 09/11/2008 is considered non-compliant because it has failed to meet the requirements of 37 CFR 1.121 or 1.4. In order for the amendment document to be compliant, correction of the following item(s) is required.

THE FOLLOWING MARKED (X) ITEM(S) CAUSE THE AMENDMENT DOCUMENT TO BE NON-COMPLIANT:

- ☐ 1. Amendments to the specification:
- ☐ A. Amended paragraph(s) do not include markings.
 - ☐ B. New paragraph(s) should not be underlined.
 - ☐ C. Other _____.
- ☐ 2. Abstract:
- ☐ A. Not presented on a separate sheet. 37 CFR 1.72.
 - ☐ B. Other _____.
- ☐ 3. Amendments to the drawings:
- ☐ A. The drawings are not properly identified in the top margin as "Replacement Sheet," "New Sheet," or "Annotated Sheet" as required by 37 CFR 1.121(d).
 - ☐ B. The practice of submitting proposed drawing correction has been eliminated. Replacement drawings showing amended figures, without markings, in compliance with 37 CFR 1.84 are required.
 - ☐ C. Other _____.
- ☒ 4. Amendments to the claims:
- ☐ A. A complete listing of all of the claims is not present.
 - ☐ B. The listing of claims does not include the text of all pending claims (including withdrawn claims)
 - ☒ C. Each claim has not been provided with the proper status identifier, and as such, the individual status of each claim cannot be identified. Note: the status of every claim must be indicated after its claim number by using one of the following status identifiers: (Original), (Currently amended), (Canceled), (Previously presented), (New), (Not entered), (Withdrawn) and (Withdrawn-currently amended).
 - ☐ D. The claims of this amendment paper have not been presented in ascending numerical order.
 - ☒ E. Other: See Continuation Sheet.
- ☐ 5. Other (e.g., the amendment is unsigned or not signed in accordance with 37 CFR 1.4):

For further explanation of the amendment format required by 37 CFR 1.121, see MPEP § 714.

TIME PERIODS FOR FILING A REPLY TO THIS NOTICE:

1. Applicant is given **no new time period** if the non-compliant amendment is an after-final amendment or an amendment filed after allowance. If applicant wishes to resubmit the non-compliant after-final amendment with corrections, the **entire corrected amendment** must be resubmitted.
2. Applicant is given **one month**, or thirty (30) days, whichever is longer, from the mail date of this notice to supply the correction, if the non-compliant amendment is one of the following: a preliminary amendment, a non-final amendment (including a submission for a request for continued examination (RCE) under 37 CFR 1.114), a supplemental amendment filed within a suspension period under 37 CFR 1.103(a) or (c), and an amendment filed in response to a *Quayle* action. If any of above boxes 1. to 4. are checked, the correction required is only the **corrected section** of the non-compliant amendment in compliance with 37 CFR 1.121.

Extensions of time are available under 37 CFR 1.136(a) only if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action.

Failure to timely respond to this notice will result in:

Abandonment of the application if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action; or

Non-entry of the amendment if the non-compliant amendment is a preliminary amendment or supplemental amendment.

/N. D./
Examiner, Art Unit 2444

/William C. Vaughn, Jr./
Supervisory Patent Examiner, Art Unit 2444

Continuation of 4(e) Other: Applicant's fails to correctly indicate the status of all pending claims. See claim 21..

REMARKS

Applicant respectfully requests reconsideration of this application in view of the following remarks. For the Examiner's convenience and reference, Applicant's remarks are presented in substantially the same order in which the corresponding issues were raised in the Office Action.

Interview Summary for Examiner Interview Conducted 9/11/2008

Applicant would like to thank the Examiner for the Examiner Interview. During the Interview, Applicant's representative presented a brief overview of the invention and the proposed amended claims. The art cited in the most recent Office Action was also discussed by Applicant's representative and the Examiner. Although there was no agreement that the proposed amendments would be allowable over the cited art, it was agreed that the amended claims appear to overcome the rejections of record, subject to additional review by the Examiner upon filing of the formal amendment.

Status of the Claims

Claims 20-26 and 35-45 are pending. Claims 1-19 and 27-34 are cancelled without prejudice. Claims 20-26 are currently amended. The claim amendments are supported by the specification. Claims 35-45 are added. The new claims are supported by the specification.

Summary of the Office Action

Claims 1-10 and 34 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Further regarding claims 27-33 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

Claims 1-34 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as his invention.

Claims 1, 3, 9-11, 13-20, 22-27, and 29-34 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent Application Publication No. 2002/0144276 to Radford et al. (hereinafter "Radford")

Claims 2, 4-8, 12, 21, and 28 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Radford.

Response to Rejections of Cancelled Claims 1-19, 27-33, and 34

Applicant respectfully submits that claims 1-19, 27-33, and 34 have been cancelled. Applicant does not concede that the Applicant is not entitled to the cancelled claims over the rejections under 35 U.S.C. § 101, § 112, § 102(b), and § 103(a), and reserves the right to file the cancelled claims in a continuation application.

Since claims 1-10, 27-33, and 34 have been canceled, the rejection of claims 1-10, 27-33, and 34 under 35 U.S.C. § 101 are moot. Accordingly, Applicant respectfully request the rejection of the claims 1-10, 27-33, and 34 under 35 U.S.C. § 101 be withdrawn. Similarly, since claims 1-19, 27-33, and 34 have been cancelled, the rejections of claims 1-19, 27-33, and 34 under 35 U.S.C. § 112, second paragraph, claims 1, 3, 9-11, 13-19, 27, and 29-34 under 35 U.S.C. § 102(b), and claims 2, 4-8, 12, and 28 under 35 U.S.C. § 103(a) are moot. Accordingly, Applicant respectfully request that the rejections of claims 1-19, 27-33, and 34 be withdrawn.

Response to Rejections under 35 U.S.C. § 112, second paragraph

The Office Action rejected claims 20-26 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as his invention. Applicant respectfully submits that the amendment to claim 20, removing “simultaneously,” overcomes the rejection of claims 20-26, and requests that the rejections of claims 20-26 under 35 U.S.C. § 112, second paragraph be withdrawn.

Response to Rejections under 35 U.S.C. § 102(b)

The Office Action rejected claims 20 and 22-26 under 35 U.S.C. § 102(b) as allegedly being anticipated by Radford. Applicant respectfully submits that claims 20-26 are patentable over the cited reference because Radford does not disclose all of the limitations of the claim. In particular, Applicant respectfully submits that claim 20 is patentable over Radford because Radford fails to disclose the following reasons:

1) Automatic and Progressively Requesting Subsequent Portions

Applicant respectfully submits that Radford discloses manually controlling the quality of the video being delivered by *allowing the user to manually select* one of the multiple content files (e.g., high quality video, low quality video, slide show presentation, audio only) by clicking on one of the buttons on the user interface. Radford, page 4, paragraphs 29-31, Figure 2, elements 230-250. In contrast, claim 20 recites “automatically and progressively requesting ... portions of the video by requesting from different ones of the copies”. As such, Radford fails to disclose at least this limitation.

2) Anticipating a Poor User Experience for Continuous Playback

Applicant respectfully submits that Radford discloses manually selecting the quality of the streamed data *in response to a poor viewing experience* (e.g., the streamed data deteriorates or is marred by interruptions). Radford, page 4, paragraphs 29 and 31. In contrast, claim 20 recites, as part of “automatically and progressively requesting,” regularly generating performance factors indicative of the current ability to sustain the streaming of the video using different ones of the copies, and making the successive determinations to shift the playback quality based on the performance factors **to achieve continuous playback of the video** using portions of the highest quality one of the copies determined sustainable at that time”. As such, Radford fails to disclose at least this limitation.

3) Requesting Portions of Video

Applicant respectfully submits that Radford discloses requesting *entire* content files. For example, Radford discloses requesting an initial streamed content file, and allowing the user to subsequently select an entirely different content file (e.g., slide show file, audio-only file, low-quality video file). In response to the user action, client device generates a second request for the initiation of delivery of a new content file in its entirety to the client device. Radford, page 4, paragraphs 29-31. In contrast, claim 20 recites that “the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, wherein corresponding portions of the different

copies have the same time index in relation to the beginning of the video”, and the operation of “requesting a plurality of sequential portions of a first of the copies encoded and compressed at a first of the bit rates from the server”, and “automatically and progressively requesting ... portions of the video by requesting from different ones of the copies”. As such, Radford fails to disclose at least these limitations.

4) Multiple TCP connections

Applicant respectfully submits that Radford discloses a *single* network connection. Radford, page 2, paragraph 11. In contrast, claim 20 recites requesting the portions “over a plurality of Transmission Control Protocol (TCP) connections”. As such, Radford fails to disclose at least this limitation.

In sum, given that the cited reference fails to disclose all of the limitations of the claim, Applicant respectfully submits that claim 20 is patentable over the cited reference. Accordingly, Applicant requests that the rejection of claim 20 under 35 U.S.C. § 102(b) be withdrawn.

Given that claims 21-26 and 35-45 depend from independent claim 20, which is patentable over the cited reference, Applicant respectfully submits that dependent claims 21-26 and 35-45 are also patentable over the cited reference. Accordingly, Applicant requests that the rejection of claims 22-26 under 35 U.S.C. § 102(b) and the rejection of claim 21 under 35 U.S.C. § 103(a) be withdrawn.

CONCLUSION

It is respectfully submitted that in view of the amendments and remarks set forth herein, the rejections have been overcome. If the Examiner believes a telephone interview would expedite the prosecution of this application, the Examiner is invited to contact Kevin Grange at (408) 720-8300.

If there are any additional charges, please charge them to Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: December 2, 2008

/Kevin O. Grange/

Kevin O. Grange

Reg. No. 60,793

1279 Oakmead Parkway
Sunnyvale, CA 94085-4040
(408) 720-8300

AMENDMENTS

Amendments to the Specification:

Please amend the following paragraph as follows:

[0066] Figure 5 is a schematic flow chart diagram illustrating one embodiment of a method 500 for processing content in accordance with the present invention. In one embodiment the method 500 starts 502, and the content module 112 receives 504 content from the publisher 110. Receiving content 504 may comprise receiving 504 a digital copy of the content file 200, or digitizing a physical copy of the content file 200. Alternatively, receiving 504 content may comprise capturing a radio or television broadcast. Once received 504, the stream module 302 generates 506 a plurality of streams 202, each stream 202 having a different quality. The quality may be predefined, or automatically set according to end user bandwidth, or in response to pre-designated publisher guidelines.

Please amend the following paragraph as follows:

[0068] Figure 6 is a schematic flow chart diagram illustrating one embodiment of a method 600 for viewing a plurality of streamlets in accordance with the present invention. The method 600 starts and an agent ~~control~~controller module 402 is provided 604 and associated with a viewer 408 and provided with a staging module 409. The agent controller module 402 then requests 606 a streamlet from the streamlet cache module 404. Alternatively, the agent controller module 402 may simultaneously request 606 a plurality of streamlets from the streamlet cache module 404. If the streamlet is stored 608 locally in the streamlet cache 410, the streamlet cache module 404 retrieves 610 the streamlet and sends the streamlet to the agent controller module 402. Upon retrieving 610 or receiving a streamlet, the agent controller module 402 makes 611 a determination of whether or not to shift to a higher or lower quality stream 202. This determination will be described below in greater detail with reference to Figure 7.

Please amend the following paragraph as follows:

[0072] Due to multiple simultaneous streamlet processing, and in order to better judge the central tendency of the performance ratio r , the agent ~~control~~controller module 402 may calculate a geometric mean, or alternatively an equivalent averaging algorithm, across a window of size m , and obtain a performance factor φ :

$$\varphi_{current} = \left(\prod_{j=1}^m r_j \right)^{\frac{1}{m}}.$$

[0073] The policy determination about whether or not to upshift 710 playback quality begins by comparing $\varphi_{current}$ with a trigger threshold Θ_{up} . If $\varphi_{current} \geq \Theta_{up}$, then an up shift to the next higher quality stream may be considered 716. In one embodiment, the trigger threshold Θ_{up} is determined by a combination of factors relating to the current read ahead margin (i.e. the amount of contiguously available streamlets that have been sequentially arranged by the staging module 409 for presentation at the current playback time index), and a minimum safety margin. In one embodiment, the minimum safety margin may be 24 seconds. The smaller the read ahead margin, the larger Θ_{up} is to discourage upshifting until a larger read ahead margin may be established to withstand network disruptions. If the agent controller module 402 is able to sustain 716 upshift quality, then the agent controller module 402 will upshift 717 the quality and subsequently request higher quality streams. The determination of whether use of the higher quality stream is sustainable 716 is made by comparing an estimate of the higher quality stream's performance factor, φ_{higher} , with Θ_{up} . If $\varphi_{higher} \geq \Theta_{up}$ then use of the higher quality stream is considered sustainable. If the decision of whether or not the higher stream rate is sustainable 716 is "no," the agent ~~control~~controller module 402 will not attempt to upshift 717 stream quality. If the end of the stream has been reached 714, the method 618 ends 716.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of the claims in the application:

Listing of Claims:

1-19. (Cancelled)

20. (Currently amended) A method for presenting rate-adaptive streams, the method comprising:

streaming by a media player operating on an end user station a video from a server, wherein the video has a playback duration, wherein different copies of the video are stored on the server, wherein each of the different copies is encoded and compressed according to a different bit rate and includes the entire playback duration of the video, wherein the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, wherein corresponding portions of the different copies have the same time index in relation to the beginning of the video, and wherein the streaming comprises:

~~simultaneously requesting at least portions of a plurality of streamlets~~
sequential portions of a first of the copies encoded and compressed at a first of the bit rates from the server over a plurality of Transmission Control Protocol (TCP) connections;

~~continuously monitoring the progress of subsequent responses to streamlet requests, and in accordance with the progress of the responses, automatically and progressively requesting over the plurality of TCP connections subsequent~~
portions of the video by requesting from different ones of the copies dependent upon successive determinations to shift the playback quality to a higher or lower

quality streamlets one of the different copies, said automatically and progressively requesting including,

regularly generating performance factors indicative of the current ability to sustain the streaming of the video using different ones of the copies; and

making the successive determinations to shift the playback quality based on the performance factors to achieve continuous playback of the video using portions of the highest quality one of the copies determined sustainable at that time; and

staging presenting the streamlets video to the user by playing back with and arranging the streamlets for playback on a content the media player the requested portions from the different copies in order of ascending playback time.

21. (Currently amended) The method of claim 20, further comprising establishing ~~multiple the plurality of Transmission Control Protocol (TCP) connections~~ with the server, ~~and requesting streamlets of varying bitrates,~~ wherein said requesting the plurality of sequential portions of the first of the copies includes requesting sub-parts of the portions over different ones of the plurality of TCP connections, and wherein said method further includes reassembling the portions from the received sub-parts.

22. (Currently amended) The method of claim 20, ~~further comprising wherein said generating a the performance factor factors according to responses from streamlet requests comprises:~~

calculating a current performance ratio across a current window of samples of a playback length; and

calculating a current average to obtain a current one of the performance factors;

said making further comprises:

comparing the current performance factor with a set of one or more trigger thresholds; and

determining whether to upshift or downshift to a higher or lower quality one of the different copies based on said comparing.

23. (Currently amended) The method of claim 20, ~~further comprising wherein~~ said determining whether to upshift or downshift comprises:

upshifting to a higher quality ~~streamlet~~ one of the different copies when the performance factor is greater than a first selected threshold[.]; and
determining if the higher quality playback can be sustained.

24. (Currently amended) The method of claim [[20]] ~~23, further comprising wherein~~ said determining whether to upshift or downshift comprises downshifting to a lower quality ~~streamlet~~ one of the different copies when the performance factor is less than a second selected threshold.

25. (Currently amended) The method of claim 20, further comprising:
~~anticipating streamlet requests; and~~
~~pre-requesting streamlets~~ receiving user input to enable fast-forward, skip randomly, and rewind functionality; and
requesting portions of the video at a specified time index that is not the next sequential time in the current playback.

26. (Currently amended) The method of claim [[20]] ~~22, further comprising:~~
initially requesting portions of video of a low quality streamlets one of the different copies to enable instant playback of [[a]] the video content file[[.]] ; and

subsequent upshifting to a higher quality one of the different copies according to the performance factor after initially requesting portions of the video of the low quality.

27-34. (Cancelled)

35. (New) The method of claim 20, further comprising establishing the plurality of TCP connections with the server, wherein said requesting the plurality of sequential portions of the first of the copies includes requesting the plurality of sequential portions over different ones of the plurality of TCP connections.

36. (New) The method of claim 20, further comprising sequentially arranging the received portions from the different copies in the order of ascending playback time for playback on the media player.

37. (New) The method of claim 20, wherein said automatically and progressively requesting includes requesting sub-parts of the portions over different ones of the plurality of TCP connections, and wherein said method further includes reassembling the portions from the received sub-parts.

38. (New) The method of claim 20, wherein the performance factors are indicative of the available bandwidth of the plurality of TCP connections and a current read ahead margin, wherein the current read ahead margin is a current amount of contiguous, sequentially arranged, un-played portions of the video for playback on the media player.

39. (New) The method of claim 38, wherein the performance factors are indicative of a minimum safety margin, wherein the minimum safety margin is a desired

amount of contiguously available sequentially arranged portions of video for playback on the media player.

40. (New) The method of claim 20, wherein the performance factors are indicative of latency of the requested portions, wherein the latency is a time measure between when a request is issued and a time that response data of the requested portion begins to arrive at the end user station.

41. (New) The method of claim 20, wherein the performance factors are indicative of time intervals between successive receive times for each response to the requested portions.

42. (New) The method of claim 20, wherein the performance factors are indicative of delays or losses in one or more of the plurality of TCP connections.

43. (New) The method of claim 20, wherein the server is a web server, and wherein the divided portions are stored in separate files on the web server.

44. (New) The method of claim 20, wherein the separate files are requested from the web server using Hyper Text Transfer Protocol (HTTP), and wherein the web server is without server-side intelligence to retrieve the requested portions.

45. (New) The method of claim 20, wherein the server is a cache server of a network infrastructure operator, and wherein the divided portions are stored in separate files on the cache server.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of:

R. Drew Major

Application No.: 11/116,783

Filed: April 28, 2005

Art unit: 2144

Examiner: Donabed, Ninos J

For: APPARATUS, SYSTEM AND
METHOD FOR ADAPTIVE-RATE
SHIFTING OF STREAMING
CONTENT

Confirmation No.: 5535

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being
submitted electronically via EFS Web on the date
shown below.

/Kevin O. Grange/ December 2, 2008

Kevin O. Grange Date

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND RESPONSE TO OFFICE ACTION

Examiner:

In response to the Notice of Non-Compliant Amendment set forth in the Office Action dated November 28, 2008, Applicant herein resubmits the Amendment and Response filed on September 11, 2008. Applicant respectfully submits that claim 21 now includes the proper status identifier, and as such, the Amendment and Response filed herewith meets the requirements of 37 CFR 1.121. Applicant respectfully requests that the Examiner enter the following amendments and consider the following remarks.

Amendments to the Specification being on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims that begins on page 4 of this paper.

Remarks begin on page 9 of this paper.

Electronic Acknowledgement Receipt

EFS ID:	4379366
Application Number:	11116783
International Application Number:	
Confirmation Number:	5535
Title of Invention:	Apparatus, system, and method for adaptive-rate shifting of streaming content
First Named Inventor/Applicant Name:	R. Drew Major
Customer Number:	08791
Filer:	Kevin Grange/Leslie Rogan
Filer Authorized By:	Kevin Grange
Attorney Docket Number:	8532P001
Receipt Date:	02-DEC-2008
Filing Date:	28-APR-2005
Time Stamp:	15:02:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		8532P001_Resp_to_Non-Compliant_Amnd.pdf	80137 86c10c22d92dc552bfe02198aa51d87a7bf2fa60	yes	13

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Specification	2	3
	Claims	4	8
	Applicant Arguments/Remarks Made in an Amendment	9	13

Warnings:

Information:

Total Files Size (in bytes):	80137
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/116,783	04/28/2005	R. Drew Major	8532P001	5535
8791 7590 02/20/2009 BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP 1279 OAKMEAD PARKWAY SUNNYVALE, CA 94085-4040			EXAMINER DONABED, NINOS J	
			ART UNIT 2444	PAPER NUMBER
			MAIL DATE 02/20/2009	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 11/116,783	Applicant(s) MAJOR ET AL.
	Examiner NINOS DONABED	Art Unit 2444

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 December 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 20-26 and 35-45 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 20-26, 35-45 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) ☒ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) ☐ Notice of Informal Patent Application |
| 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>11/07/2008 and 09/11/2008</u> . | 6) ☐ Other: _____ |

Response to Amendment

This action is in response to Applicant's amendment dated 12/02/2008. Claims 1-19 and 27-34 have been cancelled. Claims 20-26 have been amended. Claims 35-45 have been added. Claims 20-26 and 35-45 are pending.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 39 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. "The minimum safety margin is a desired amount of contiguously available sequentially arranged portions of video for playback on the media player" is considered new matter.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 20-26 and 25-45 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 20, 22-24, 26, 38-42, the phrase “performance factors” is vague and unclear. For the furthering of prosecution it will be taken to mean any factor which relates to the performance of the network in general.

Further regarding claims 21 and 37, the phrase “requesting sub-parts of the portions over different ones of the plurality of TCP connections” is vague and unclear. It is not understood what a sub-part is or encompasses. For the furthering of prosecution it will be taken to mean any part of any of the copies of video files.

Further regarding claim 20, the phrase “requesting a plurality of sequential portions of a first of the copies encoded and compressed at a first of the bit rates from the server over a plurality of Transmission Control Protocol (TCP) connections” is vague and unclear as it is not understood whether the plurality of connections is with a plurality of devices or just a single device. For the furthering of prosecution it will be taken to mean over a single device.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 20-21, 23-24, 26, 35-38, 40-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hughes (United States Patent Application Publication

20020188745) in view of Li (United States Patent application Publication 20030135631)
further in view of Gamble (United States Patent Application Publication 20040093420.)

Regarding claims 20 as best understood,

Hughes teaches method for presenting rate-adaptive streams, the method comprising: **(See abstract Hughes)**

automatically and progressively requesting over the TCP connection subsequent portions of the video by requesting from different ones of the copies dependent upon successive determinations to shift the playback quality to a higher or lower quality one of the different copies, said automatically and progressively requesting including, regularly generating performance factors indicative of the current ability to sustain the streaming of the video using different ones of the copies; and making the successive determinations to shift the playback quality based on the performance factors to achieve continuous playback of the video using portions of the highest quality one of the copies determined sustainable at that time: and **(See figure 1 and paragraphs [0037] – [0040], Hughes teaches automatically shifting between different qualities of the video based on performance factors of the network.)**

presenting the video to the user by playing back with and the media player the requested portions from the different copies in order of ascending playback time. **(See figure 1 and paragraphs [0037] – [0040], Hughes teaches playing the video on the user's terminal.)**

Hughes does not explicitly teach different “copies” of the video.

Li teaches streaming by a media player operating on an end user station a video from a server, wherein the video has a playback duration, wherein different copies of the video are stored on the server, wherein each of the different copies is encoded and compressed according to a different bit rate and includes the entire playback duration of the video, wherein the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, wherein corresponding portions of the different copies have the same time index in relation to the beginning of the video, and wherein the streaming.

(See paragraphs [0007] – [0012], Li teaches different quality copies of a video stored on a server and one copy being provided to the user terminal based on the terminals capabilities.)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have known to combine Li with Hughes because both deal with dynamically switching between video content based on a users workstation capabilities. The advantage of incorporating the full duration copies of the video encoded at different bit rates of Li into the teachings of Hughes is that it makes the system of Hughes more robust and efficient in the sense that it allows the different copies of the video to be independent of one another in case a file corruption occurs.

Li does not explicitly teach a plurality of TCP connections.

Gamble teaches a requesting a plurality of sequential portions of a first of the copies encoded and compressed at a first of the bit rates from the server over a plurality of Transmission Control Protocol (TCP) connections; **(See figure 3 and paragraphs [0035] – [0040], Gamble teaches requesting a plurality of sequential of a files over a plurality of TCP connections.)**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have known to combine Gamble with Li and Hughes because both deal with the transferring of files form a server to a terminal. The advantage of incorporating Gambles' "requesting a plurality of sequential portions of a first of the copies encoded and compressed at a first of the bit rates from the server over a plurality of Transmission Control Protocol (TCP) connections" into the system of Li and Hughes is that it allows for parallel transfer of files which makes the system more efficient and robust and also reliable. **(See Gamble paragraphs [0035] – [0036].)**

Regarding claims 21 as best understood,

Hughes Li and Gamble teach the method of claim 20, further comprising establishing the plurality of (TCP) connections with the server, wherein said requesting the plurality of sequential portions of the first of the copies includes requesting sub-parts of the portions over different ones of the plurality of TCP connections, and wherein said method further includes reassembling the portions

from the received sub-parts. **(See figure 3 and paragraphs [0035] – [0040], Gamble.)**

The motivation that was used in claim 20 equally applies to claim 21.

Regarding claims 23 as best understood,

Hughes Li and Gamble teach the method of claim 20, wherein said determining whether to upshift or downshift comprises: upshifting to a higher quality one of the different copies when the performance factor is greater than a first selected threshold; and determining if the higher quality playback can be sustained. **(See paragraphs [0036] – [0039], Hughes.)**

Regarding claims 24 as best understood,

Hughes Li and Gamble teach the method of claim 23, further wherein said determining whether to upshift or downshift comprises downshifting to a lower quality streamlet one of the different copies when the performance factor is less than a second selected threshold. **(See paragraphs [0036] – [0039], Hughes.)**

Regarding claims 26 as best understood,

Hughes Li and Gamble teach the method of claim 22, further comprising: initially requesting portions of video of a low quality one of the different copies to enable instant playback of the video content fill ; and subsequent upshifting to a higher quality one of the different copies according to the performance factor

after initially requesting portions of the video of the low quality. **(See paragraphs [0036] – [0039], Hughes.)**

Regarding claims 35 as best understood,

Hughes Li and Gamble teach the method of claim 20, further comprising establishing the plurality of TCP connections with the server, wherein said requesting the plurality of sequential portions of the first of the copies includes requesting the plurality of sequential portions over different ones of the plurality of TCP connections. **(See figure 3 and paragraphs [0035] – [0040], Gamble.)**

The motivation that was used in claim 20 equally applies to claim 35.

Regarding claims 36 as best understood,

Hughes Li and Gamble teach the method of claim 20, further comprising sequentially arranging the received portions from the different copies in the order of ascending playback time for playback on the media player. **(See paragraphs [0036] – [0040], Hughes.)**

Regarding claims 37 as best understood,

Hughes Li and Gamble teach the method of claim 20, wherein said automatically and progressively requesting includes requesting sub-parts of the portions over different ones of the plurality of TCP connections, and wherein said

method further includes reassembling the portions from the received sub-parts.

(See figure 3 and paragraphs [0035] – [0040], Gamble.)

The motivation that was used in claim 20 equally applies to claim 37.

Regarding claims 38 as best understood,

Hughes Li and Gamble teach the method of claim 20, wherein the performance factors are indicative of the available bandwidth of the plurality of TCP connections and a current read ahead margin, wherein the current read ahead margin is a current amount of contiguous, sequentially arranged, un-played portions of the video for playback on the media player. **(See paragraphs [0033] – [0040], Hughes.)**

Regarding claims 40 as best understood,

Hughes and Li teach the method of claim 20, wherein the performance factors are indicative of latency of the requested portions, wherein the latency is a time measure between when a request is issued and a time that response data of the requested portion begins to arrive at the end user station. **(See paragraphs [0036] – [0039], Hughes.)**

Regarding claims 41 as best understood,

Hughes Li and Gamble teach the method of claim 20, wherein the performance factors are indicative of time intervals between successive receive

times for each response to the requested portions. **(See paragraphs [0036] – [0039], Hughes.)**

Regarding claims 42 as best understood,

Hughes Li and Gamble teach the method of claim 20, wherein the performance factors are indicative of delays or losses in one or more of the plurality of TCP connections. **(See paragraphs [0036] – [0039], Hughes.)**

Regarding claims 43 as best understood,

Hughes Li and Gamble teach the method of claim 20, wherein the server is a web server, and wherein the divided portions are stored in separate files on the web server. **(See paragraphs [0036] – [0039], Hughes.)**

Regarding claims 44 as best understood,

Hughes Li and Gamble teach the method of claim 20, wherein the separate files are requested from the web server using Hyper Text Transfer Protocol (HTTP), and wherein the web server is without server-side intelligence to retrieve the requested portions. **(See paragraphs [0011] – [0013], Hughes.)**

7. Claims 22, 25, 39, 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hughes (United States Patent Application Publication 20020188745) in view of Li (United States Patent application Publication 20030135631) further in view of Gamble

(United States Patent Application Publication 20040093420) further in view of Official Notice.

Regarding claims 22 as best understood,

Hughes Li and Gamble teach the method of claim 20.

Hughes Li and Gamble do not explicitly teach wherein said. generating the performance factors requests comprises: calculating a current performance ratio across a current window of samples of a playback length; and calculating a current average to obtain a current one of the performance factors; said making further comprises: comparing the current performance factor with a set of one or more trigger thresholds; and determining whether to upshift or downshift to a higher or lower quality one of the different copies based on said comparing.

Examiner takes Official Notice as to wherein said. generating the performance factors requests comprises: calculating a current performance ratio across a current window of samples of a playback length; and calculating a current average to obtain a current one of the performance factors; said making further comprises: comparing the current performance factor with a set of one or more trigger thresholds; and determining whether to upshift or downshift to a higher or lower quality one of the different copies based on said comparing.

It would have been obvious to have known that multiple techniques could be implemented to derive a performance factor including ratios, averages as well as trigger thresholds. One of ordinary skill would have known that in order to

automatically switch between the different qualities of the copies of the video, a threshold would have to be incorporated.

Regarding claims 25 as best understood,

Hughes Li and Gamble teach the method of claim 20.

Hughes Li and Gamble do not explicitly teach further comprising; receiving user input to enable fast-forward, skip randomly, and rewind functionality; and requesting portions of the video at a specified time index that is not the next sequential time in the current playback.

Examiner takes Official Notice as to further comprising; receiving user input to enable fast-forward, skip randomly, and rewind functionality; and requesting portions of the video at a specified time index that is not the next sequential time in the current playback.

It would have been obvious to have known that a media player would allow the user to be able to operate the player using such functions as fast-forward, skip randomly, and rewind functionality, as well as skipping through the files. This is commonly enabled to users of media players.

Regarding claims 39 as best understood,

Hughes Li and Gamble teach the method of claim 38.

Hughes Li and Gamble do not explicitly teach wherein the performance factors are indicative of a minimum safety margin, wherein the minimum safety

margin is a desired amount of contiguously available sequentially arranged portions of video for playback on the media player.

Examiner takes Official Notice as to wherein the performance factors are indicative of a minimum safety margin, wherein the minimum safety margin is a desired amount of contiguously available sequentially arranged portions of video for playback on the media player.

It would have been obvious to one of ordinary skill in the art to have known that a minimum safety margin could have been used in order to optimize the users experience when watching the video via a media player on a terminal.

Regarding claims 45 as best understood,

Hughes Li and Gamble teach the method of claim 20.

Hughes Li and Gamble do not explicitly teach wherein the server is a cache server of a network infrastructure operator, and wherein the divided portions are stored in separate files on the cache server.

Examiner takes Official Notice as to wherein the server is a cache server of a network infrastructure operator, and wherein the divided portions are stored in separate files on the cache server.

It would have been obvious to have known that any of number of different types of servers could be used to store the portions of the files separate files.

Response to Arguments

8. Applicant's arguments with respect to claims 20-26 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any response to this Office Action should be **faxed** to (571) 272-8300 or **mailed** to:

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Hand-delivered responses should be brought to

Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, Virginia 22314

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NINOS DONABED whose telephone number is (571)270-3526. The examiner can normally be reached on Monday-Friday, 7:30 AM-5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Vaughn can be reached on (571) 272-3922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. D./
Examiner, Art Unit 2444

/William C. Vaughn, Jr./
Supervisory Patent Examiner, Art Unit 2444

Substitute for Form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(use as many sheets as necessary)</i>				Complete if Known	
				Application Number	11/116,783
				Filing Date	April 28, 2005
				First Named Inventor:	R. Drew Major
				Art Unit	2144
Sheet	1	Of	1	Examiner Name	Donabed, Ninos J
				Attorney Docket Number	8532P001

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 2002/0174434 A1	11-21-2002	Lee et al.	
		US- 2003/0067872 A1	04-10-2003	Harrell et al.	
		US- 2004/0030797 A1	02-12-2004	Akinlar et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Country Code ³ Number ⁴ Kind Code ⁵ (if known)				
		WO 00/67469	11-09-2000	Hannuksela (Nokia Mobil Phones Ltd.)		
		CA 2466482	05-22-2003	Doron et al. (Musicmatch, Inc.)		

NON-PATENT LITERATURE

Examiner Initials*			T ²
		Supplemental European Search Report, September 30, 2008, (3 pages)	

Examiner Signature	/Ninos Donabed/	Date Considered	02/13/2009
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*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹Applicant's unique citation designation number (optional). ²Applicant is to place a check mark here if English Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.I.

Search Notes 	Application/Control No. 11116783	Applicant(s)/Patent Under Reexamination MAJOR ET AL.
	Examiner NINOS DONABED	Art Unit 2444

SEARCHED			
Class	Subclass	Date	Examiner
709	246	05/07/2008	ND

SEARCH NOTES		
Search Notes	Date	Examiner
See EAST Search History	05/07/2008	ND
Conducted double patenting search	05/07/2008	ND
Consulted with SPE William Vaughn	11/13/2008	ND
See updated EAST search	12/13/2009	ND
Consulted with SPE William Vaughn regarding Final	02/12/2009	ND

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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<i>Index of Claims</i> 	Application/Control No. 11116783	Applicant(s)/Patent Under Reexamination MAJOR ET AL.
	Examiner NINOS DONABED	Art Unit 2444

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant		☐ CPA		☐ T.D.		☐ R.1.47			
CLAIM		DATE							
Final	Original	02/13/2009							
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	20	✓							
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	30	-							
	31	-							
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	33	-							
	34	-							
	35	✓							
	36	✓							

<i>Index of Claims</i> 	Application/Control No. 11116783	Applicant(s)/Patent Under Reexamination MAJOR ET AL.
	Examiner NINOS DONABED	Art Unit 2444

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
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☐ Claims renumbered in the same order as presented by applicant		☐ CPA		☐ T.D.		☐ R.1.47			
CLAIM		DATE							
Final	Original	02/13/2009							
	37	✓							
	38	✓							
	39	✓							
	40	✓							
	41	✓							
	42	✓							
	43	✓							
	44	✓							
	45	✓							

Substitute for Form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(use as many sheets as necessary)</i>				Complete if Known		
				Application Number:	11/116,783	
				Filing Date:	April 28, 2005	
				First Named Inventor:	R. Drew Major	
				Art Unit:	2144	
Examiner Name:	Donabed, Ninos J					
Attorney Docket Number:	8532.P001					
Sheet	1	of	2			

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document Number		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)				
		US-	6,091,775	07-18-2000	Hibi et al.	
		US-	6,091,777	07-18-2000	Guetz et al.	
		US-	6,510,553 B1	01-21-2003	Hazra	
		US-	6,731,600 B1	05-04-2004	Patel et al.	
		US-	6,732,183 B1	05-04-2004	Graham	
		US-	6,968,387 B2	11-22-2005	Lanphear	
		US-	7,075,986 B2	07-11-2006	Girod et al.	
		US-	7,349,976 B1	03-25-2008	Glaser et al.	
		US-	2002/0073167 A1	06-13-2002	Powell et al.	
		US-	2005/0123058 A1	06-09-2005	Greenbaum et al.	
		US-	2007/0024705 A1	02-01-2007	Richter et al.	
		US-	2008/0028428 A1	01-31-2008	Jeong et al.	
		US-	2008/0056373 A1	03-06-2008	Newlin et al.	
		US-	2008/0195744 A1	08-14-2008	Bowra et al.	
		US-	2008/0195745 A1	08-14-2008	Bowra et al.	
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Examiner Signature	/Ninos Donabed/	Date Considered	02/13/2009
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Application No. 11/116,783 ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.I.

Substitute for Form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(use as many sheets as necessary)</i>				Application Number	11/116,783
				Filing Date	April 28, 2005
				First Named Inventor:	R. Drew Major
				Art Unit	2144
				Examiner Name	Donabed, Ninos J
Sheet	2	of	2	Attorney Docket Number	8532.P001

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document Country Code ³ Number ⁴ Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		EP 0 711 077 A2	05-08-1996	Haskell et al. (AT&T Corp)		
		EP 0 919 952 A1	06-02-1999	Mattavelli et al. (Ecole Poly.)		
		EP 1 641 271 A2	03-29-2006	Klemets et al. (Microsoft Corp.)		
		EP 1 670 256 A2	06-14-2006	Klemets et al. (Microsoft Corp.)		
		EP 1 777 969 A1	04-25-2007	___ (British Telecommunications)		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T ²
		PATHAN, Al-Mukaddim, et al., "A Taxonomy and Survey of Content Delivery Networks", Australia, February 2007. Available at http://www.gridbus.org/reports/CDN-Taxonomy.pdf	
		On2 Technologies, Inc., "TrueMotion VP7 Video Codec", White Paper, Document Version 1.0, January 10, 2005, (13 pages).	

Examiner Signature	/Ninos Donabed/	Date Considered	02/13/2009
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¹Applicant's unique citation designation number (optional). ²Applicant is to place a check mark here if English Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.**

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Notice of References Cited	Application/Control No. 11/116,783		Applicant(s)/Patent Under Reexamination MAJOR ET AL.	
	Examiner NINOS DONABED		Art Unit 2444	Page 1 of 1

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2003/0135631	07-2003	Li et al.	709/231
*	B	US-2002/0188745	12-2002	Hughes et al.	709/231
*	C	US-2004/0093420	05-2004	Gamble, Jonathan Bailey	709/231
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

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	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	899	(upconvert\$3 or upshift\$3) with (stream\$3 or (video with strem\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:04
S2	899	(upconvert\$3 or upshift\$3) with (stream\$3 or (video with stream\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:04
S3	0	(upconvert\$3 or upshift\$3) with (stream\$3 or (video with stream\$3)) same ((multiple or plurality or many or three or two) near3 copi\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:05
S4	2	(upconvert\$3 or upshift\$3) with (stream\$3 or (video with stream\$3)) same ((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:06
S5	85	(upconvert\$3 or upshift\$3) with (stream\$3 or (video with stream\$3)) and ("709"/\$\$.ccls. or "725"/\$\$.ccls.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:06
S6	81	(upconvert\$3 or upshift\$3) with (stream\$3 or (video with stream\$3)) and ("709"/\$\$.ccls. or "725"/\$\$.ccls.) and network	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:06
S7	12707	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4)) same (stream\$3 or (video with stream\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:08
S8	441696	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:08

S9	12707	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4)) same (stream\$3 or (video with stream\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:08
S10	1044	S9 and "709"/\$\$\$ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:09
S11	1044	S9 and "709"/\$\$\$ccls. and (stream\$3 or video)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:09
S12	299	S9 and "709"/231.ccls. and (stream\$3 or video)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:09
S13	6	("20020174434" "20030067872" "20040030797").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:12
S14	32	("20020174434" "20030067872" "20040030797").PN. or ("20020073167" "20050123058" "20070024705" "20080028428" "20080056373" "6091775" "6091777" "6510553" "6731600" "6732183" "6968387" "7075986" "7349976").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:12
S15	21	S14 and (Stream\$3 or (video with stream\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:13
S16	5	S14 and (Stream\$3 or (video with stream\$3)) and "709"/\$\$\$ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:13

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S21	7262	S9 and (stream\$3 or video) and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:18
S22	186	S9 and @ad<"20040430" and (upshift\$3 or upconvert \$3 or downshift\$3 or downconvert\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:19
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S25	1	S22 and "709"/230-234.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:20
S26	7913	"709"/230-234.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:20
S27	7	"709"/230-234.ccls. and (upconvert\$3 or upshift\$3 or downshift\$3) with (stream\$3 or (video with strem\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:21
S28	7	"709"/230-234.ccls. and (upconvert\$3 or upshift\$3 or downshift\$3) with (stream\$3 or (video with stream\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:22
S29	14	(real near2 network).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:32
S30	142	(sure-stream or sure adj stream or surestream)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:35
S31	26	(sure-stream or surestream)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:35
S32	2	"7054948".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:37
S33	1	"7054948".pn. and surestream	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 17:37

S34	9	"7406527".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 18:01
S35	855	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4))) same (stream\$3 or (video with stream\$3)) same server	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 18:02
S36	855	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4))) same (stream\$3 or (video with stream\$3)) same server and709/230-234.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 18:03
S37	855	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4))) same (stream\$3 or (video with stream\$3)) same server and709/231.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 18:03
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S39	94	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4))) same (stream\$3 or (video with stream\$3)) same server and (709/231.ccls. and @ad<"20040430")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 18:04
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S42	121	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4))) same3 (stream\$3 or (video with stream\$3)) same server and (709/231.ccls. and @ad<"20040430")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 19:25
S43	0	((dynamically near3 chang \$4) with (((multiple or plurality or many or three or two) near5 (version or format \$4 or copies or cop\$4)))) same3 (stream\$3 or (video with stream\$3)) same server and (709/231.ccls. and @ad<"20040430")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 19:30
S44	0	((dynamically near3 chang \$4) with (((multiple or plurality or many or three or two) near5 (version or format \$4 or copies or cop\$4)))) same3 (stream\$3 or (video with stream\$3)) same server	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 19:31
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S47	5	((dynamic\$5) with (((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop \$4)))) same3 (stream\$3 or (video with stream\$3)) same server	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 19:34
S48	3	S47 not S45	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 19:36

S49	782	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4)) same3 (stream\$3 or (video with stream\$3)) same server and (@ad<"20040430")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 19:45
S50	146	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4)) same3 (stream\$3 or (video with stream\$3)) same server and (@ad<"20040430") and ((dynamic\$5 or automatical \$5) near3 (upshift\$3 or downshift\$3 or upconvert\$3 or downcovnert\$3 or chan \$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 19:56
S51	78	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4)) same3 (stream\$3 or (video with stream\$3)) same server and (@ad<"20040430") and ((dynamic\$5 or automatical \$5) near3 (upshift\$3 or downshift\$3 or upconvert\$3 or downcovnert\$3 or chan \$4)) and "709"/\$\$\$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 19:58
S52	29	((multiple or plurality or many or three or two) near5 (version or format\$4 or copies or cop\$4)) same3 (stream\$3 or (video with stream\$3)) same server and (@ad<"20040430") and ((dynamic\$5 or automatical \$5) near3 (upshift\$3 or downshift\$3 or upconvert\$3 or downcovnert\$3 or chan \$4)) and "709"/230-234.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 20:01
S53	7913	"709"/230-234.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 20:02
S54	1660	(multi-rate and (stream\$3 or (video with stream\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 20:04

S55	11	(multi-rate and (stream\$3 or (video with stream\$3))).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/09 20:04
S56	6	("20020174434" "20030067872" "20040030797").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 14:44
S57	32	("20020174434" "20030067872" "20040030797").PN. or ("20020073167" "20050123058" "20070024705" "20080028428" "20080056373" "6091775" "6091777" "6510553" "6731600" "6732183" "6968387" "7075986" "7349976").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 14:45
S58	21	S57 and (stream\$3 or (video with stream\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 14:45
S59	1	S57 and (stream\$3 or (video with stream\$3)) and ((plurality or many or multiple) near5 (version or format or cop\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 14:46
S60	4	S57 and (stream\$3 or (video with stream\$3)) and ((plurality or many or multiple) near5 (version or format or cop\$3 or quality or (high and low)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 14:47
S61	670510	(plurality or many or three or two or multiple) near5 (file or cop\$3 or version or format\$3 or compress\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 14:51

S62	662	((plurality or many or three or two or multiple) near5 (file or cop\$3 or version or format \$3 or compress\$5)) with ((automatic\$4 or dynamic\$5) near5 (switch\$3 or chang\$3 or upshift\$3 or downshift\$3 or upconvert\$3 or downconvert\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 14:52
S64	72	S62 and "709"/\$\$\$ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:02
S65	62	S62 and "709"/\$\$\$ccls. and @ad<"20050408"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:05
S66	5	S62 and "709"/230-234.ccls. and @ad<"20050408"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:06
S67	424	((plurality or many or three or two or multiple) near5 (file or cop\$3 or version or format \$3 or compress\$5)) with ((automatic\$4) near5 (switch \$3 or chang\$3 or upshift\$3 or downshift\$3 or upconvert \$3 or downconvert\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:07
S68	425	((plurality or many or three or two or multiple) near5 (file or cop\$3 or version or format \$3 or compress\$5 or (bit adj2 rate or bit-rate))) with ((automatic\$4) near5 (switch \$3 or chang\$3 or upshift\$3 or downshift\$3 or upconvert \$3 or downconvert\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:08
S69	5	S68 and "709"/230-234.ccls. and @ad<"20050408"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:09
S70	12589	(stream\$3 or (video with stream\$3)) and ((plurality or many or multiple) near8 automat\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:10

S71	6937	(stream\$3 or (video with stream\$3)) and ((plurality or many or multiple) near4 automat\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:10
S72	26	(stream\$3 or (video with stream\$3)) and ((plurality or many or multiple) near4 automat\$5) and 709/231.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:11
S73	0	(stream\$3 or (video with stream\$3)) and ((plurality or many or multiple) near4 automat\$5) and 709/231.ccls. and (upshift\$3 or downshift\$3 or upconvert\$3 or downconvert\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:11
S74	2	(stream\$3 or (video with stream\$3)) and ((plurality or many or multiple) near4 automat\$5) and 709/230-234.ccls. and (upshift\$3 or downshift\$3 or upconvert\$3 or downconvert\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:12
S75	5236	709/231-234.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:12
S76	4485	709/231-234.ccls. and @ad<"20050408"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:12
S77	691	S76 and ((multiple or plurality or many or three) near5 files)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:13
S78	591	S76 and ((multiple or plurality or many or three) near3 files)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:14
S79	233	S76 and ((multiple or plurality or many or three) near3 copies)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:14

S80	1	S76 and ((multiple or plurality or many or three) near3 copies) near5 (encod\$3 or bit-rate or quality)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:15
S81	9	S76 and ((multiple or plurality or many or three) near3 (copies or files)) near5 (encod\$3 or bit-rate or quality)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:25
S82	1	S76 and ((multiple or plurality or many or three) near3 (copies))with (encod\$3 or bit-rate or quality)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:27
S83	1	S76 and ((multiple or plurality or many or three) near3 (copies)) with (encod\$3 or bit-rate or quality)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:27
S84	233	S76 and ((multiple or plurality or many or three) near3 (copies))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:28
S85	1	S76 and ((multiple or plurality or many or three) near3 (copies)) near5 (bit adj3 rate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:28
S86	6	@ad<"20050408" and ((multiple or plurality or many or three) near3 (copies)) near5 (bit adj3 rate)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:29
S87	251	(dynamic near5 stream\$3).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:32
S88	169	(dynamic near5 stream\$3).ti. and @ad<"20050408"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:34

S89	10	(dynamic near5 stream\$3).ti. and @ad<"20050408" and 709/230-234.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:34
S90	2	"5832300".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:40
S91	0	(dautomatic\$4 near5 stream \$3).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:41
S92	326	(automatic\$4 near5 stream \$3).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:41
S93	241	@ad<"20050408" and S92	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:42
S94	0	(automatic\$4 near5 stream\$3 with (upshift\$3 or downshift\$3 or upconvert\$3 or downconvert\$3)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:43
S95	0	(automatic\$4 near5 stream\$3 with (upshift\$3 or downshift \$3 or upconvert\$3 or downconvert\$3)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:43
S96	0	(automatic\$4 with stream\$3 with (upshift\$3 or downshift \$3 or upconvert\$3 or downconvert\$3)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:43
S97	3	(stream\$3 with (upshift\$3 or downshift\$3 or upconvert\$3 or downconvert\$3)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:43

S98	0	(stream\$3 with (video with stream\$3)).ti. and (automatic \$4 near4 switch\$3 near4 different near4 quality)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:52
S99	0	(stream\$3 with (video with stream\$3)) and (automatic\$4 near4 switch\$3 near4 different near4 quality)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:52
S100	1081374	(dynamic\$3 and switch\$3 and stream\$3 or video)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:57
S101	271819	(dynamic\$3 and switch\$3 and stream\$3 or video).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:58
S102	0	(dynamic\$3 and switch\$3 and stream\$3 and video).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:58
S103	0	(dynamic\$3 and switch\$3 and (stream\$3 and video)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:59
S104	0	(dynamic\$3 and (switch\$3 or shivt\$3 or upshift\$3) and (stream\$3 and video)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:59
S105	5	(automatic\$4 and (switch\$3 or shivt\$3 or upshift\$3) and (stream\$3 and video)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:59
S106	6	(automatic\$4 and (switch\$3 or shift\$3 or upshift\$3) and (stream\$3 and video)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 15:59

S107	108	(automatic\$4 and (switch\$3 or shift\$3 or upshift\$3) and (stream\$3 and video))	DERWENT	OR	ON	2009/02/11 16:00
S108	6	(automatic\$4 near5 (switch\$3 or shift\$3 or upshift\$3) near5 (stream\$3 and video))	DERWENT	OR	ON	2009/02/11 16:02
S109	1	(automatic\$4 near5 (copies or files or versions) near5 (stream\$3 and video))	DERWENT	OR	ON	2009/02/11 16:02
S110	11	(multiple or many or three or plurality) near5 ((files or version) near5 (quality or bit-rate or bit adj rate))	DERWENT	OR	ON	2009/02/11 16:03
S111	365	(multiple or many or three or plurality) near5 ((files or version) near5 (quality or bit-rate or bit adj rate))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:04
S112	37	S111 and 709/230-234.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:04
S113	108249	(multiple or many or three or plurality) near5 ((files or version))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:10
S114	1240	S113 and 709/230-234.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:11
S115	1038	S113 and 709/230-234.ccls. and @ad< "20050408"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:11
S116	11	S113 and 709/230-234.ccls. and (upshift\$3 or downshift\$3 or upconvert\$3 or downconvert\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:12
S117	3	S113 and 709/230-234.ccls. and ((upshift\$3 or downshift\$3 or upconvert\$3 or downconvert\$3) with (quality))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:14

S118	3	709/230-234.ccls. and ((upshift\$3 or downshift\$3 or upcovert\$3 or downconvert\$3) with (quality with (video or stream\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:14
S119	7	((upshift\$3 or downshift\$3 or upcovert\$3 or downconvert\$3) with (quality with (video or stream\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:15
S120	50419	microsoft.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:15
S121	981	microsoft.as. and (stream\$3). ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:16
S122	650	microsoft.as. and (stream\$3). ti. and @ad<"20050408"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:16
S123	6	microsoft.as. and (stream\$3 with quality).ti. and @ad<"20050408"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:17
S124	0	(automatica\$3 near5 switch \$3 near5 (different near5 qualit\$5) near5 (files or version))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:19
S125	0	(automatic\$5 near5 switch\$3 near5 (different near5 qualit \$5) near5 (files or version))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:20
S126	0	(automatic\$5 near5 switch\$3 near5 ((different near5 qualit \$5) near5 (files or version)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:20

S127	0	((automatic\$5 near5 (switch \$3 or upshift\$3 or downshift \$3 or upconvert\$3)) with ((different near5 qualit\$5) near5 (files or version)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:20
S128	6	((automatic\$5 near5 (switch \$3 or upshift\$3 or downshift \$3 or upconvert\$3)) with ((qualit\$5) near5 (files or version)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/02/11 16:22

2/ 13/ 2009 4:56:24 PM

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Electronic Acknowledgement Receipt

EFS ID:	4968127
Application Number:	11116783
International Application Number:	
Confirmation Number:	5535
Title of Invention:	Apparatus, system, and method for adaptive-rate shifting of streaming content
First Named Inventor/Applicant Name:	R. Drew Major
Customer Number:	08791
Filer:	Kevin Grange
Filer Authorized By:	
Attorney Docket Number:	8532P001
Receipt Date:	14-MAR-2009
Filing Date:	28-APR-2005
Time Stamp:	18:27:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		8532P001_After-Final_Response.pdf	156940 61fecf97e0224fe27d1d96168c8406729545caeb	yes	29

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Amendment After Final	1	1
	Claims	2	7
	Applicant Arguments/Remarks Made in an Amendment	8	29
Warnings:			
Information:			
Total Files Size (in bytes):		156940	
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AMENDMENTS

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of the claims in the application:

Listing of Claims:

1-19. (Cancelled)

20. (Currently amended) A method for presenting rate-adaptive streams, the method comprising:

streaming by a media player operating on an end user station a video from a server, wherein the video has a playback duration, wherein different copies of the video are stored on the server, wherein each of the different copies is encoded and compressed according to a different bit rate and includes the entire playback duration of the video, wherein the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, wherein corresponding portions of the different copies have the same time index in relation to the beginning of the video, and wherein the streaming comprises:

requesting by the media player a plurality of sequential portions of ~~a first one~~ of the copies encoded and compressed at ~~a first one~~ of the bit rates from the server over a plurality of Transmission Control Protocol (TCP) connections;

automatically and progressively requesting by the media player from the server over the plurality of TCP connections subsequent portions of the video ~~by requesting~~ from different ones of the copies dependent upon successive determinations by the media player to shift the playback quality to a higher or lower quality one of the different copies, said automatically and progressively requesting including,

regularly generating a set of one or more performance factors indicative of the current ability to sustain the streaming of the video using different ones of the copies, wherein the set of one or more factors relate to the performance of the network; and

making the successive determinations to shift the playback quality based on at least one of the performance set of factors to achieve continuous playback of the video using portions of the highest quality one of the copies determined sustainable at that time; and

presenting the video to the user by playing back with the media player the requested portions from the different copies in order of ascending playback time.

21. (Currently amended) The method of claim 20, ~~further comprising establishing the plurality of TCP connections with the server~~, wherein said requesting the plurality of sequential portions of the first one of the copies includes requesting sub-parts of the portions over different ones of the plurality of TCP connections, and wherein said ~~method~~ presenting further includes reassembling the portions from the received sub-parts.

22. (Currently amended) The method of claim 20, wherein:
said generating the ~~performance factors~~ set of factors comprises:

_____ monitoring time intervals between successive receive times for each of the requested portions;

_____ calculating a current performance ratio across a current window of samples of a playback length the time intervals; and

_____ calculating a current average of the performance ratio to obtain a current ~~one~~ performance factor of the ~~performance~~ set of factors;

said making further comprises:

_____comparing the current performance factor with a set of one or more trigger thresholds; and

_____determining whether to upshift or downshift to a higher or lower quality one of the different copies based on said comparing.

23. (Currently amended) The method of claim [[20]] 22, wherein said determining whether to upshift or downshift comprises:

upshifting to a higher quality one of the different copies when the current performance factor is greater than a first of the set of selected threshold~~thresholds~~; and
determining if the higher quality playback can be sustained.

24. (Currently amended) The method of claim 23, wherein said determining whether to upshift or downshift comprises downshifting to a lower quality one of the different copies when the current performance factor is less than a second of the set of selected threshold~~thresholds~~.

25. (Previously presented) The method of claim 20, further comprising:
receiving user input to enable fast-forward, skip randomly, and rewind functionality; and

requesting portions of the video at a specified time index that is not the next sequential time in the current playback.

26. (Currently amended) The method of claim 22, ~~further comprising:~~
~~_____wherein said requesting the plurality of sequential portions includes initially~~
requesting portions of video ~~off~~from a low quality one of the different copies to enable instant playback of the video[[:]], and wherein said automatically and progressively requesting includes subsequently~~subsequently~~ upshifting to a higher quality one of the

different copies according to the performance factor after initially requesting portions of the video of the low quality.

27-34. (Cancelled)

35. (Currently amended) The method of claim 20, ~~further comprising~~ establishing the plurality of TCP connections with the server, wherein said requesting the plurality of sequential portions of the ~~first one~~ of the copies includes requesting the plurality of sequential portions over different ones of the plurality of TCP connections.

36. (Currently amended) The method of claim 20, ~~further comprising~~ wherein said presenting comprises sequentially arranging the ~~received~~ requested portions from the different copies in the order of ascending playback time for playback on the media player.

37. (Currently amended) The method of claim 20, wherein said automatically and progressively requesting includes requesting sub-parts of the portions over different ones of the plurality of TCP connections, and wherein said ~~method~~ presenting further includes reassembling the portions from the received sub-parts.

38. (Currently amended) The method of claim 20, wherein at least one of the ~~performance factors~~ set of factors ~~are~~ is indicative of the available bandwidth of the plurality of TCP connections, ~~and a current read-ahead margin, wherein the current read-ahead margin is a current amount of contiguous, sequentially arranged, un-played portions of the video for playback on the media player.~~

39. (Currently amended) The method of claim ~~[[38]]~~ 20, wherein ~~the~~ said making comprises: ~~performance factors are indicative of a minimum safety margin~~

comparing a current performance factor of the set of factors with a set of one or more trigger thresholds, wherein the set of one or more trigger thresholds is determined by a combination of two of the set of factors relating to a current read ahead margin and a minimum safety margin, wherein the ~~minimum safety margin~~ current read ahead margin is a desired an amount of contiguously available, sequentially arranged requested portions of video received by the media player for playback on the media player, at a current playback time index; and

determining whether to upshift or downshift to a higher or lower quality one of the different copies based on said comparing.

40. (Currently amended) The method of claim 20, wherein at least one of the performance set of factors ~~are~~ is indicative of latency of the requested portions, wherein the latency is a time measure between when a request is issued and a time that response data of the requested portion begins to arrive at the end user station.

41. (Currently amended) The method of claim 20, wherein at least one of the performance set of factors ~~are~~ is indicative of time intervals between successive receive times for each response to the requested portions.

42. (Currently amended) The method of claim 20, wherein at least one of the performance set of factors ~~are~~ is indicative of delays or losses in one or more of the plurality of TCP connections.

43. (Currently amended) The method of claim 20, wherein the server is a web server, and wherein the ~~divided~~ portions are stored in separate files on the web server.

44. (Currently amended) The method of claim [[20]] 43, wherein the separate files are requested from the web server using Hyper Text Transfer Protocol (HTTP), and wherein the web server is without specialized server-side intelligence to retrieve respond to said requesting ~~the requested portions~~.

45. (Currently amended) The method of claim 20, wherein the server is a cache server of a network infrastructure operator, and wherein the ~~divided~~ portions are stored in separate files on the cache server.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of:

R. Drew Major

Application No.: 11/116,783

Filed: April 28, 2005

Art unit: 2144

Examiner: Donabed, Ninos J

For: APPARATUS, SYSTEM AND
METHOD FOR ADAPTIVE-RATE
SHIFTING OF STREAMING
CONTENT

Confirmation No.: 5535

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being submitted electronically via Facsimile on the date shown below.

/Kevin O. Grange/ March 14, 2009

Kevin O. Grange Date

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AMENDMENT AND RESPONSE TO OFFICE ACTION
under 37 C.F.R. § 1.116 – Expedited Procedure

Examiner:

In response to the Final Office Action mailed on Feb. 20, 2009, Applicant respectfully requests that the Examiner consider the following amendments and the following remarks.

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 8 of this paper.

REMARKS

Applicant respectfully requests reconsideration of this application in view of the following remarks. For the Examiner's convenience and reference, Applicant's remarks are presented in substantially the same order in which the corresponding issues were raised in the Final Office Action.

Interview Summary for Examiner Interview Conducted 3/11/2009

Applicant would like to thank the Examiners for the Examiner Interview. During the Interview, the art cited in the most recent Office Action was discussed, and it was agreed that the rejections were overcome, subject to additional review by the Examiner.

Claim Amendments

The amendments to claim 20 to add “by the media player,” “by the media player from the server,” and another “by the media player” are non-narrowing at least because they were inherently present. With regard to the first “by the media player,” the claim already required “streaming by a media player operating on an end user station a video from a server,” “wherein different copies of the video are stored on the server,” and “requesting ... from the server.” With regard to “by the media player from the server,” the “automatically and progressively requesting over the plurality of TCP connections” directly follows the “requesting ... from the server over a plurality of Transmission Control Protocol (TCP) connections,” and thus is performed by the media player from the server. With regard to the second “by the media player,” the fact that the “automatically and progressively requesting over the plurality of TCP connections” is performed by the media play means the “successive determinations” are by the media player. The amendments to claim 20 to change “a first of the copies” to “one of the copies” and “a first of the bit rates” to “one of the bit rates” have been made because there is no specific recitation to a second of the copies or at a second of the bit rates in the claim sets. These amendments are non-narrowing, since they have the same meaning. The amendment to claim 20 to remove “by requesting” is broadening, and thus, is a non-narrowing amendment. The amendments to claim 20 to change “performance factors” to “a set of one or more factors,” to add the clause “wherein the set of one or more factors relate to

the performance of the network,” and to change making the successive determinations “based on at least one of the set of factors,” are broadening, and thus, are non-narrowing amendments.

The amendment to claim 21 to remove “establishing the plurality of TCP connections with the server” is broadening, and thus, is a non-narrowing amendment. The amendment to claim 21 to change the “first of the copies” to the “one of the copies” is non-narrowing, since they have the same meaning. Also, the amendment to claim 21 to change “wherein said method further includes” to “wherein said presenting includes” is non-narrowing at least because it was inherently present. The claim already required “requesting *sub-parts of the portions*” as part of the streaming the video, and “presenting the video to the user by playing back ... *the requested portions*.” As such, the “presenting” limitation already inherently required reassembling the portions from the received sub-parts for presenting the video.

The amendments to claim 22 to change “the performance factors” to “the set of factors,” are broadening, and thus, are non-narrowing amendments. The amendment to claim 22 to add “of the performance ratio” is non-narrowing, since it was inherently present in the claim. The claim already required “calculating a current performance ratio” and “calculating a current average to obtain a current performance factor.” Clearly, the “calculating a current average” limitation already required “calculating a current average of the performance ratio.” The amendment to claim 22 to change “a current one of the performance factors” to “a current performance factor” is non-narrowing, since they inherently have the same meaning.

The amendments to claims 23 and 24, changing “a first selected threshold” to “a first of the set of thresholds,” and “a second selected threshold” to “a second of the set of thresholds,” are non-narrowing at least because they were inherently present. The claim already required “comparing the current performance factor with *a set of one or more trigger thresholds*” and “when the current performance factor is greater than a first selected threshold” and “when the current performance factor is less than a second selected threshold.” (emphasis added). As such, clearly the “first selected threshold” and “second selected threshold” were already part of the “set of one or more trigger

thresholds.” Also, the amendments to remove “selected” in claims 23 and 24 are broadening, and thus, are non-narrowing amendments.

As for claim 26, changing “subsequent” to “subsequently” is non-narrowing, since it has the same meaning. Also, the amendments to claim 26 to change “initially requesting portions” and “subsequently upshifting,” as being part of the limitations of “requesting ... the plurality of sequential portions” and “automatically and progressively requesting ... subsequent portions,” respectively, are non-narrowing at least because they were inherently present. The limitation of “initially requesting portions” already inherently referred to the requesting in the limitation of “requesting ... a *plurality of sequential portions of one of the copies* encoded and compressed at one of the bit rates,” and the limitation of “subsequently upshifting to a higher quality one” already inherently referred to the requesting of subsequent portions in the limitation of “automatically and progressively requesting ... subsequent portions of the video from different ones of the copies” (emphasis added). The amendment to claim 26 to change “of” to “from” is non-narrowing, since they inherently have the same meaning. Also, the amendment to claim 26 to remove “according to the performance factor after initially requesting portions of the video of the low quality” is broadening, and thus, is a non-narrowing amendment.

The amendment to claim 35 to remove “establishing the plurality of TCP connections with the server” is broadening, and thus, is a non-narrowing amendment. The amendment to claim 35 to change the “first of the copies” to the “one of the copies” is non-narrowing, since they have the same meaning. The amendment to claim 36 to change “wherein said method further includes” to “wherein said presenting includes” is non-narrowing because it was inherently present. The claim already required presenting the video to the user by playing back the requested portions “in order of ascending playback time.” As such, it is clear that “sequentially arranging” was already inherently part of “presenting the video to the user.” The amendment to claim 36 to change “received portions” to “requested portions” is non-narrowing, since they inherently have the same meaning. Also, the amendment to claim 37 to change “wherein said method further includes” to “wherein said presenting includes” is non-narrowing at least because it was inherently present. The claim already required “requesting *sub-parts of the portions*” as part of the streaming the video, and “presenting the video to the user by

playing back ... *the requested portions.*” As such, the “presenting” limitation already inherently required reassembling the portions from the received sub-parts for presenting the video.

The amendment to claim 38 to change the “performance factors” to “at least one of the set of factors,” and to remove “a current read ahead margin” and the following limitation, are broadening, and thus, are non-narrowing amendments. The amendments in claims 40-42 to change the “performance factors” to “at least one of the set of factors,” are broadening, and thus, are non-narrowing amendments. The amendments to claims 43 and 45 to change the “divided portions” to the “portions” are non-narrowing, since they have the same meaning. The amendments to claim 44 to change “without server-side intelligence to retrieve the requested portions” to “without specialized server-side intelligence to respond to said requesting” are non-narrowing because the amendments further limit the negative limitation of the web server, which broadens the scope of the claim.

Response to Rejections under 35 U.S.C. § 112, first paragraph

Claim 39 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. In particular, the Examiner asserts that “the minimum safety margin is a desired amount of contiguously available sequentially arranged portions of video for playback on the media player” is considered new matter. Applicant respectfully submits that claim 39 has been amended as follows:

The method of claim 38, wherein said making comprises:

comparing a current performance factor of the set of factors with a set of one or more trigger thresholds, wherein the set of one or more trigger thresholds is **determined by a combination of two of the set of factors relating to a current read ahead margin and a minimum safety margin, wherein the current read ahead margin is an amount of contiguously available, sequentially arranged requested portions of the video received by the media player for playback at a current playback time index;** and

determining whether to upshift or downshift to a higher or lower quality one of the different copies based on said comparing. (Emphasis added).

Applicant respectfully submits that the amendments for claim 39 are supported by the specification. For example, paragraph [0071] describes the following:

The policy determination about whether or not to upshift 710 playback quality begins by **comparing [the current performance factor] $\varphi_{current}$ with a trigger threshold Θ_{up}** . If $\varphi_{current} \geq \Theta_{up}$, then an up shift to the next higher quality stream may be considered 716. In one embodiment, **the trigger threshold Θ_{up} is determined by a combination of factors relating to the current read ahead margin (i.e. the amount of contiguously available streamlets that have been sequentially arranged by the staging module 409 for presentation at the current playback time index), and a minimum safety margin.** In one embodiment, the minimum safety margin may be 24 seconds.
(Applicant's specification, pages 21-22, paragraph 71.)

By way of example and not limitation, the sequentially arranged streamlets have a fixed duration (page 12, paragraph 45) in some embodiments, and thus, the read ahead margin can also be represented as an amount of playback time of the sequentially arranged streamlets. The specification also describes that the staging module 409 may be configured to arrange the streamlets 212 in order of ascending playback time. *Id.* at page 15, paragraph 53. Accordingly, Applicant respectfully requests that the rejection of claim 39 under 35 U.S.C. § 112, first paragraph, be withdrawn.

Response to Rejections under 35 U.S.C. § 112, second paragraph

The Examiner rejected claims 20-26 and 35-45 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as his invention.

1) "Performance Factors"

Regarding claims 20, 22-24, 26, and 38-42, the Examiner alleges that the phrase "performance factors" is vague and unclear. Applicant respectfully disagrees that the phrase "performance factors" is vague and unclear. However, in interest of advancing the claims to be in condition for allowance, Applicant respectfully amends claim 20 to overcome the Examiner's concern regarding "performance factors," as described below.

Claim 20 has been amended to recite "regularly generating *a set of one or more factors* indicative of the current ability to sustain the streaming of the video using different ones of the copies, wherein the set of one or more factors relate to the performance of the network" and "making the successive determinations to shift the playback quality *based on at least one of the set of factors*" (emphasis added). Such

amendment would encompass the Examiner's identified definition of "any factor which relates to the performance of the network in general" (see *FOA*, at page 3).

Applicant respectfully submits that the amendment is supported by the specification. Applicant respectfully submits that the specification describes various factors that can be generated, including, but not limited to, "a performance factor," according to receive times of requested portions (*Id.* at paragraphs 20, and 68), "a performance factor" according to time intervals Δ between successive receive times for each response (*Id.* at paragraph 68), "a current read ahead margin" for determining a trigger threshold (*Id.* at paragraph 71), "a current read ahead margin" for determining whether a higher quality stream is sustainable (*Id.* at paragraph 15), "a minimum safety margin" for determining a trigger threshold (*Id.* at paragraph 71), "a minimum safety margin" for determining whether a higher quality stream is sustainable (*Id.* at paragraph 15), and an amount of contiguously available requested portions stored in a staging module (*Id.*). These factors relate to the performance of the network in general. As such, the specification provides support for the amendment of "regularly generating a set of one or more factors indicative of the current ability to sustain the streaming of the video using different ones of the copies, wherein the set of one or more factors relate to the performance of the network," as recited in claim 20.

Applicant respectfully submits that the specification describes making successive determinations to shift the playback quality based on at least one of the set of factors to archive continuous playback of the video. By way of example and not limitation, the specification describes in relation to Figure 7 that the *network behavior characteristics can fluctuate*, sometimes quite suddenly, the media player can compensate for this fluctuation by calculating a *performance factor*, and comparing the performance factor with a trigger threshold. *Id.* at pages 21-22, paragraphs 68-70. Although the specification describes specific algorithms to obtain a performance factor by calculating a geometric mean or average of the 'performance ratio' of the time intervals Δ between successive receive times for each streamlet response, the specification also indicates that these algorithms can be "replaced by alternative streamlet monitoring solutions." *Id.* at page 22, paragraph 72. As such, the specification also provides support for using other monitoring solutions to obtain other factors which relate to the performance of the network in

general, such as, for example, factors that are indicative of latency, delays or losses of the requested portions¹, and available bandwidth of the TCP connections².

For the foregoing reasons, Applicant respectfully submits that claim 20, as amended, is not vague and unclear. Accordingly, Applicant respectfully submits that this proposed amendment overcomes the rejection of claim 20 under 35 U.S.C. §112, second paragraph, and requests that the rejections of claims 22, 22-24, 26, and 38-42 under 35 U.S.C. § 112, second paragraph, be withdrawn.

2) “Requesting Sub-Parts”

Regarding claims 21 and 37, the Examiner alleges that the phrase “requesting sub-parts of the portions over different ones of the plurality of TCP connections” is vague and unclear. The Examiner interprets the term “sub-parts” to mean “any part of the copies of the video files.” *FOA*, at page 3. Applicant respectfully submits that the claim language requires that the “sub-parts” encompass **any part of the requested portions of the video, not just any part of the copies of the video files**. By way of example and not limitation, the specification describes embodiments where the media player requests streamlets, each streamlet having a portion of the video, and those portions of the video can be requested by “requesting pieces of any streamlet file.” Applicant’s specification, at page 16, paragraph 56. The specification describes that streamlets, for example, can be encapsulated as an independent media object, and can be any sized portion of the video contained in the original content file. *Id.* at page 12, paragraph 45. The content in a streamlet (i.e., portion of the video) has a unique time index in relation to the beginning of the content contained in a stream (i.e., a copy of the video that has been encoded and compressed according to a bit rate and includes the entire playback duration of the video), and has a fixed duration of time (e.g., 2 seconds). *Id.* As set forth in claims 20, the

¹By way of example and not limitation, the specification describes latency of the requested streamlets, and delays or losses of the responses to the requests as *other factors in performance*, and proposes at least one embodiment where multiple TCP connections may be opened between the client and server to achieve the latency-reduction efficiency benefits of pipelining while not having serial dependency between requests in traditional pipelining. *Id.* at pages 17-18, paragraph 59-60.

² By way of example and not limitation, the specification describes that the available bandwidth of the user’s network connection and how well the user’s available bandwidth is used (i.e., efficiency) can constrain the quality of video that can be received for real time presentation, and proposes at least one embodiment where multiple responses may be in transit concurrently, assuring that communication bandwidth between the client and server is always being utilized. *Id.* at page 17-18, paragraph 60.

“different copies are divided into *portions* whose playback is the same portion of the video for each of the different copies,” and “corresponding portions of the different copies have the same time index in relation to the beginning of the video.” Claim 21 further recites “requesting sub-parts of the portions over different ones of the plurality of TCP connection.” By way of example and not limitation, the Applicant’s specification indicates that the parts of these portions of the video (e.g., streamlets) can be requested using parallel TCP connections, with each part requested on mutually independent TCP connections. *Id.* at page 16, paragraph 53, page 17, paragraph 57, and page 18, paragraph 61. Applicant’s specification describes that “splitting the requested streamlet into smaller pieces or portions beneficially allows for an increased efficiency potential, and also eliminates problems associated with multiple full-streamlet requests sharing the bandwidth at any given moment.” *Id.* Applicant has used “sub-parts” to distinguish the pieces or parts of the portion of video from the portion itself. As such, the sub-parts of the portions of video encompass any part of the requested portions of the video, not just “any part of any of the copies of the video files,” as alleged by the Examiner. For these reasons, Applicant respectfully submits that claims 21 and 37 are not vague and unclear, and requests that the rejections of claims 21 and 37 under 35 U.S.C. § 112, second paragraph, be withdrawn.

3) “Plurality of TCP Connections”

Regarding claim 20, the Examiner alleges that the phrase “requesting by the media player a plurality of sequential portions of one of the copies encoded and compressed at one of the bit rates from the server over a plurality of Transmission Control Protocol (TCP) connections” is vague and unclear as it is not understood whether the plurality of connections is with a plurality of devices or just a single device. Applicant respectfully submits that claim 20 has been amended to recite “*requesting by the media player a plurality of sequential portions ... from the server over a plurality of Transmission Control Protocol (TCP) connections*” and “*automatically and progressively requesting by the media player from the server over a plurality of TCP connections subsequent portions of the video from different ones of the copies ...*” Applicant submits that claim 20, as amended, is not vague and unclear, and requests that the rejection of claim 20 under 35 U.S.C. § 112, second paragraph, be withdrawn.

Response to Rejections under 35 U.S.C. § 103(a)

In the Final Office Action (FOA), the Examiner rejects claims 20-21, 23-24, 26, 35-38, and 40-44 under 35 U.S.C §103(a) as being unpatentable over *Hughes* in view of *Li* and further in view of *Gamble*, and claims 22, 25, 39, and 45 under 35 U.S.C §103(a) as being unpatentable over *Hughes* in view of *Li*, further in view of *Gamble*, and further in view of Official Notice. Applicant respectfully submits that claims 20-26 and 35-45 are patentable over the combination of cited references for at least the following reasons:

1) Combination of *Hughes* and *Li* Does not Arrive at the Claimed Invention

As described in detail below, *Hughes* describes that instead of doing A (multiple copies), do B (stacked media file); *Li*'s background section describes A; the Office Action cites to B from *Hughes*, ignoring *Hughes*' background section in asserting *Hughes* lacks A, cites to A from *Li*, asserts A and B are combinable (although, *Hughes* suggests they are not), and fails to explain how the combination would work in view of *Hughes*' background section. As such, *Hughes*' background section describing A and its problems has been ignored; the combination of A+B is inappropriate because *Hughes* describes using B instead of A; the combination of A+B, if possible, is not explained in view of *Hughes*' background section, and the combination of A+B, if possible, does not teach the claimed invention.

Hughes describes in the background section that a conventional system for transferring media files over the Internet, in which multiple copies of the same media file are encoded for differing access speeds (A). *Hughes*, page 1, paragraph 9. To address problems with the multiple copies approach³, *Hughes* proposes in the detailed description section shifting between quality-based segregated data sets of a *pecially formatted media file* (B) to allow for seamless shifting, *in lieu of* shifting between multiple copies (A) of the same media file, which are encoded for differing access speeds. *Id.* at page 2, paragraph 11, and page 2, paragraphs 20 and 22.

³ *Hughes* describes that these multiple copies involve many redundancies in the data stored, which translates into the need for substantial amounts of extra data storage capacity and a substantial waste of bandwidth. *Id.* at paragraph 8. *Hughes* also describes that there is no simple way presently available for the user to be shifted seamlessly to a file encoded at a higher sampling rate or a file encoded at a lower sampling rate. *Id.* at pages 1-2, paragraph 9.

The Office Action cites to sections of the detailed description (B) to support the allegation that *Hughes* teaches various limitations of claim 20, including “automatically and progressively requesting ... subsequent portions of the video from different ones of the copies dependent upon successive determinations by the media player to shift the playback quality ... to achieve continuous playback of the video using portions of the highest quality one of the copies.” *FOA*, at page 4, citing *Hughes* at pages 4-5, paragraph 37-40. Then, the Office Action ignores *Hughes*’ background section describing the use of different copies of the video (A), and proposes a combination with *Li*, citing to the background section of *Li* for the allegation that *Li* teaches different quality copies of a video (A). *Id.*, citing *Li*, at page 1, paragraph 7-12. Since the background section of *Hughes* teaches different copies (A) of the same media file, which are encoded for differing access speeds, the Office action, in effect, reverts back to the teachings presented in the background section of *Hughes* (A) by combining *Hughes* with *Li*. *Hughes*, page 1, paragraph 9.

In addition to the combination being improper, Applicant respectfully submits that the background section of *Hughes* fails to teach at least **“automatically and progressively requesting by the media player from the server ... subsequent portions of the video from different ones of the copies dependent upon successive determinations by the media player to shift the playback quality ... to achieve continuous playback of the video** using portions of the highest quality one of the copies,” as recited in claim 20, because *Hughes* teaches that shifting between multiple copies of the same media file cannot be done seamlessly. *Hughes*, at pages 1-2, paragraph 9. Applicant respectfully submits that *Li* fails to cure the deficiencies described in the background of *Hughes*. In particular, *Li* teaches that the server can automatically change to higher or lower bit rate versions of the media file, responsive to bandwidth changes during transmission, but such switching results in “noticeable artifacts in the file playback where file bit rate is changed during playback.” *Li*, at page 1, paragraph 8. As such, *Li*’s shifting is not seamless. In addition, *Li* does not address the artifact problem by improving how switches are performed, but rather by reducing the number of switches. Specifically, *Li* suggests using buffering, where playback of the media file is delayed on the client for a period of time, which tends to smooth out

bandwidth fluctuations, thereby reducing, but not entirely eliminating the need to sometimes switch between different media file bit rates. *Li*, at paragraph 9. In effect, *Li*'s teachings encourage buffering to smooth out bandwidth fluctuations so that the server doesn't have to switch, since such switching is not seamless, but causes noticeable artifacts. Thus, *Li* fails to cure the deficiencies described in the background section of *Hughes*. Thus, the appropriate combination of *Hughes* and *Li* is multiple copies (A) (as described in the background of *Hughes* and *Li*) using the buffering technique of *Li* to reduce the number of switches in an effort to reduce the artifact problem.

Notwithstanding the fact that the following arguments address the how the cited passages in the detailed description of *Hughes*, in combination with the teachings of *Li*, fail to teach various limitations of the claim, Applicant respectfully maintains that the combination of *Hughes* and *Li* is improper because the Office Action improperly cites passages of the detailed description in *Hughes* when such combination reverts back to the teachings in the background section of *Hughes*.

2) Shifting the Playback Quality by Requesting Portions of Different Copies by the Media Player to Achieve Continuous Playback of the Video

Applicant respectfully submits that *Hughes* teaches dynamically switching between different quality versions of a selected stacked media file (B) as a function of instantaneous connection speed to the user's computer, as determined by the server. *Hughes*, page 5, paragraph 37. *Hughes* does very little to explain how the switching is done with (B). More to the point, as previously explained, *Hughes* describes doing B (stacked media file) instead of doing A (multiple copies) in part because when using multiple copies (A) there is no simple way presently available for the user to be shifted seamlessly to a file encoded at a higher sampling rate or a file encoded at a lower sampling rate. *Id.* at pages 1-2, paragraph 9. This is consistent with *Li*'s "artifact" problem described below.

Li teaches that the server can automatically change to higher or lower bit rate versions of the media file (B), responsive to bandwidth changes during transmission. *Li*, at page 1, paragraph 8. *Li*, however, teaches that such switching between files having different bit rates results in "noticeable artifacts in the file playback where file bit rate is

changed during playback.” *Id.* *Li* does not address the artifact problem by improving how switches are performed, but rather by reducing the number of switches. Specifically, *Li* suggests using buffering, where playback of the media file is delayed on the client for a period of time, which tends “to smooth out bandwidth fluctuations, thereby reducing, but not entirely eliminating the need to sometimes switch between different media file bit rates.” *Li*, at paragraph 9. As such, *Li*’s teachings encourage buffering to smooth out bandwidth fluctuations so that the server doesn’t have to switch, since such switching causes noticeable artifacts without buffering.

In contrast to *Li*, the Applicant’s claimed invention uses different copies and encourages shifts in the playback quality, because of how it switches, to allow the media player to request and present the highest quality sustainable, given such bandwidth fluctuations. The first argument (labeled 2a) articulates the combination of cited references failure to teach how the different copies are “divided into portions,”⁴ and the following arguments (labeled 2b), and 2c)) articulate some of the advantageous acts derived from the different copies being divided into portions. Some of the advantages of the Applicant’s claimed invention are directed to how to shift the playback quality by anticipating a poor user experience and requesting portions of different copies of the video by the media player to achieve continuous playback of the video.

2a) Different Copies “Divided into Portions”

Applicant respectfully submits that the combination of cited references fails to teach “streaming by a media player operating on an end user station a video from a server, wherein the video has a playback duration, wherein different copies of the video are stored on the server, wherein each of the different copies is encoded and compressed according to a different bit rate and includes the entire playback duration of the video, **wherein the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, wherein corresponding portions of the different copies have the same time index in relation to the beginning of the video,**” as recited in claim 20, for the following reasons:

⁴ Neither *Hughes* nor *Li* describe the claimed multiple copies that are each divided into the same time indexes of the video to form portions whose playback is the same position of the video for each of the different copies.

Hughes Fails to Teach “Divided into Portions” of the Video

First, the Office Action acknowledges that *Hughes* detailed description section does not teach “different copies of the video,” and is non-specific as to the other above quoted limitations. This lack of specificity was initially believed to mean that *Hughes* lacked these limitations as well, but the Office Action does not identify them in *Li* either. Applicant respectfully submits that *Hughes*’ detailed description does not teach “different copies of the video,” as well as the other limitations, including the divided “portions” of the video and related limitations for the following reasons. If the Examiner believes *Hughes* describes such limitations, Applicant requests that such be articulated in an interview or new/supplemental Office Action.

Hughes’s detailed description teaches, in response to a user’s query to a database containing a stacked media file and upon selection by a user of a result of the query, the server determines the connection speed to the user’s computer and *the server selects the appropriate portions of the stacked media file to be sent to the client from the server.* *Hughes*, page 4, paragraph 37, and Figure 1. The meaning of “portions” required by Applicant’s claim language⁵ is completely different from that of *Hughes* because *Hughes* describes that each portion represents a different quality version of the media file, and thus portions have nothing to do with a time index, etc. *Id.* at paragraph 37. Specifically, the “*portions* of the stacked media file” in *Hughes* refer to data sets (or stacks) of the especially formatted media file, where each successive data set contains only data points not found in the preceding data set. *Id.* at paragraph 22. Because the data in each successive data set contains only data points not found in the preceding data set, the media file of *Hughes* is divided according to the differences in data points generated at different sampling rates or frequencies, not time. As such, the data sets or portions of the stacked media file of *Hughes* do not constitute the claimed “portions” of the video and the different copies, because the media file is not “divided into portions whose playback is the same portion of the video for each of the different copies,” as recited in claim 20. Also, *Hughes* does not teach that media file is divided into portions where “corresponding

⁵ “wherein the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, wherein corresponding portions of the different copies have the same time index in relation to the beginning of the video.”

portions of the different copies have the same time index in relation to the beginning of the video,” as recited in claim 20.

Hughes Fails to Teach Requesting “Portions” of the Video

Since *Hughes* lacks the above limitations, *Hughes* also fails to teach the subsequent limitations that use the portions - “requesting ... a plurality of **sequential portions of one of the copies** encoded and compressed at one of the bit rates...,” and “automatically and progressively requesting ... **subsequent portions of the video from different ones of the copies...**”.

Li Fails to Cure the Deficiencies of Hughes

Applicant respectfully submits that *Li* fails to cure the above noted deficiencies of *Hughes*.

Li teaches a multi-rate scheme that generates, for each media file, several compressed media files (each compressed at a different bit rate), and in which the server “determines the available bandwidth between the server and the client, and sends [one of the] compressed media file[s] having the highest bit rate that can be successfully transmitted using the given bandwidth.” *Li*, page 1, paragraph 8, material in brackets added for clarity. Although *Li* teaches generating several compressed files (A) at different bit rates for each media file, does not describe the claimed “divided into portions whose playback is the same portion of the video for each of the different copies” and the claimed “corresponding portions of the different copies have the same time index in relation to the beginning of the video,” as recited in claim 20.

Li Fails to Teach Requesting “Portions” of the Video

Moreover, as described above, *Hughes* fails to teach “requesting a plurality of sequential portions of one of the copies...,” and “automatically and progressively requesting ... subsequent portions of the video from different ones of the copies...,” recited in claim 20. Since the compressed files of *Li* are not divided into portions, as described above, Applicant respectfully submits that *Li* cannot teach requesting such portions.

Gamble Fails to Cure the Deficiencies of Hughes and Li

Applicant respectfully submits that *Gamble*, which has been used by the Office Action to address the claimed plurality of TCP connections, fails to cure the above noted

deficiencies of *Hughes* and *Li* because *Gamble* fails to teach the limitations identified above.

Therefore, the combination of cited references fails to teach at least the limitations identified above of claim 20.

2b) Continuous Playback of the Video using Multiple Copies

Claim 20 recites in pertinent part:

automatically and progressively requesting by the media player from the server ... subsequent portions of the video from different ones of the copies dependent upon successive determinations by the media player to shift the playback quality ... including,

...

making the successive determinations to shift the playback quality ... **to achieve continuous playback of the video using portions** of the highest quality one of the copies determined sustainable at that time.

(Emphasis added).

Because the “copies” are “divided” into “portions” as described above, the “portions” are requestable and the media player can automatically and progressively request subsequent portions of the video from different copies dependent upon successive determinations to shift the playback quality **in order to achieve continuous playback of the video**. As such, the media player, by requesting portions of different quality copies based on the successive determinations, can achieve continuous playback of the video without the problem described in the background of *Hughes* and *Li*.

Applicant also respectfully submits that the media player can achieve continuous playback of the requested video without the problem described in the background of *Hughes* and of *Li* because the shifts between the playback quality occur during playback at portion boundaries. The “requests” are for “portions,” so the “shifts” occur at the “portion” level; and the “portions” of the different “copies” are the “same portion of the video;” so shifts happen on portion boundaries and the portion boundaries of the copies at the same time index in the video – meaning playback is continuous.

As described above, *Li* teaches that the switching of *Li* results in “noticeable artifacts,” and describes buffering to reduce the number of required shifts. *Hughes* describes doing B (stacked media file) instead of doing A (multiple copies) in part because when using multiple copies (A) there is no simple way presently available for the

user to be shifted seamlessly to a file encoded at a higher sampling rate or a file encoded at a lower sampling rate. *Id.* at pages 1-2, paragraph 9 As such, *Hughes* individually and the combination of *Hughes* and *Li* fails to teach “**automatically and progressively requesting by the media player from the server ... subsequent portions of the video from different ones of the copies ...**, and making the successive determinations to shift the playback quality ... to **achieve continuous playback of the video using portions of the highest quality one of the copies** determined sustainable at that time,” as recited in claim 20.

Gamble, which has been used by the Office Action to teach plurality of TCP connections, also fails to cure this deficiency because *Gamble* does not teach all the identified limitations recited in claim 20.

Therefore, the combination of cited references fails to teach at least these limitations of the claim.

2c) Requesting “by the Media Player From the Server” and Related Limitations

In particular, claim 20 recites in pertinent part “**requesting by the media player** a plurality of sequential portions ... **from the server**,” and “automatically and progressively **requesting by the media player from the server**... subsequent portions of the video.” Applicant respectfully submits that because the different copies are *divided into portions* whose playback is the same portion of the video for each of the different copies, and because each portion is requestable, the media player can request the portions of the different copies of the video from the server, instead of the server pushing the video to the media player.

Hughes Fails to Teach “Automatically and Progressively Requesting by the Media Player from the Server”

Applicant respectfully submits that *Hughes* teaches that *a server dynamically switches* between different quality versions of a stacked media file (B) by determining the connection speed to the user’s computer and selecting the appropriate version for streaming to the user. *Hughes*, page 4, paragraph 37, Figure 1, elements 19 and 11. Although the software player on the user’s computer of *Hughes* may allow the user to

manually select the stacked media file (B) to be streamed by the server, the *server monitors* the instantaneous connection speed and *changes* between quality versions of the media file (B) by selecting the appropriate data sets of the stacked media file (B) to be sent to the user's computer, *effectively pushing the data of the media file to the user's computer*. *Id.* Also, nothing in *Hughes* teaches or suggests that these operations could be performed by the software player on the user's computer, instead of by the server. Moreover, such modifications to the system of *Hughes* would be contrary to the push-based streaming configuration described in *Hughes*. For the foregoing reasons, *Hughes* fails to teach the limitation identified above.

Li Fails to Teach “Automatically and Progressively Requesting by the Media Player from the Server”

Li, which has been used by the Office Action for a separate limitation, fails to cure this deficiency because *Li* also teaches that the server determines the available bandwidth between the server and the client, and *the server sends the compressed media file having the highest bit rate to the client, in response to changes in the bandwidth determined by the server*. *Li*, page 1, paragraph 8.

Gamble Fails to Teach “Requesting by the Media Player from the Server” Portions

Gamble, which has been used by the Office Action to teach the claimed plurality of TCP connections, also fails to cure this deficiency because *Gamble* does not teach all the identified limitations recited in claim 20.

Therefore, the combination of cited references fails to teach at least these limitations of the claim.

3) Multiple TCP connections

Applicant respectfully submits that because the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, and because the portions are requestable by the media player, the media player can request the plurality of sequential portions of the video and the subsequent portions of the video *over a plurality of TCP connections*.

Claim 20 recites in pertinent part:

requesting by the media player a plurality of sequential portions of one of the copies encoded and compressed at one of the bit rates from the server over a plurality of Transmission Control Protocol (TCP) connections,

...

automatically and progressively requesting by the media player from the server over the plurality of TCP connections subsequent portions of the video from different ones of the copies ...

(Emphasis added).

The Examiner acknowledges that *Hughes* and *Li* do not teach “a plurality of TCP connections,” but alleges that *Gamble* cures this deficiency. *FOA*, at pages 5-6. In support of this conclusion, the Examiner states that *Gamble* teaches “requesting a plurality of sequential files over a plurality of TCP connections.” *Id.* Applicant respectfully disagrees that *Gamble* cures this deficiency.

Applicant respectfully submits that *Gamble* teaches a method and system for transferring large data files over parallel connections between applications operating on respective computing systems. *Gamble*, Abstract. More specifically, *Gamble* teaches that the TCP layer *segments data into packets* for delivery to a destination computing system, by *segmenting a file into a set number of bytes* (e.g., “READCHUNK”), and stores each segment in a send buffer to be sent to the application on the destination computing system. *Id.* at page 3, paragraph 36 and 40. Although *Gamble* teaches that the TCP layer establishes parallel TCP connections between the client application and the server application, *Gamble* does not teach that an application like a media player can request segments from different copies over the parallel TCP connections. In effect, *Gamble* teaches that once a file has been selected to be sent to the destination application, the TCP layer of the originating application segments the selected file into segments, stores them into a send buffer, and sends the segments over the parallel TCP connections. As such, *Gamble* does not teach requesting individual segments of the file, much less requesting segments from different files. Therefore, *Gamble* fails to teach “**requesting by the media player a plurality of sequential portions of one of the copies** encoded and compressed at one of the bit rates from the server **over a plurality of Transmission Control Protocol (TCP) connections,**” and “**automatically and progressively requesting by the media player from the server over the plurality of TCP connections subsequent portions of the video from different ones of the copies,**” as recited in claim 20.

In addition, Applicant respectfully submits that the teachings of *Gamble* combined with the teachings of *Li* and *Hughes* would result in a server that makes determinations to switch to a compressed file having a different bit rate, segments the compressed file into packets, and sends the packets over parallel TCP connections to push the data to the client. Such combination still fails to teach that the client can request individual portions of the video from different copies over the parallel TCP connections.

Moreover, as described above, both *Hughes* and *Li* fail to teach that the different copies of the video are divided into portions. Thus, for *Gamble* to cure the deficiency of the limitations above, *Gamble* would need to teach requesting ***portions from different copies of video*** over the parallel TCP connections, not just transmission of the segments over the parallel TCP connection. Since *Gamble* does not specifically teach that the segments of the files are portions of different copies of the video, *Gamble* fails to cure the deficiencies of *Hughes* and *Li*.

Therefore, the combination of cited references fails to teach at least these limitations of the claim.

4) Conclusion

In sum, given that the combination of cited references fails to teach all of the limitations of the claim, Applicant respectfully submits that claim 20 is patentable over the combination of cited references. Accordingly, Applicant requests that the rejection of claim 20 under 35 U.S.C. § 103(a) be withdrawn.

Given that claims 21-26 and 35-45 depend from independent claim 20, which is patentable over the cited reference, Applicant respectfully submits that dependent claims 21-26 and 35-45 are also patentable over the combination of cited references. Accordingly, Applicant requests that the rejection of claims 21-26 and 35-45 under 35 U.S.C. § 103(a) be withdrawn.

Response to Rejections under 35 U.S.C. § 103(a) using Official Notice

The *FOA* rejects claims 22, 25, 39, and 45 under 35 U.S.C §103(a) as being unpatentable over *Hughes* in view of *Li*, further in view of *Gamble*, and further in view of Official Notice. The *MPEP* provides that “[i]n certain circumstances where appropriate,

an examiner may take official notice of facts not in the record or rely on ‘common knowledge’ in making a rejection, however such rejections should be judiciously applied. *MPEP* 2144.03. The *MPEP* also provides that it is not appropriate for the examiner to take official notice of facts without citing a prior art reference where the facts asserted to be well known *are not capable of instant and unquestionable demonstration as being well-known*. *MPEP* 2144.03(A), citing, *inter alia*, *In re Eynde*, 480 F.2d 1364, 1370, stating “[t]he facts constituting the state of the art are normally subject to the possibility of rational disagreement among reasonable men and are not amendable to taking of such notice.”). The *MPEP* also provides that “[i]f such notice is taken, the basis for such reasoning must be set forth explicitly,” providing specific factual findings predicated on sound technical and scientific reasoning to support his or her conclusion of common knowledge. *MPEP* 2144.03(B). Applied here, the Examiner has taken Official Notice to entire dependent claims, including the entire limitation of multiple claim limitations, without citing a prior art reference.

For example, the Office Action, in the analysis of claim 22, indicates that combination of *Hughes*, *Li*, and *Gamble* fails to teach the four separate limitations of the claim, but takes Official Notice for all of the limitations introduced in the claim. *FOA*, at page 11. The reasoning, provided by the Office Action for taking the Official Notice, is deficient because the Office Action only provides two conclusory statements that “[i]t would have been obvious to have known that multiple techniques could be implemented to derive a performance factor including ratios, averages as well as trigger thresholds,” and that “[o]ne of ordinary skill would have known that in order to automatically switch between the different qualities of the copies of the video, a threshold would have to be incorporated.” These conclusory statements do not provide an explicit reasoning with specific factual findings predicated on sound technical and scientific reasoning to support the Office Action’s conclusion of common knowledge, as required by the *MPEP*. Moreover, although there may be various techniques for deriving a performance factor, claim 22 sets forth a specific technique that monitors time intervals between successive receive times for each of the requested portions, calculates a current performance ratio across a current window of the time intervals, and calculates a current average of the performance ratio to obtain a current performance factor of the set of factors. These

operations are not of the type of facts that would be *capable of instant and unquestionable demonstration as being well-known*, without supporting evidence, as set forth in *MPEP* 2144.03(A).

Similarly, the limitations of claims 25, 39, and 45 include similar limitations that are not capable of instant and unquestionable demonstration as being well-known. Because the limitations of claim 25, 39, and 45 are not capable of instant and unquestionable demonstration as being well-known, Applicant respectfully submits that the Office Notices taken in claims 25, 39, and 45 are improper.

If the Examiner maintains the rejection of claims 22, 25, 39, and 45, Applicant respectfully requests the Examiner produce authority for each of factual assertions as required by *MPEP* 2144.03(C). In particular, the Examiner must provide documentary evidence, and point to some concrete evidence in the record in support of these finding. Also, if the Examiner is relying on personal knowledge to support the finding of what is known in the art, provision of an affidavit or declaration setting forth specific factual statements and explanation to support the finding. *MPEP* 2144.03(C).

CONCLUSION

It is respectfully submitted that in view of the amendments and remarks set forth herein, the rejections have been overcome, putting the claims in condition for allowance. If the Examiner believes a telephone interview would expedite the prosecution of this application, the Examiner is invited to contact Kevin Grange at (408) 720-8300.

If there are any additional charges, please charge them to Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: March 14, 2009

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/116,783	04/28/2005	R. Drew Major	8532P001	5535
8791 7590 03/20/2009 BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP 1279 OAKMEAD PARKWAY SUNNYVALE, CA 94085-4040			EXAMINER DONABED, NINOS J	
			ART UNIT 2444	PAPER NUMBER
			MAIL DATE 03/20/2009	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Interview Summary	Application No. 11/116,783	Applicant(s) MAJOR ET AL.	
	Examiner NINOS DONABED	Art Unit 2444	

All participants (applicant, applicant's representative, PTO personnel):

(1) NINOS DONABED. (3) Kevin Grange (Reg# 60793).

(2) LASHONDA JACOBS. (4) Dan DeVos (Reg # 37813).

Date of Interview: 11 March 2009.

Type: a) ☐ Telephonic b) ☐ Video Conference
c) ☒ Personal [copy given to: 1) ☐ applicant 2) ☒ applicant's representative]

Exhibit shown or demonstration conducted: d) ☒ Yes e) ☐ No.
If Yes, brief description: Interview Agenda, Attached.

Claim(s) discussed: All.

Identification of prior art discussed: Hughes (20030135631), Li (20020188745), Gambie (20040093420).

Agreement with respect to the claims f) ☐ was reached. g) ☒ was not reached. h) ☐ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: See Continuation Sheet.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN A NON-EXTENDABLE PERIOD OF THE LONGER OF ONE MONTH OR THIRTY DAYS FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

/Ninos Donabed/ Examiner, Art Unit 2444	/William C. Vaughn, Jr./ Supervisory Patent Examiner, Art Unit 2444
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Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.

All business with the Patent and Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: The interview began with Applicant's representatives briefly describing the claimed invention. They then went on to explain how they believed the claimed invention was different than the prior art of record and how they believed their invention solves some of the existing problems in the prior art. A discussion on claim clarity ensued which allowed the Examiners the opportunity to obtain more information regarding the claim limitations as they relate to the specification and drawing of the invention.

Search Notes 	Application/Control No. 11116783	Applicant(s)/Patent Under Reexamination MAJOR ET AL.
	Examiner NINOS DONABED	Art Unit 2444

SEARCHED			
Class	Subclass	Date	Examiner
709	246	05/07/2008	ND

SEARCH NOTES		
Search Notes	Date	Examiner
See EAST Search History	05/07/2008	ND
Conducted double patenting search	05/07/2008	ND
Consulted with SPE William Vaughn	11/13/2008	ND
See updated EAST search	12/13/2009	ND
Consulted with SPE William Vaughn regarding Final	02/12/2009	ND
Consulted with SPE William Vaughn regarding Advisory	03/29/2009	ND

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/116,783	04/28/2005	R. Drew Major	8532P001	5535
8791 7590 04/02/2009 BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP 1279 OAKMEAD PARKWAY SUNNYVALE, CA 94085-4040			EXAMINER DONABED, NINOS J	
			ART UNIT 2444	PAPER NUMBER
			MAIL DATE 04/02/2009	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Advisory Action Before the Filing of an Appeal Brief	Application No. 11/116,783	Applicant(s) MAJOR ET AL.	
	Examiner NINOS DONABED	Art Unit 2444	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 14 March 2009 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:

- a) ☐ The period for reply expires _____ months from the mailing date of the final rejection.
 b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
 Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
 (a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
 (b) ☐ They raise the issue of new matter (see NOTE below);
 (c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
 (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
 5. ☐ Applicant's reply has overcome the following rejection(s): _____.
 6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
 7. ☒ For purposes of appeal, the proposed amendment(s): a) ☒ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
 The status of the claim(s) is (or will be) as follows:
 Claim(s) allowed: NONE.
 Claim(s) objected to: NONE.
 Claim(s) rejected: 21-33 and 35-45.
 Claim(s) withdrawn from consideration: NONE.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
 9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
 10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
 12. ☐ Note the attached Information *Disclosure Statement(s)*. (PTO/SB/08) Paper No(s). _____.
 13. ☒ Other: See Continuation Sheet.

/William C. Vaughn, Jr./
 Supervisory Patent Examiner, Art Unit 2444

/N. D./
 Examiner, Art Unit 2444

Continuation of 13. Other: Regarding claim 22, the limitation "monitoring time intervals between successive receive times for each of the requested portions" changes the scope of the claims and would require further search and consideration on behalf of the examiner. Furthermore regarding claim 39, the limitation "comparing a current performance factor of the set of factors with a set of one or more trigger thresholds, wherein the set of one or more trigger thresholds is determined by a combination of two of the set of factors relating to a current read ahead margin and a minimum safety margin" and "determining whether to upshift or downshift to a higher or lower quality of the different copies based on said comparing" changes the scope of the claims and would require further search and consideration on the part of the Examiner..

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of:

R. Drew Major

Application No.: 11/116,783

Filed: April 28, 2005

Art unit: 2144

Examiner: Donabed, Ninos J

For: APPARATUS, SYSTEM AND
METHOD FOR ADAPTIVE-RATE
SHIFTING OF STREAMING
CONTENT

Confirmation No.: 5535

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being submitted electronically via Facsimile on the date shown below.

/Kevin O. Grange/ March 14, 2009

Kevin O. Grange Date

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AMENDMENT AND RESPONSE TO OFFICE ACTION
under 37 C.F.R. § 1.116 – Expedited Procedure

Examiner:

In response to the Final Office Action mailed on Feb. 20, 2009, Applicant respectfully requests that the Examiner consider the following amendments and the following remarks.

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 8 of this paper.

REMARKS

Applicant respectfully requests reconsideration of this application in view of the following remarks. For the Examiner's convenience and reference, Applicant's remarks are presented in substantially the same order in which the corresponding issues were raised in the Final Office Action.

Interview Summary for Examiner Interview Conducted 3/11/2009

Applicant would like to thank the Examiners for the Examiner Interview. During the Interview, the art cited in the most recent Office Action was discussed, and it was agreed that the rejections were overcome, subject to additional review by the Examiner.

Claim Amendments

The amendments to claim 20 to add “by the media player,” “by the media player from the server,” and another “by the media player” are non-narrowing at least because they were inherently present. With regard to the first “by the media player,” the claim already required “streaming by a media player operating on an end user station a video from a server,” “wherein different copies of the video are stored on the server,” and “requesting ... from the server.” With regard to “by the media player from the server,” the “automatically and progressively requesting over the plurality of TCP connections” directly follows the “requesting ... from the server over a plurality of Transmission Control Protocol (TCP) connections,” and thus is performed by the media player from the server. With regard to the second “by the media player,” the fact that the “automatically and progressively requesting over the plurality of TCP connections” is performed by the media play means the “successive determinations” are by the media player. The amendments to claim 20 to change “a first of the copies” to “one of the copies” and “a first of the bit rates” to “one of the bit rates” have been made because there is no specific recitation to a second of the copies or at a second of the bit rates in the claim sets. These amendments are non-narrowing, since they have the same meaning. The amendment to claim 20 to remove “by requesting” is broadening, and thus, is a non-narrowing amendment. The amendments to claim 20 to change “performance factors” to “a set of one or more factors,” to add the clause “wherein the set of one or more factors relate to

the performance of the network,” and to change making the successive determinations “based on at least one of the set of factors,” are broadening, and thus, are non-narrowing amendments.

The amendment to claim 21 to remove “establishing the plurality of TCP connections with the server” is broadening, and thus, is a non-narrowing amendment. The amendment to claim 21 to change the “first of the copies” to the “one of the copies” is non-narrowing, since they have the same meaning. Also, the amendment to claim 21 to change “wherein said method further includes” to “wherein said presenting includes” is non-narrowing at least because it was inherently present. The claim already required “requesting *sub-parts of the portions*” as part of the streaming the video, and “presenting the video to the user by playing back ... *the requested portions*.” As such, the “presenting” limitation already inherently required reassembling the portions from the received sub-parts for presenting the video.

The amendments to claims 23 and 24, changing “a first selected threshold” to “a first threshold” and changing “a second selected threshold” to “a second threshold,” are non-narrowing at least because the word “selected” was removed. The amendments to claims 23 and 24, changing “performance factor” to “at least one factor,” are non-narrowing at least because the word “performance” was removed. The amendments to the preamble of claims 23 and 24, changing “said determining whether to upshift or downshift” to “said making the successive determinations to shift,” is non-narrowing at least because the original and amended language refers to the same limitation in claim 20.

As for claim 26, changing “subsequent” to “subsequently” is non-narrowing, since it has the same meaning. Also, the amendments to claim 26 to change “initially requesting portions” and “subsequently upshifting,” as being part of the limitations of “requesting ... the plurality of sequential portions” and “automatically and progressively requesting ... subsequent portions,” respectively, are non-narrowing at least because they were inherently present. The limitation of “initially requesting portions” already inherently referred to the requesting in the limitation of “requesting ... *a plurality of sequential portions of one of the copies* encoded and compressed at one of the bit rates,” and the limitation of “subsequently upshifting to a higher quality one” already inherently referred to the requesting of subsequent portions in the limitation of “automatically and

progressively requesting ... subsequent portions of the video from different ones of the copies” (emphasis added). The amendment to claim 26 to change “of” to “from” is non-narrowing, since they inherently have the same meaning. Also, the amendment to claim 26 to remove “according to the performance factor after initially requesting portions of the video of the low quality” is broadening, and thus, is a non-narrowing amendment. Finally, amending claim 26 to depend on 20 is non-narrowing because it now depends from the independent claim rather than another dependent claim.

The amendment to claim 35 to remove “establishing the plurality of TCP connections with the server” is broadening, and thus, is a non-narrowing amendment. The amendment to claim 35 to change the “first of the copies” to the “one of the copies” is non-narrowing, since they have the same meaning. The amendment to claim 36 to change “wherein said method further includes” to “wherein said presenting includes” is non-narrowing because it was inherently present. The claim already required presenting the video to the user by playing back the requested portions “in order of ascending playback time.” As such, it is clear that “sequentially arranging” was already inherently part of “presenting the video to the user.” The amendment to claim 36 to change “received portions” to “requested portions” is non-narrowing, since they inherently have the same meaning. Also, the amendment to claim 37 to change “wherein said method further includes” to “wherein said presenting includes” is non-narrowing at least because it was inherently present. The claim already required “requesting *sub-parts of the portions*” as part of the streaming the video, and “presenting the video to the user by playing back ... *the requested portions*.” As such, the “presenting” limitation already inherently required reassembling the portions from the received sub-parts for presenting the video.

The amendment to claim 38 to change the “performance factors” to “at least one of the set of factors,” and to remove “a current read ahead margin” and the following limitation, are broadening, and thus, are non-narrowing amendments. The amendments in claims 40-42 to change the “performance factors” to “at least one of the set of factors,” are broadening, and thus, are non-narrowing amendments. The amendments to claims 43 and 45 to change the “divided portions” to the “portions” are non-narrowing, since they have the same meaning. The amendments to claim 44 to change “without server-side

intelligence to retrieve the requested portions” to “without specialized server-side intelligence to respond to said requesting” are non-narrowing because the amendments further limit the negative limitation of the web server, which broadens the scope of the claim.

Response to Rejections under 35 U.S.C. § 112, first paragraph

Claim 39 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Claim 39 has been cancelled without prejudice.

Response to Rejections under 35 U.S.C. § 112, second paragraph

The Examiner rejected claims 20-26 and 35-45 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as his invention.

1) “Performance Factors”

Regarding claims 20, 22-24, 26, and 38-42, the Examiner alleges that the phrase “performance factors” is vague and unclear. Applicant respectfully disagrees that the phrase “performance factors” is vague and unclear. However, in interest of advancing the claims to be in condition for allowance, Applicant respectfully amends claim 20 to overcome the Examiner’s concern regarding “performance factors,” as described below.

Claim 20 has been amended to recite “regularly generating *a set of one or more factors* indicative of the current ability to sustain the streaming of the video using different ones of the copies, wherein the set of one or more factors relate to the performance of the network” and “making the successive determinations to shift the playback quality *based on at least one of the set of factors*” (emphasis added). Such amendment would encompass the Examiner’s identified definition of “any factor which relates to the performance of the network in general” (see *FOA*, at page 3).

Applicant respectfully submits that the amendment is supported by the specification. Applicant respectfully submits that the specification describes various factors that can be generated, including, but not limited to, “a performance factor,” according to receive times of requested portions (*Id.* at paragraphs 20, and 68), “a

performance factor” according to time intervals Δ between successive receive times for each response (*Id.* at paragraph 68), “a current read ahead margin” for determining a trigger threshold (*Id.* at paragraph 71), “a current read ahead margin” for determining whether a higher quality stream is sustainable (*Id.* at paragraph 15), “a minimum safety margin” for determining a trigger threshold (*Id.* at paragraph 71), “a minimum safety margin” for determining whether a higher quality stream is sustainable (*Id.* at paragraph 15), and an amount of contiguously available requested portions stored in a staging module (*Id.*). These factors relate to the performance of the network in general. As such, the specification provides support for the amendment of “regularly generating a set of one or more factors indicative of the current ability to sustain the streaming of the video using different ones of the copies, wherein the set of one or more factors relate to the performance of the network,” as recited in claim 20.

Applicant respectfully submits that the specification describes making successive determinations to shift the playback quality based on at least one of the set of factors to archive continuous playback of the video. By way of example and not limitation, the specification describes in relation to Figure 7 that the *network behavior characteristics can fluctuate*, sometimes quite suddenly, the media player can compensate for this fluctuation by calculating a *performance factor*, and comparing the performance factor with a trigger threshold. *Id.* at pages 21-22, paragraphs 68-70. Although the specification describes specific algorithms to obtain a performance factor by calculating a geometric mean or average of the ‘performance ratio’ of the time intervals Δ between successive receive times for each streamlet response, the specification also indicates that these algorithms can be “replaced by alternative streamlet monitoring solutions.” *Id.* at page 22, paragraph 72. As such, the specification also provides support for using other monitoring solutions to obtain other factors which relate to the performance of the network in general, such as, for example, factors that are indicative of latency, delays or losses of the requested portions¹, and available bandwidth of the TCP connections².

¹By way of example and not limitation, the specification describes latency of the requested streamlets, and delays or losses of the responses to the requests as *other factors in performance*, and proposes at least one embodiment where multiple TCP connections may be opened between the client and server to achieve the latency-reduction efficiency benefits of pipelining while not having serial dependency between requests in traditional pipelining. *Id.* at pages 17-18, paragraph 59-60.

For the foregoing reasons, Applicant respectfully submits that claim 20, as amended, is not vague and unclear. Claims 22 and 39 have been cancelled without prejudice. Claims 23-24, 26, 38, and 40-42 have been amended to correspondingly remove the term performance factor. Accordingly, Applicant respectfully submits that the amendments overcome the rejection under 35 U.S.C. §112, second paragraph, and requests that the rejections of claims 20, 22-24, 26, and 38-42 under 35 U.S.C. § 112, second paragraph, be withdrawn.

2) “Requesting Sub-Parts”

Regarding claims 21 and 37, the Examiner alleges that the phrase “requesting sub-parts of the portions over different ones of the plurality of TCP connections” is vague and unclear. The Examiner interprets the term “sub-parts” to mean “any part of the copies of the video files.” *FOA*, at page 3. Applicant respectfully submits that the claim language requires that the “sub-parts” encompass **any part of the requested portions of the video, not just any part of the copies of the video files**. By way of example and not limitation, the specification describes embodiments where the media player requests streamlets, each streamlet having a portion of the video, and those portions of the video can be requested by “requesting pieces of any streamlet file.” Applicant’s specification, at page 16, paragraph 56. The specification describes that streamlets, for example, can be encapsulated as an independent media object, and can be any sized portion of the video contained in the original content file. *Id.* at page 12, paragraph 45. The content in a streamlet (i.e., portion of the video) has a unique time index in relation to the beginning of the content contained in a stream (i.e., a copy of the video that has been encoded and compressed according to a bit rate and includes the entire playback duration of the video), and has a fixed duration of time (e.g., 2 seconds). *Id.* As set forth in claims 20, the “different copies are divided into *portions* whose playback is the same portion of the video for each of the different copies,” and “corresponding portions of the different copies have the same time index in relation to the beginning of the video.” Claim 21 further recites “requesting sub-parts of the portions over different ones of the plurality of

² By way of example and not limitation, the specification describes that the available bandwidth of the user’s network connection and how well the user’s available bandwidth is used (i.e., efficiency) can constrain the quality of video that can be received for real time presentation, and proposes at least one embodiment where multiple responses may be in

TCP connection.” By way of example and not limitation, the Applicant’s specification indicates that the parts of these portions of the video (e.g., streamlets) can be requested using parallel TCP connections, with each part requested on mutually independent TCP connections. *Id.* at page 16, paragraph 53, page 17, paragraph 57, and page 18, paragraph 61. Applicant’s specification describes that “splitting the requested streamlet into smaller pieces or portions beneficially allows for an increased efficiency potential, and also eliminates problems associated with multiple full-streamlet requests sharing the bandwidth at any given moment.” *Id.* Applicant has used “sub-parts” to distinguish the pieces or parts of the portion of video from the portion itself. As such, the sub-parts of the portions of video encompass any part of the requested portions of the video, not just “any part of any of the copies of the video files,” as alleged by the Examiner. For these reasons, Applicant respectfully submits that claims 21 and 37 are not vague and unclear, and requests that the rejections of claims 21 and 37 under 35 U.S.C. § 112, second paragraph, be withdrawn.

3) “Plurality of TCP Connections”

Regarding claim 20, the Examiner alleges that the phrase “requesting by the media player a plurality of sequential portions of one of the copies encoded and compressed at one of the bit rates from the server over a plurality of Transmission Control Protocol (TCP) connections” is vague and unclear as it is not understood whether the plurality of connections is with a plurality of devices or just a single device. Applicant respectfully submits that claim 20 has been amended to recite “*requesting by the media player a plurality of sequential portions ... from the server over a plurality of Transmission Control Protocol (TCP) connections*” and “*automatically and progressively requesting by the media player from the server over a plurality of TCP connections subsequent portions of the video from different ones of the copies ...*” Applicant submits that claim 20, as amended, is not vague and unclear, and requests that the rejection of claim 20 under 35 U.S.C. § 112, second paragraph, be withdrawn.

transit concurrently, assuring that communication bandwidth between the client and server is always being utilized. *Id.* at page 17-18, paragraph 60.

Response to Rejections under 35 U.S.C. § 103(a)

In the Final Office Action (FOA), the Examiner rejects claims 20-21, 23-24, 26, 35-38, and 40-44 under 35 U.S.C §103(a) as being unpatentable over *Hughes* in view of *Li* and further in view of *Gamble*, and claims 22, 25, 39, and 45 under 35 U.S.C §103(a) as being unpatentable over *Hughes* in view of *Li*, further in view of *Gamble*, and further in view of Official Notice. Applicant respectfully submits that claims 20-26 and 35-45 are patentable over the combination of cited references for at least the following reasons:

1) Combination of *Hughes* and *Li* Does not Arrive at the Claimed Invention

As described in detail below, *Hughes* describes that instead of doing A (multiple copies), do B (stacked media file); *Li*'s background section describes A; the Office Action cites to B from *Hughes*, ignoring *Hughes*' background section in asserting *Hughes* lacks A, cites to A from *Li*, asserts A and B are combinable (although, *Hughes* suggests they are not), and fails to explain how the combination would work in view of *Hughes*' background section. As such, *Hughes*' background section describing A and its problems has been ignored; the combination of A+B is inappropriate because *Hughes* describes using B instead of A; the combination of A+B, if possible, is not explained in view of *Hughes*' background section, and the combination of A+B, if possible, does not teach the claimed invention.

Hughes describes in the background section that a conventional system for transferring media files over the Internet, in which multiple copies of the same media file are encoded for differing access speeds (A). *Hughes*, page 1, paragraph 9. To address problems with the multiple copies approach³, *Hughes* proposes in the detailed description section shifting between quality-based segregated data sets of a *pecially formatted media file* (B) to allow for seamless shifting, *in lieu of* shifting between multiple copies (A) of the same media file, which are encoded for differing access speeds. *Id.* at page 2, paragraph 11, and page 2, paragraphs 20 and 22.

³ *Hughes* describes that these multiple copies involve many redundancies in the data stored, which translates into the need for substantial amounts of extra data storage capacity and a substantial waste of bandwidth. *Id.* at paragraph 8. *Hughes* also describes that there is no simple way presently available for the user to be shifted seamlessly to a file encoded at a higher sampling rate or a file encoded at a lower sampling rate. *Id.* at pages 1-2, paragraph 9.

The Office Action cites to sections of the detailed description (B) to support the allegation that *Hughes* teaches various limitations of claim 20, including “automatically and progressively requesting ... subsequent portions of the video from different ones of the copies dependent upon successive determinations by the media player to shift the playback quality ... to achieve continuous playback of the video using portions of the highest quality one of the copies.” *FOA*, at page 4, citing *Hughes* at pages 4-5, paragraph 37-40. Then, the Office Action ignores *Hughes*’ background section describing the use of different copies of the video (A), and proposes a combination with *Li*, citing to the background section of *Li* for the allegation that *Li* teaches different quality copies of a video (A). *Id.*, citing *Li*, at page 1, paragraph 7-12. Since the background section of *Hughes* teaches different copies (A) of the same media file, which are encoded for differing access speeds, the Office action, in effect, reverts back to the teachings presented in the background section of *Hughes* (A) by combining *Hughes* with *Li*. *Hughes*, page 1, paragraph 9.

In addition to the combination being improper, Applicant respectfully submits that the background section of *Hughes* fails to teach at least **“automatically and progressively requesting by the media player from the server ... subsequent portions of the video from different ones of the copies dependent upon successive determinations by the media player to shift the playback quality ... to achieve continuous playback of the video** using portions of the highest quality one of the copies,” as recited in claim 20, because *Hughes* teaches that shifting between multiple copies of the same media file cannot be done seamlessly. *Hughes*, at pages 1-2, paragraph 9. Applicant respectfully submits that *Li* fails to cure the deficiencies described in the background of *Hughes*. In particular, *Li* teaches that the server can automatically change to higher or lower bit rate versions of the media file, responsive to bandwidth changes during transmission, but such switching results in “noticeable artifacts in the file playback where file bit rate is changed during playback.” *Li*, at page 1, paragraph 8. As such, *Li*’s shifting is not seamless. In addition, *Li* does not address the artifact problem by improving how switches are performed, but rather by reducing the number of switches. Specifically, *Li* suggests using buffering, where playback of the media file is delayed on the client for a period of time, which tends to smooth out

bandwidth fluctuations, thereby reducing, but not entirely eliminating the need to sometimes switch between different media file bit rates. *Li*, at paragraph 9. In effect, *Li*'s teachings encourage buffering to smooth out bandwidth fluctuations so that the server doesn't have to switch, since such switching is not seamless, but causes noticeable artifacts. Thus, *Li* fails to cure the deficiencies described in the background section of *Hughes*. Thus, the appropriate combination of *Hughes* and *Li* is multiple copies (A) (as described in the background of *Hughes* and *Li*) using the buffering technique of *Li* to reduce the number of switches in an effort to reduce the artifact problem.

Notwithstanding the fact that the following arguments address the how the cited passages in the detailed description of *Hughes*, in combination with the teachings of *Li*, fail to teach various limitations of the claim, Applicant respectfully maintains that the combination of *Hughes* and *Li* is improper because the Office Action improperly cites passages of the detailed description in *Hughes* when such combination reverts back to the teachings in the background section of *Hughes*.

2) Shifting the Playback Quality by Requesting Portions of Different Copies by the Media Player to Achieve Continuous Playback of the Video

Applicant respectfully submits that *Hughes* teaches dynamically switching between different quality versions of a selected stacked media file (B) as a function of instantaneous connection speed to the user's computer, as determined by the server. *Hughes*, page 5, paragraph 37. *Hughes* does very little to explain how the switching is done with (B). More to the point, as previously explained, *Hughes* describes doing B (stacked media file) instead of doing A (multiple copies) in part because when using multiple copies (A) there is no simple way presently available for the user to be shifted seamlessly to a file encoded at a higher sampling rate or a file encoded at a lower sampling rate. *Id.* at pages 1-2, paragraph 9. This is consistent with *Li*'s "artifact" problem described below.

Li teaches that the server can automatically change to higher or lower bit rate versions of the media file (B), responsive to bandwidth changes during transmission. *Li*, at page 1, paragraph 8. *Li*, however, teaches that such switching between files having different bit rates results in "noticeable artifacts in the file playback where file bit rate is

changed during playback.” *Id.* *Li* does not address the artifact problem by improving how switches are performed, but rather by reducing the number of switches. Specifically, *Li* suggests using buffering, where playback of the media file is delayed on the client for a period of time, which tends “to smooth out bandwidth fluctuations, thereby reducing, but not entirely eliminating the need to sometimes switch between different media file bit rates.” *Li*, at paragraph 9. As such, *Li*’s teachings encourage buffering to smooth out bandwidth fluctuations so that the server doesn’t have to switch, since such switching causes noticeable artifacts without buffering.

In contrast to *Li*, the Applicant’s claimed invention uses different copies and encourages shifts in the playback quality, because of how it switches, to allow the media player to request and present the highest quality sustainable, given such bandwidth fluctuations. The first argument (labeled 2a) articulates the combination of cited references failure to teach how the different copies are “divided into portions,”⁴ and the following arguments (labeled 2b), and 2c)) articulate some of the advantageous acts derived from the different copies being divided into portions. Some of the advantages of the Applicant’s claimed invention are directed to how to shift the playback quality by anticipating a poor user experience and requesting portions of different copies of the video by the media player to achieve continuous playback of the video.

2a) Different Copies “Divided into Portions”

Applicant respectfully submits that the combination of cited references fails to teach “streaming by a media player operating on an end user station a video from a server, wherein the video has a playback duration, wherein different copies of the video are stored on the server, wherein each of the different copies is encoded and compressed according to a different bit rate and includes the entire playback duration of the video, **wherein the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, wherein corresponding portions of the different copies have the same time index in relation to the beginning of the video,**” as recited in claim 20, for the following reasons:

⁴ Neither *Hughes* nor *Li* describe the claimed multiple copies that are each divided into the same time indexes of the video to form portions whose playback is the same position of the video for each of the different copies.

Hughes Fails to Teach “Divided into Portions” of the Video

First, the Office Action acknowledges that *Hughes* detailed description section does not teach “different copies of the video,” and is non-specific as to the other above quoted limitations. This lack of specificity was initially believed to mean that *Hughes* lacked these limitations as well, but the Office Action does not identify them in *Li* either. Applicant respectfully submits that *Hughes*’ detailed description does not teach “different copies of the video,” as well as the other limitations, including the divided “portions” of the video and related limitations for the following reasons. If the Examiner believes *Hughes* describes such limitations, Applicant requests that such be articulated in an interview or new/supplemental Office Action.

Hughes’s detailed description teaches, in response to a user’s query to a database containing a stacked media file and upon selection by a user of a result of the query, the server determines the connection speed to the user’s computer and *the server selects the appropriate portions of the stacked media file to be sent to the client from the server.* *Hughes*, page 4, paragraph 37, and Figure 1. The meaning of “portions” required by Applicant’s claim language⁵ is completely different from that of *Hughes* because *Hughes* describes that each portion represents a different quality version of the media file, and thus portions have nothing to do with a time index, etc. *Id.* at paragraph 37. Specifically, the “*portions* of the stacked media file” in *Hughes* refer to data sets (or stacks) of the especially formatted media file, where each successive data set contains only data points not found in the preceding data set. *Id.* at paragraph 22. Because the data in each successive data set contains only data points not found in the preceding data set, the media file of *Hughes* is divided according to the differences in data points generated at different sampling rates or frequencies, not time. As such, the data sets or portions of the stacked media file of *Hughes* do not constitute the claimed “portions” of the video and the different copies, because the media file is not “divided into portions whose playback is the same portion of the video for each of the different copies,” as recited in claim 20. Also, *Hughes* does not teach that media file is divided into portions where “corresponding

⁵ “wherein the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, wherein corresponding portions of the different copies have the same time index in relation to the beginning of the video.”

portions of the different copies have the same time index in relation to the beginning of the video,” as recited in claim 20.

Hughes Fails to Teach Requesting “Portions” of the Video

Since *Hughes* lacks the above limitations, *Hughes* also fails to teach the subsequent limitations that use the portions - “requesting ... a plurality of **sequential portions of one of the copies** encoded and compressed at one of the bit rates...,” and “automatically and progressively requesting ... **subsequent portions of the video from different ones of the copies...**”.

Li Fails to Cure the Deficiencies of Hughes

Applicant respectfully submits that *Li* fails to cure the above noted deficiencies of *Hughes*.

Li teaches a multi-rate scheme that generates, for each media file, several compressed media files (each compressed at a different bit rate), and in which the server “determines the available bandwidth between the server and the client, and sends [one of the] compressed media file[s] having the highest bit rate that can be successfully transmitted using the given bandwidth.” *Li*, page 1, paragraph 8, material in brackets added for clarity. Although *Li* teaches generating several compressed files (A) at different bit rates for each media file, does not describe the claimed “divided into portions whose playback is the same portion of the video for each of the different copies” and the claimed “corresponding portions of the different copies have the same time index in relation to the beginning of the video,” as recited in claim 20.

Li Fails to Teach Requesting “Portions” of the Video

Moreover, as described above, *Hughes* fails to teach “requesting a plurality of sequential portions of one of the copies...,” and “automatically and progressively requesting ... subsequent portions of the video from different ones of the copies...,” recited in claim 20. Since the compressed files of *Li* are not divided into portions, as described above, Applicant respectfully submits that *Li* cannot teach requesting such portions.

Gamble Fails to Cure the Deficiencies of Hughes and Li

Applicant respectfully submits that *Gamble*, which has been used by the Office Action to address the claimed plurality of TCP connections, fails to cure the above noted

deficiencies of *Hughes* and *Li* because *Gamble* fails to teach the limitations identified above.

Therefore, the combination of cited references fails to teach at least the limitations identified above of claim 20.

2b) Continuous Playback of the Video using Multiple Copies

Claim 20 recites in pertinent part:

automatically and progressively requesting by the media player from the server ... subsequent portions of the video from different ones of the copies dependent upon successive determinations by the media player to shift the playback quality ... including,

...

making the successive determinations to shift the playback quality ... to **achieve continuous playback of the video using portions** of the highest quality one of the copies determined sustainable at that time.

(Emphasis added).

Because the “copies” are “divided” into “portions” as described above, the “portions” are requestable and the media player can automatically and progressively request subsequent portions of the video from different copies dependent upon successive determinations to shift the playback quality **in order to achieve continuous playback of the video**. As such, the media player, by requesting portions of different quality copies based on the successive determinations, can achieve continuous playback of the video without the problem described in the background of *Hughes* and *Li*.

Applicant also respectfully submits that the media player can achieve continuous playback of the requested video without the problem described in the background of *Hughes* and of *Li* because the shifts between the playback quality occur during playback at portion boundaries. The “requests” are for “portions,” so the “shifts” occur at the “portion” level; and the “portions” of the different “copies” are the “same portion of the video;” so shifts happen on portion boundaries and the portion boundaries of the copies at the same time index in the video – meaning playback is continuous.

As described above, *Li* teaches that the switching of *Li* results in “noticeable artifacts,” and describes buffering to reduce the number of required shifts. *Hughes* describes doing B (stacked media file) instead of doing A (multiple copies) in part because when using multiple copies (A) there is no simple way presently available for the

user to be shifted seamlessly to a file encoded at a higher sampling rate or a file encoded at a lower sampling rate. *Id.* at pages 1-2, paragraph 9 As such, *Hughes* individually and the combination of *Hughes* and *Li* fails to teach “**automatically and progressively requesting by the media player from the server ... subsequent portions of the video from different ones of the copies ...**, and making the successive determinations to shift the playback quality ... to **achieve continuous playback of the video using portions of the highest quality one of the copies** determined sustainable at that time,” as recited in claim 20.

Gamble, which has been used by the Office Action to teach plurality of TCP connections, also fails to cure this deficiency because *Gamble* does not teach all the identified limitations recited in claim 20.

Therefore, the combination of cited references fails to teach at least these limitations of the claim.

2c) Requesting “by the Media Player From the Server” and Related Limitations

In particular, claim 20 recites in pertinent part “**requesting by the media player a plurality of sequential portions ... from the server,**” and “**automatically and progressively requesting by the media player from the server...** subsequent portions of the video.” Applicant respectfully submits that because the different copies are *divided into portions* whose playback is the same portion of the video for each of the different copies, and because each portion is requestable, the media player can request the portions of the different copies of the video from the server, instead of the server pushing the video to the media player.

Hughes Fails to Teach “Automatically and Progressively Requesting by the Media Player from the Server”

Applicant respectfully submits that *Hughes* teaches that *a server dynamically switches* between different quality versions of a stacked media file (B) by determining the connection speed to the user’s computer and selecting the appropriate version for streaming to the user. *Hughes*, page 4, paragraph 37, Figure 1, elements 19 and 11. Although the software player on the user’s computer of *Hughes* may allow the user to

manually select the stacked media file (B) to be streamed by the server, the *server monitors* the instantaneous connection speed and *changes* between quality versions of the media file (B) by selecting the appropriate data sets of the stacked media file (B) to be sent to the user's computer, *effectively pushing the data of the media file to the user's computer*. *Id.* Also, nothing in *Hughes* teaches or suggests that these operations could be performed by the software player on the user's computer, instead of by the server. Moreover, such modifications to the system of *Hughes* would be contrary to the push-based streaming configuration described in *Hughes*. For the foregoing reasons, *Hughes* fails to teach the limitation identified above.

Li Fails to Teach “Automatically and Progressively Requesting by the Media Player from the Server”

Li, which has been used by the Office Action for a separate limitation, fails to cure this deficiency because *Li* also teaches that the server determines the available bandwidth between the server and the client, and *the server sends the compressed media file having the highest bit rate to the client, in response to changes in the bandwidth determined by the server*. *Li*, page 1, paragraph 8.

Gamble Fails to Teach “Requesting by the Media Player from the Server” Portions

Gamble, which has been used by the Office Action to teach the claimed plurality of TCP connections, also fails to cure this deficiency because *Gamble* does not teach all the identified limitations recited in claim 20.

Therefore, the combination of cited references fails to teach at least these limitations of the claim.

3) Multiple TCP connections

Applicant respectfully submits that because the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, and because the portions are requestable by the media player, the media player can request the plurality of sequential portions of the video and the subsequent portions of the video *over a plurality of TCP connections*.

Claim 20 recites in pertinent part:

requesting by the media player a plurality of sequential portions of one of the copies encoded and compressed at one of the bit rates from the server over a plurality of Transmission Control Protocol (TCP) connections,

...

automatically and progressively requesting by the media player from the server over the plurality of TCP connections subsequent portions of the video from different ones of the copies ...

(Emphasis added).

The Examiner acknowledges that *Hughes* and *Li* do not teach “a plurality of TCP connections,” but alleges that *Gamble* cures this deficiency. *FOA*, at pages 5-6. In support of this conclusion, the Examiner states that *Gamble* teaches “requesting a plurality of sequential files over a plurality of TCP connections.” *Id.* Applicant respectfully disagrees that *Gamble* cures this deficiency.

Applicant respectfully submits that *Gamble* teaches a method and system for transferring large data files over parallel connections between applications operating on respective computing systems. *Gamble*, Abstract. More specifically, *Gamble* teaches that the TCP layer *segments data into packets* for delivery to a destination computing system, by *segmenting a file into a set number of bytes* (e.g., “READCHUNK”), and stores each segment in a send buffer to be sent to the application on the destination computing system. *Id.* at page 3, paragraph 36 and 40. Although *Gamble* teaches that the TCP layer establishes parallel TCP connections between the client application and the server application, *Gamble* does not teach that an application like a media player can request segments from different copies over the parallel TCP connections. In effect, *Gamble* teaches that once a file has been selected to be sent to the destination application, the TCP layer of the originating application segments the selected file into segments, stores them into a send buffer, and sends the segments over the parallel TCP connections. As such, *Gamble* does not teach requesting individual segments of the file, much less requesting segments from different files. Therefore, *Gamble* fails to teach “**requesting by the media player a plurality of sequential portions of one of the copies** encoded and compressed at one of the bit rates from the server **over a plurality of Transmission Control Protocol (TCP) connections,**” and “**automatically and progressively requesting by the media player from the server over the plurality of TCP connections subsequent portions of the video from different ones of the copies,**” as recited in claim 20.

In addition, Applicant respectfully submits that the teachings of *Gamble* combined with the teachings of *Li* and *Hughes* would result in a server that makes determinations to switch to a compressed file having a different bit rate, segments the compressed file into packets, and sends the packets over parallel TCP connections to push the data to the client. Such combination still fails to teach that the client can request individual portions of the video from different copies over the parallel TCP connections.

Moreover, as described above, both *Hughes* and *Li* fail to teach that the different copies of the video are divided into portions. Thus, for *Gamble* to cure the deficiency of the limitations above, *Gamble* would need to teach requesting ***portions from different copies of video*** over the parallel TCP connections, not just transmission of the segments over the parallel TCP connection. Since *Gamble* does not specifically teach that the segments of the files are portions of different copies of the video, *Gamble* fails to cure the deficiencies of *Hughes* and *Li*.

Therefore, the combination of cited references fails to teach at least these limitations of the claim.

4) Conclusion

In sum, given that the combination of cited references fails to teach all of the limitations of the claim, Applicant respectfully submits that claim 20 is patentable over the combination of cited references. Accordingly, Applicant requests that the rejection of claim 20 under 35 U.S.C. § 103(a) be withdrawn.

Given that claims 21-26 and 35-45 depend from independent claim 20, which is patentable over the cited reference, Applicant respectfully submits that dependent claims 21-26 and 35-45 are also patentable over the combination of cited references. Accordingly, Applicant requests that the rejection of claims 20-21, 23-24, 26, 35-38 and 30-45 under 35 U.S.C. § 103(a) be withdrawn.

Response to Rejections under 35 U.S.C. § 103(a) using Official Notice

The *FOA* rejects claims 22, 25, 39, and 45 under 35 U.S.C §103(a) as being unpatentable over *Hughes* in view of *Li*, further in view of *Gamble*, and further in view of Official Notice. Claims 22 and 39 have been canceled without prejudice. Applicant

respectfully disagrees with regard to the official notice, and, if the rejections to the independent claims are maintained, respectfully requests the Examiner produce authority for each of the factual assertions as required by *MPEP* 2144.03(C). In particular, that the Examiner provides documentary evidence, as well as point to some concrete evidence in the record in support of these finding. Also, if the Examiner is relying on personal knowledge to support the finding of what is known in the art, provision of an affidavit or declaration setting forth specific factual statements and explanation to support the finding. *MPEP* 2144.03(C).

CONCLUSION

It is respectfully submitted that in view of the amendments and remarks set forth herein, the rejections have been overcome, putting the claims in condition for allowance. If the Examiner believes a telephone interview would expedite the prosecution of this application, the Examiner is invited to contact Dan DeVos at (408) 720-8300.

If there are any additional charges, please charge them to Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 04/10/2009

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AMENDMENTS

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of the claims in the application:

Listing of Claims:

1-19. (Cancelled)

20. (Currently amended) A method for presenting rate-adaptive streams, the method comprising:

streaming by a media player operating on an end user station a video from a server, wherein the video has a playback duration, wherein different copies of the video are stored on the server, wherein each of the different copies is encoded and compressed according to a different bit rate and includes the entire playback duration of the video, wherein the different copies are divided into portions whose playback is the same portion of the video for each of the different copies, wherein corresponding portions of the different copies have the same time index in relation to the beginning of the video, and wherein the streaming comprises:

requesting by the media player a plurality of sequential portions of ~~a first one~~ of the copies encoded and compressed at ~~a first one~~ of the bit rates from the server over a plurality of Transmission Control Protocol (TCP) connections;

automatically and progressively requesting by the media player from the server over the plurality of TCP connections subsequent portions of the video ~~by requesting~~ from different ones of the copies dependent upon successive determinations by the media player to shift the playback quality to a higher or lower quality one of the different copies, said automatically and progressively requesting including,

regularly generating a set of one or more performance factors indicative of the current ability to sustain the streaming of the video using different ones of the copies, wherein the set of one or more factors relate to the performance of the network; and

making the successive determinations to shift the playback quality based on at least one of the performance set of factors to achieve continuous playback of the video using portions of the highest quality one of the copies determined sustainable at that time; and

presenting the video to the user by playing back with the media player the requested portions from the different copies in order of ascending playback time.

21. (Currently amended) The method of claim 20, ~~further comprising~~ ~~establishing the plurality of TCP connections with the server~~, wherein said requesting the plurality of sequential portions of the ~~first one~~ of the copies includes requesting sub-parts of the portions over different ones of the plurality of TCP connections, and wherein said ~~method~~ presenting further includes reassembling the portions from the received sub-parts.

22. (Cancelled)

23. (Currently amended) The method of claim 20, wherein said ~~determining whether~~ making the successive determinations to shift upshift or downshift comprises: upshifting to a higher quality one of the different copies when the at least one ~~performance~~ factor is greater than a first ~~selected~~ threshold; and determining if the higher quality playback can be sustained.

24. (Currently amended) The method of claim 23, wherein said ~~determining whether~~ making the successive determinations to shift upshift or downshift comprises

downshifting to a lower quality one of the different copies when the at least one ~~performance~~ factor is less than a second ~~selected~~ threshold.

25. (Previously presented) The method of claim 20, further comprising:
receiving user input to enable fast-forward, skip randomly, and rewind
functionality; and

requesting portions of the video at a specified time index that is not the next
sequential time in the current playback.

26. (Currently amended) The method of claim ~~[[22]]~~20, ~~further comprising:~~
~~—wherein said requesting the plurality of sequential portions includes initially~~
requesting portions of video ~~offrom~~ a low quality ~~streamlets~~ one of the different copies to
enable instant playback of the video~~[[;]]~~, and wherein said automatically and
progressively requesting includes subsequent~~subsequently~~ upshifting to a higher quality
one of the different copies ~~according to the performance factor after initially requesting~~
~~portions of the video of the low quality.~~

27-34. (Cancelled)

35. (Currently amended) The method of claim 20, ~~further comprising~~
~~establishing the plurality of TCP connections with the server~~, wherein said requesting the
plurality of sequential portions of the ~~first~~one of the copies includes requesting the
plurality of sequential portions over different ones of the plurality of TCP connections.

36. (Currently amended) The method of claim 20, ~~further comprising~~wherein
said presenting comprises sequentially arranging the ~~received~~requested portions from the
different copies in the order of ascending playback time for playback on the media player.

37. (Currently amended) The method of claim 20, wherein said automatically and progressively requesting includes requesting sub-parts of the portions over different ones of the plurality of TCP connections, and wherein said ~~method~~presenting further includes reassembling the portions from the received sub-parts.

38. (Currently amended) The method of claim 20, wherein at least one of the performance factors~~set of factors~~ are~~is~~ indicative of the available bandwidth of the plurality of TCP connections, ~~and a current read-ahead margin, wherein the current read-ahead margin is a current amount of contiguous, sequentially arranged, un-played portions of the video for playback on the media player.~~

39. (Cancelled)

40. (Currently amended) The method of claim 20, wherein at least one of the performance~~set of factors~~ are~~is~~ indicative of latency of the requested portions, wherein the latency is a time measure between when a request is issued and a time that response data of the requested portion begins to arrive at the end user station.

41. (Currently amended) The method of claim 20, wherein at least one of the performance~~set of factors~~ are~~is~~ indicative of time intervals between successive receive times for each response to the requested portions.

42. (Currently amended) The method of claim 20, wherein at least one of the performance~~set of factors~~ are~~is~~ indicative of delays or losses in one or more of the plurality of TCP connections.

43. (Currently amended) The method of claim 20, wherein the server is a web server, and wherein the ~~divided~~ portions are stored in separate files on the web server.

44. (Currently amended) The method of claim [[20]] ~~43~~, wherein the separate files are requested from the web server using Hyper Text Transfer Protocol (HTTP), and wherein the web server is without specialized server-side intelligence to ~~retrieve~~ respond to said requesting the requested portions.

45. (Currently amended) The method of claim 20, wherein the server is a cache server of a network infrastructure operator, and wherein the ~~divided~~ portions are stored in separate files on the cache server.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of:

R. Drew Major

Application No.: 11/116,783

Filed: April 28, 2005

Art unit: 2444

Examiner: Donabed, Ninos J.

For: APPARATUS, SYSTEM, AND
METHOD FOR ADAPTIVE-RATE
SHIFTING OF STREAMING
CONTENT

Confirmation No.: 5535

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND RESPONSE TO FINAL OFFICE ACTION
under 37 C.F.R. §1.116 - Expedited Procedure

Examiner:

In response to the Final Office Action mailed on February 20, 2009 and the Advisory Action mailed April 2, 2009, Applicant respectfully requests that the Examiner consider the following amendments and the following remarks. Since the only reason listed in the advisory action for requiring another search was claims 22 and 39, this supplemental response is almost identical to the un-entered 3/14/09 After Final Response with the exception that claims 23 and 24 were amended and that the dependency of claim 26 was amended to accommodate the cancellation of claim 22.

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 7 of this paper.

Electronic Acknowledgement Receipt

EFS ID:	5135374
Application Number:	11116783
International Application Number:	
Confirmation Number:	5535
Title of Invention:	Apparatus, system, and method for adaptive-rate shifting of streaming content
First Named Inventor/Applicant Name:	R. Drew Major
Customer Number:	08791
Filer:	Daniel De Vos
Filer Authorized By:	
Attorney Docket Number:	8532P001
Receipt Date:	10-APR-2009
Filing Date:	28-APR-2005
Time Stamp:	20:44:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		8532P001_AF_Response_2_04 1009.pdf	151633 e7733a4c539e328c33286967b87b64b81a1 2b21d	yes	26

Multipart Description/PDF files in .zip description			
Document Description	Start	End	
Amendment After Final	1	1	
Claims	2	6	
Applicant Arguments/Remarks Made in an Amendment	7	26	

Warnings:

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Total Files Size (in bytes):	151633
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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.