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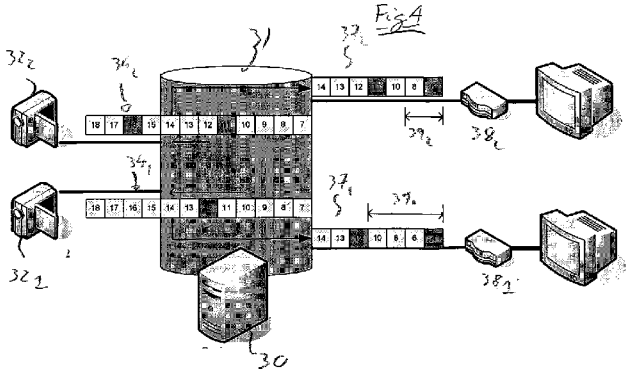
(54) Title: METHOD FOR RETRANSMISSION OF A MULTIMEDIA STREAM, FROM A VIDEO TRANSMITTER, VIA AN INTERMEDIARY SERVER



(57) Abstract: Method for retransmission of a multimedia stream from a video transmitter via an intermediary storage server, this multimedia stream comprising packets coding independent images, and packets of dependent images, the multimedia stream comprising a continuous component and a discontinuous component, the intermediary server storing this multimedia stream in a memory characterized in that it comprises the following steps: - the step for the intermediary server to receive a request for retransmission of the multimedia stream transmitted - the step for the intermediary server to select an independent image packet stored in its memory in order to begin a retransmission of the received multimedia stream and - the step for the server to accelerate the retransmission of the multimedia stream received later than the independent image packet selected omitting to retransmit the dependent image packets until the accelerated part of the stream retransmitted by the intermediary server is synchronized with the stream received by this intermediary server, wherein the retransmission of the discontinuous component is accelerated while the retransmission of the continuous component is carried out, without acceleration, from a continuous packet stored in the server in such a way that the continuous component is synchronized with the discontinuous component retransmitted when the stream retransmitted by the intermediary server is synchronized with the stream received by this intermediary server.

WO 2010/055096 A1

Method for retransmission of a multimedia stream, from a video transmitter, via an intermediary server.

Technical domain of the invention

The present invention relates to a method for retransmission of a multimedia stream, from a video transmitter, via an intermediary server, particularly when this multimedia stream is retransmitted via the intermediary server to an IP (Internet Protocol) decoder.

In the domain of digital television, it is known in the art to use a network such as an Internet network to offer a plurality of video contents each having a specific multimedia stream.

Typically, these contents are broadcast in the Internet network by a multimedia stream that a user can receive as it is being transmitted in the Internet network.

Such a restitution principle, referred to as real time transmission hereafter, is notably used for the viewing of television programmes or of content available as Video on Demand (VoD) via the Internet network.

In reference to figure 1, it is known in the prior art to use an intermediary server 10 receiving a plurality of multimedia streams 14_1 and 14_2 transmitted in the Internet network by the respective transmitters 12_1 and 12_2.

In this context of transmission by the Internet network, the multimedia streams 14_1 and 14_2 can be formed by packets of differing nature, and notably:

- by packets of independent images, that can be directly displayed by the decoder. These images are known as “Intra coded frames” or “keyframes” and

- by packets of dependant images, requiring at least one independent image to be displayed.

As an example the format MPEG-2 (Moving Pictures Experts Group), uses such independent images noted as I that are used to reconstruct the dependant images noted as B or P as shown in figure 2.

For this purpose, it should be noted that the order of transmission of these images – axis 20 – differs from the order of display of these images – axis 22.

The intermediary server 10 stores the packets of these multimedia streams 14_1 and 14_2 in a memory temporarily in such a way that, for each of these streams 14_1 and 14_2, packets received later by the intermediary server replace the packets received earlier by the server.

Due to this temporary storage, the intermediary server 10 can immediately respond to a request 16 from an IP decoder 18, requesting to receive one of these streams 14_1 or 14_2, by transmitting the stored packets.

For example, such a request can be due to a change in the multimedia content viewed by the user, such rapid and successive changes being known under the term zapping.

To respond to such a request, it is known to increase the transmission bitrate of the server 10 so that, after an acceleration time, the server can transmit the stored packets and the received packets in order to attain a transmission in real time of the received stream 14_1 and 14_2.

The present invention results from the observation that such an acceleration method via a large increase in bitrate presents various disadvantages:

On one hand, it requires equipping an IP decoder with the elements that can detect and process strong accelerations in bitrates, this element leading to an increased cost for the IP decoders that are so equipped.

Moreover, it requires a strong increase in the availability of the bandwidth allocated to the stream 17 transmitted by the server 10, this increased availability being not necessarily possible.

In order to overcome at least one of these disadvantages, the present invention relates to a method for retransmission of a multimedia stream, from a video transmitter, via an intermediary storage server, this multimedia stream comprising packets coding independent images so that each

independent image can be directly decoded, and packets of dependent images so that each dependent image requires at least an independent image to be decoded, the intermediary server storing this multimedia stream in a memory in such a way that the packets received later by the intermediary server replace the packets received earlier by this server, characterized in that it comprises the following steps:

- the step for the intermediary server to receive a request for retransmission of the multimedia stream transmitted by an IP decoder,
- the step for the intermediary server, on reception of the request, to select an independent image packet stored in its memory in order to begin a retransmission of the received multimedia stream to the IP decoder from this selected packet, and
- the step for the server to accelerate the retransmission of the multimedia stream received later than the independent image packet selected omitting to retransmit the dependent image packets until the accelerated part of the stream retransmitted by the intermediary server is synchronized with the stream received by this intermediary server.

Due to a method in compliance with the invention, it is possible to accelerate the retransmission of a multimedia stream transmitted by an intermediary server in response to a retransmission request, without requiring a large increase of the bitrate, to attain a transmission of this received stream in real time.

Indeed, the acceleration in the transmission of the stream is carried out omitting to transmit some packets coding the dependent images, which limits the quantity of data to be transmitted.

Hence, such a method can be implemented with standard decoders, that is to say without requiring elements enabling the detection and processing of a highly variable bitrate in the multimedia stream.

In addition, according to an embodiment, a constant bandwidth can be allocated to the intermediary server that does not require a high additional bitrate to respond to a transmission request.

In one embodiment, the packet selected is the independent image packet most recently stored by the server.

According to an embodiment, the number of dependent image packets for which the retransmission is omitted corresponds to the number of dependent image packets stored in the server, and received after the selected packet, during the reception of the transmission request.

In one embodiment, the synchronization between the stream retransmitted and the stream received by this intermediary server is attained when the intermediary server retransmits the stream received in real time, that is to say as it is being received.

According to an embodiment, the synchronization between the stream retransmitted and the stream received by this intermediary server is attained when the intermediary server retransmits the stream received with a constant temporary offset with respect to its reception.

In one embodiment, the received multimedia stream being retransmitted according to the RTP protocol, synchronization and numbering information of packets of the retransmitted stream are modified in the accelerated part of the retransmitted stream so as to generate a retransmitted stream in compliance with the RTP protocol.

According to an embodiment, the multimedia stream comprises a continuous component and a discontinuous component, the retransmission of the discontinuous component is accelerated while the retransmission of the continuous component is carried out, without acceleration, from a continuous packet stored in the server in such a way that the continuous component is synchronized with the discontinuous component retransmitted when the stream retransmitted by the intermediary server is synchronized with the stream received by this intermediary server.

In an embodiment, the continuous packet selected to begin the transmission of the continuous component is the last packet of this continuous component stored in the server during reception of the retransmission request.

According to an embodiment, the continuous component being desynchronized in advance with respect to the continuous component, the continuous packet selected to begin the transmission of the continuous

component is a packet stored prior to the last packet received in a delay corresponding to the de-synchronization.

In an embodiment, the multimedia stream transmits the packets in MPEG-2 TS format, the independent images corresponding to images I transmitted in sub-packets in MPEG-2 TS format.

According to an embodiment, there is an omission to retransmit the packets in MPEG-TS format intended to be transmitted after a selected image I but for which the display must precede the display of this selected image I.

In an embodiment, the server modifies the MPEG-2 TS packets received, associating a continuous component and a synchronized discontinuous component, in order to generate new MPEG-2 TS packets associating a continuous component and a desynchronized discontinuous component.

According to an embodiment, a unicast retransmission is carried out between the sever and the IP decoder during the retransmission of the accelerated part of the stream then a multicast retransmission between the server and the IP decoder when the stream retransmitted by the intermediary server is synchronized with the stream received by this intermediary server.

In an embodiment, a multicast retransmission is carried out between the server and the IP decoder during the retransmission of the accelerated part of the stream, the IP decoder being practically the only destination of this multicast retransmission.

The invention also relates to an intermediary storage server for the retransmission of a multimedia stream from a video transmitter, this multimedia stream comprising packets coding independent images so that each independent image can be directly decoded, and packets of dependent images so that each dependent image requires at least one independent image to be decoded, the intermediary server comprising a memory to store this multimedia stream in such a way that the packets received later by this intermediary replace the packets received earlier by this server, characterized in that it comprises:

- the means to receive a request for retransmission of a multimedia stream transmitted by an IP decoder,
- the means to select an independent image packet stored in its memory in order to begin a retransmission of the multimedia stream received to the IP decoder from this selected packet, and
- the means to accelerate the retransmission of the multimedia stream received later than the independent image packet selected omitting to retransmit the dependent image packets until the accelerated part of the stream retransmitted is synchronized with the stream received according to a method conforming to one of the preceding embodiments.

Brief description of the figures

Other characteristics and advantages of the invention will clearly emerge from the description provided below as a non-restrictive example, with reference to the different annexed figures that show:

- in figure 1, already described, a diagrammatic representation of a transmission via the Internet network of a multimedia stream via an intermediary server,
- in figure 2, already described, a diagrammatic representation of a multimedia stream in compliance with the MPEG-2 format,
- in figure 3 and 4, a first embodiment of the invention implementing a video multimedia stream,
- in figures 5 and 6, a second embodiment of the invention implementing a multimedia stream having a synchronized video component and audio component,
- in figure 7, a third embodiment of the invention implementing a multimedia stream presenting a desynchronized video component and audio component,
- in figure 8, an embodiment of the invention implementing successively a unicast transmission then a multicast transmission,
- in figures 9 and 10, an embodiment of the invention that can be implemented independently, and

- in figure 11, a diagrammatic representation of a server according to an embodiment of the invention.

Description of the preferred embodiments of the invention

The elements appearing on the different figures may conserve, unless otherwise specified, the same references.

In reference to figure 3, an intermediary server 30 receives multimedia streams 34_1 and 34_2 respectively from the video transmitters 32_1 or 32_2 via the Internet network.

In reference to figure 11, the intermediary server 30 comprises a memory 31, a reception module 30.2 of a request for transmission of a multimedia stream transmitted by and IP decoder, a selection module 30.1 to select an independent image packet stored in the memory 31 in order to begin a retransmission of a received multimedia stream to an IP decoder from the selected packet, and a retransmission acceleration module 30.3 of multimedia streams received after the selected independent image packet.

These multimedia streams 34_1 and 34_2 comprise the packets 1 to 12 coding different types of images, such as:

- independent images such that each independent image can be directly decoded by a decoder 38_1 or 38_2. The packets transmitting such independent images are in dark grey on figure 1, namely: for the stream 34_1, the packets 4 and 12 and for the stream 34_2, the packets 6 and 11,

- dependent images such that each dependent image requires at least one independent image to be decoded.

In order to be able to respond in real time to a request 36_1 or 36_2 transmitted, respectively, by the IP decoder 38_1 or 38_2, the intermediary server 30 stores these multimedia streams 34_1 and 34_2 in a memory 31 as they are received.

Thus, the packets of a stream received later by the intermediary server replace the packets of the stream received earlier by the server 30.

In accordance with the invention, when the intermediary server 30 receives a transmission request 36_1 or 36_2 the intermediary server 30 selects an independent image packet stored in its memory to begin a retransmission

of the received stream, to the IP decoder requiring this stream, from this independent image packet.

In this preferred embodiment, the independent image packet selected is the last independent image packet stored by the server at reception of the transmission request.

Thus the streams 37_1 and 37_2 (figure 2) retransmitted by the server 30 are temporarily close to the received streams 34_1 and 34_2 which enables notably to rapidly synchronize the streams 37_1 or 37_2 retransmitted by the intermediary server with the corresponding stream 34_1 or 34_2 on reception due to an acceleration of the stream.

Indeed, this stream acceleration is carried out omitting to transmit the dependent image packets until the stream retransmitted by the intermediary server is synchronized with the stream received by the intermediary server.

In this embodiment, the synchronization between the stream retransmitted by the intermediary server and the stream received by this intermediary server is attained when no storage delay is introduced by the server in the transmission of the multimedia stream, that is to say when retransmission is carried out in real time.

As a result, the number of dependent image packets for which the transmission must be omitted corresponds to the number of dependent image packets stored in the server, and received after the selected independent image packet, during the reception of the transmission request. In the examples below:

- Considering the stream 34_1, the packet 4 selected on reception of the request 36_1 has an offset of four packets with the packet 9 being received.

For this reason, 4 packets (shaded) 5, 7, 9 and 11 are not transmitted so that the stream from the intermediary server is synchronized with the stream received by the intermediary server.

- Considering the stream 34_2, the packet 6 selected on reception of the request 36_2 has an offset of two packets with the packet 9 being received.

For this reason, 2 packets (shaded) 7and 9 are not transmitted so that the stream from the intermediary server is synchronized with the stream received by the intermediary server.

As shown in figure 4, the acceleration of the transmission of streams results in the streams 37_1 and 37_2 accelerated, with respect to the streams 34_1 and 34_2 received. More specifically, these streams 37_1 and 37_2 are only accelerated in the parts 39_1 or 39_2 modified with respect to the stream received.

Thus, as previously indicated, a server 30 in accordance with the invention does not require a strong increase in its bandwidth, that is to say an increase in bitrate, to accelerate the transmission of a stream and results in a transmission in real time of a stream initiated from the packets stored in the memory.

The invention is typically implemented to respond to a request 36_1 or 36_2 for retransmission aiming to receive a stream for, for example, zapping and changing television channel at the level of the display terminal associated with the decoder.

The embodiment previously described can be implemented with the video streams 34_1 and 34_2 using the MPEG format or, more generally, with video streams using a protocol compatible with a transmission of images via packets such as the RTP (Real-Time Transport Protocol) protocol.

Such an RTP protocol enables synchronizing the temporal functions, for example for the broadcasting of video content live, by adding a specific header to the packets transmitted.

This header comprises notably synchronization and numbering information of packets so that the possible loss of a packet can be detected and/or an offset of packets can be corrected.

A server 30 modifies the sequence of packets of a stream, it is then necessary to modify the synchronization and numbering of packet information in the accelerated part of the streams so as to generate a modified stream in accordance with the RTP protocol.

For this purpose, these modifications are carried out while analysing the packets for which the transmission is omitted from the first packet that is

synchronized with the live stream in such a way that the sequence numbers and the temporal markers of packets retransmitted by the server 30 are coherent with the RTP protocol.

When the acceleration of the stream according to the invention leads to a local increase of the stream, it may be necessary to modify the values regulating the management of the stream at the level of the IP decoder, particularly its VBV (Video Buffer Verifier) values.

It should be noted however that, by default, these VBV values are fixed at 15 Mbps in the majority of contexts of an MPEG-2 stream having an MP@ML (Main Profile at Main Level) profile, this threshold enabling the transmission of an accelerated stream according to the invention.

More generally again, the streams described can simply be transmitted according to the UDP (User Datagram Protocol) protocol, widely used on the Internet. The UDP protocol enables a simple transmission of packets between a transmitter and a decoder defined by their IP addresses and the port numbers which enables working in non-connected mode.

Moreover, it is possible that a video multimedia stream has one or more other components than its video component, for example audio, teletext and subtitle components.

Such a case is shown in figure 5 where a transmitter 42 transmits a multimedia stream 44 having a video component 44v and an audio component 44a.

In this case, the multimedia stream 44 comprises a continuous component, the audio component 44a, that cannot be modified without noticeably altering the entire decoding of this component as each packet of this audio component 44a comprises an item of information necessary and complimentary to the entire decoding of the component.

For its part, the video component 44v is a discontinuous component that can be modified in an acceptable manner as described with the streams 34_1 and 34_2.

Indeed, a continuous component reproduces progressively the set of a content over the duration allocated to the reproduction of this content while

a discontinuous component represents the same content during the reproduction period allocated to this content.

In addition, the transmission of the continuous component 44a is carried out from a continuous packet stored in the server such that, without omitting the packet in the transmission of the continuous component 44a, this latter is synchronized with the discontinuous component 44v when the stream retransmitted 47 by the intermediary server 30 is itself synchronized with the stream received 44 by this intermediary server 30.

In the example of figure 5, this stored continuous packet is the last packet received 8 which enables notably having a multimedia stream having an audio component immediately transmitted in real time.

In omitting to transmit the shaded packets 5, 7, 10 and 12 of the video component 44v, it then appears that the synchronization of discontinuous components 44v and continuous components 44a is obtained from the packet 13. At this level, the stream from the intermediary server is itself synchronized with the stream received by this intermediary server after an accelerated part 49 of the retransmitted stream 47 (figure 6).

It should be noted that, during the acceleration period of the transmission of the video component 44v, this latter is desynchronized with respect to the audio component 44a.

In reference to figure 7, it is possible that the audio component 44a presents a de-synchronization at its reception by the server 30 with respect to the video component 44v. For example, this de-synchronization can correspond to an advance of packets of the audio component 44a on the packets of the video component 44v.

In this case, in accordance with an embodiment of the invention, the stored continuous packet from which commences the transmission of the audio component 44a is the packet 8 stored in the memory 31 of the server with an advance on the last packet 10 received corresponding to this de-synchronization, that is two packets in the example shown.

Thus, the implementation of the invention - abandons the packets 5, 7, 10 and 12 of the component 44v - enables resynchronization of the audio component 44a and the component 44v.

In one embodiment, the packets transmitted are in MPEG-2 TS (Transport Stream) format, such that, in the received packets, are associated a continuous component with a discontinuous component in a synchronized manner.

In this case, the server 30 can generate new MPEG-2 TS packets associating a continuous component and a discontinuous component de-synchronized in a way to implement the invention previously described.

Moreover, the acceleration in the transmission of these packets is increased by omitting to retransmit the packets in MPEG-TS format intended to be transmitted after a selected image I but whose display should precede this selected image I.

Finally, it should be noted that to enable a rapid processing of new MPEG-2 TS packets transmitted, it is desirable to transmit the tables PAT and PMT previously corresponding to the selected image I.

The present invention can be implemented according to different variants, particularly depending on whether the IP decoder receives a unicast stream, that is to say dedicated to its IP address, or a multicast stream transmitted to a set of decoders accessing a common address.

In the first case, the invention is simply implemented as described previously while, in the second case, the server 30 in accordance with the invention must impose a unicast transmission during the acceleration period before returning to multicast as described below.

In reference to figure 8, two decoders 68_1 and 68_2 usually operate by receiving a multicast stream from a server 30. To do this, these decoders can use an IGMP (Internet Group Management Protocol) type protocol

Such a protocol enables access to a multicast group using the IP (Internet Protocol) protocol so that these decoders 68_1 and 68_2 are connected to a group.

The IGMP (Internet Group Management Protocol) protocol thus enables an IP decoder to register in a group.

However, when these decoders 68_1 and 68_2 transmit a respective request 66_1 et 66_2 to receive a multimedia stream broadcast in multicast, each of these decoders 68_1 and 68_2 receives, initially, a stream 69_1 or 69_2

accelerated in unicast.

When the retransmitted stream is thus synchronized with the stream received at the level of the server 30 for each of the decoders, a same multicast stream 70 can be retransmitted to the latter.

In one embodiment, a single IP decoder is connected to server 30 in such a way that a multicast retransmission can be carried out between the server 30 and the IP decoder during the accelerated part, reproducing in practice a unicast transmission.

According to an aspect of the invention that can be used independently – in reference to figures 9 and 10 - a server 80 for retransmission of a multimedia stream 84_1 or 84_2, from respective video transmitters 82_1 or 82_2, receives multimedia streams 84_1 and 84_2 comprising packets coding independent images and dependent image packets as previously defined.

In addition, the server 80 stores these multimedia streams 84_1 or 84_2 in a memory 81 in such a way that the packets received later by the intermediary server replaces the packets received later by this server.

In accordance with this variant of the invention, when the intermediary server receives a request 86_1 or 86_2 for retransmission of a multimedia stream transmitted by an IP decoder 88_1 or 88_2, the intermediary server selects the independent image packet most recently stored in its memory in order to begin a retransmission of the received multimedia stream to the IP decoder from this selected packet.

This selected packet, 4 or 6 for, respectively, the streams 84_1 and 84_2, presents an offset with the packet being received, that is an offset of 4 packets for the stream 84_1 and an offset of 2 packets for the stream 84_2.

In this case, the server 80 can omit to accelerate the retransmission of the multimedia streams 84_1 and 84_2 and retransmit these streams maintaining the same offset, between the streams received and the streams retransmitted, as this offset presents between the selected packet and the packet being received.

Thus the server 80 can respond in real time to a request for retransmission without requiring either an increase in the bandwidth or decoders equipped with specific means for bitrate variations.

However, it is also possible to realize an acceleration of the stream transmitted as previously described omitting to retransmit some packets received by the server, particularly the dependent image packets. For example, it is simple to omit the retransmission of dependent image packets before being transmitted later to an independent image packet, selected to carry out an acceleration, and before being displayed earlier than this independent image.

In this case, this acceleration can enable a retransmission of the stream received by the server to be attained with a constant temporary offset on variable time periods according to the application.

CLAIMS

1. Method for retransmission of a multimedia stream (34, 34_2, 44), from a video transmitter (32_1, 32_2, 42), via an intermediary storage server (30), this multimedia stream (34, 34_2, 44) comprising packets coding independent images so that each independent image can be directly decoded, and packets of dependent images so that each dependent image requires at least an independent image to be decoded, the multimedia stream (34_1, 34_2, 44) comprising a continuous component (44a) and a discontinuous component (44v), the intermediary server (30) storing this multimedia stream (34_1, 34_2, 44) in a memory (31) in such a way that the packets received later by the intermediary server (30) replace the packets received earlier by this server (30), characterized in that it comprises the following steps:

- the step for the intermediary server (30) to receive a request (36_1, 36_2, 46, 66) for retransmission of the multimedia stream transmitted by an IP decoder (38_1, 38_2, 48, 68_1 and 68_2),
- the step for the intermediary server (30), on reception of the request (36_1, 36_2, 46, 66), to select an independent image packet stored in its memory (31) in order to begin a retransmission of the received multimedia stream to the IP (38_1, 38_2, 48, 68_1 and 68_2) decoder from this selected packet, and
- the step for the server (30) to accelerate the retransmission of the multimedia stream received later than the independent image packet selected omitting to retransmit the dependent image packets until the accelerated part (39, 49) of the stream retransmitted by the intermediary server (30) is synchronized with the stream received (34_1, 34_2, 44) by this intermediary server (30), wherein the retransmission of the discontinuous component (44v) is accelerated while the retransmission of the continuous component (44a) is carried out, without acceleration, from a continuous packet stored in the server (30) in such a way that the continuous component (47a) is synchronized with the discontinuous component (47v) retransmitted when the stream (37_1, 37_2, 47) retransmitted by the intermediary server is synchronized with the stream (34_1, 34_2, 44) received by this intermediary server (30).

2. Method according to the preceding claim characterized in that the packet selected is the independent image packet most recently stored by the server (30).

3. Method according to claim 1 or 2 characterized in that the number of dependent image packets for which the retransmission is omitted corresponds to the number of dependent image packets stored in the server, and received after the selected packet, during the reception of the transmission request (36_1, 36_2, 46, 66).

4. Method according to one of the preceding claims characterized in that the synchronization between the stream retransmitted (37_1, 37_2, 47) and the stream received (34_1, 34_2, 44) by this intermediary server (30) is attained when the intermediary server (30) retransmits the stream received (34_1, 34_2, 44) in real time, that is to say as it is being received.

5. Method according to one of the claims 1, 2 or 3 characterized in that the synchronization between the stream retransmitted (37_1, 37_2, 47) and the stream received (34_1, 34_2, 44) by this intermediary server (30) is attained when the intermediary server (30) retransmits the stream received (34_1, 34_2, 44) with a constant temporary offset with respect to its reception.

6. Method according to one of the preceding claims characterized in that, the multimedia stream received (34_1, 34_2, 44) being retransmitted according to the RTP protocol, the synchronization information and the numbering of packets of the retransmitted stream are modified in the accelerated part (39, 49) of the stream retransmitted (37_1, 37_2, 47) in such a way to generate a stream retransmitted in accordance with the RTP protocol.

7. Method according to one of the preceding claims characterized in that the continuous packet selected to begin the transmission of the continuous component (44a) is the last packet of this continuous component (44a) stored in the server (30) during reception of the retransmission request (46).

8. Method according to one of the preceding claims characterized in that, the continuous component (44a) being desynchronized with respect to the continuous component (44v), the continuous packet selected to begin the transmission of the continuous component (47a) is a packet stored prior to the last packet received in a delay corresponding to the de-synchronization.

9. Method according to one of the preceding claims characterized in that the multimedia stream (34_1, 34_2, 44) transmits the packets in MPEG-2 TS format, the independent images corresponding to images I transmitted in sub-packets in MPEG-2 TS format.

10. Method according to claim 9 characterized in that there is an omission to retransmit the packets in MPEG-TS format intended to be transmitted after a selected image I but for which the display must precede the display of this selected image I.

11. Method according to claim 10 characterized in that the server (30) modifies the MPEG-2 TS packets received, associating a synchronized continuous component and a discontinuous component, in order to generate new MPEG-2 TS packets associating a desynchronized continuous component and a discontinuous component.

12. Method according to one of the preceding claims characterized in that a unicast retransmission is carried out between the sever (30) and the IP decoder (68_1, 68_2) during the retransmission of the accelerated part (69_1, 69_2) of the stream then a multicast retransmission between the server (30) and the IP decoder (68_1, 68_2) when the stream (70_1, 70_2) retransmitted by the intermediary server (30) is synchronized with the stream received by this intermediary server.

13. Method according to one of claims 1 to 11 characterized in that a multicast retransmission is carried out between the server (30) and the IP decoder during the retransmission of the accelerated part of the stream, the IP decoder being practically the only destination of this multicast retransmission.

14. Intermediary storage server (30) for the retransmission of a multimedia stream (34_1, 34_2, 44) from a video transmitter (32_1, 32_2, 42), this multimedia stream (34, 34_2, 44) comprising packets coding independent images so that each independent image can be directly decoded, and packets of dependent images so that each dependent image requires at least one independent image to be decoded, the multimedia stream (34_1, 34_2, 44) comprising a continuous component (44a) and a discontinuous component (44v), the intermediary server (30) comprising a memory (31) to store this multimedia

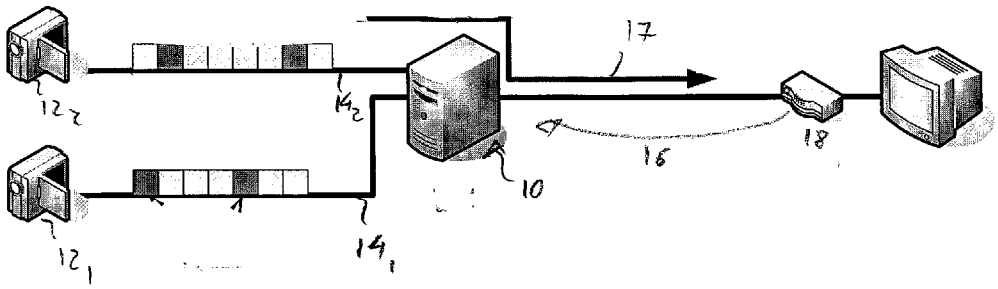
stream in such a way that the packets received later by this intermediary replace the packets received earlier by this server, characterized in that it comprises:

- the means to receive (30.2) a request for retransmission of a multimedia stream transmitted by an IP decoder,

- the means to select (30.1) an independent image packet stored in its memory in order to begin a retransmission of the multimedia stream received to the IP decoder from this selected packet, and

- the means to accelerate the retransmission (30.3) of the multimedia stream received later than the independent image packet selected omitting to retransmit the dependent image packets until the accelerated part of the stream retransmitted is synchronized with the stream received according to a method in accordance with one of the preceding claims, wherein the retransmission of the discontinuous component (44v) is accelerated while the retransmission of the continuous component (44a) is carried out, without acceleration, from a continuous packet stored in the server (30) in such a way that the continuous component (47a) is synchronized with the discontinuous component (47v) retransmitted when the stream (37_1, 37_2, 47) retransmitted by the intermediary server is synchronized with the stream (34_1, 34_2, 44) received by this intermediary server (30)..

Fig 1



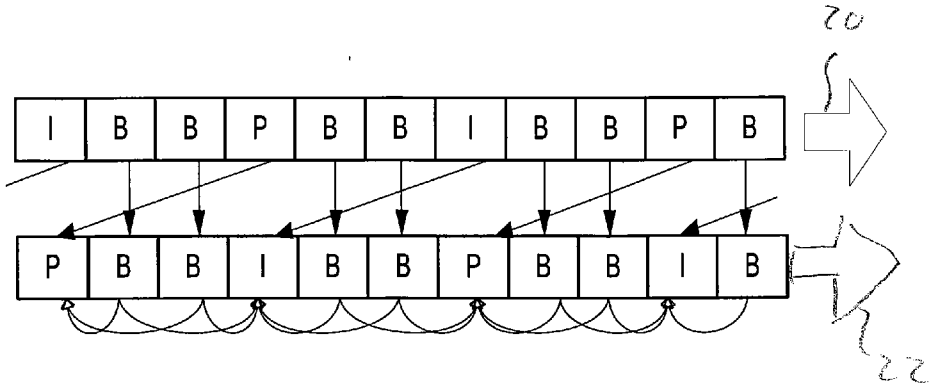


Fig 2

Fig 3

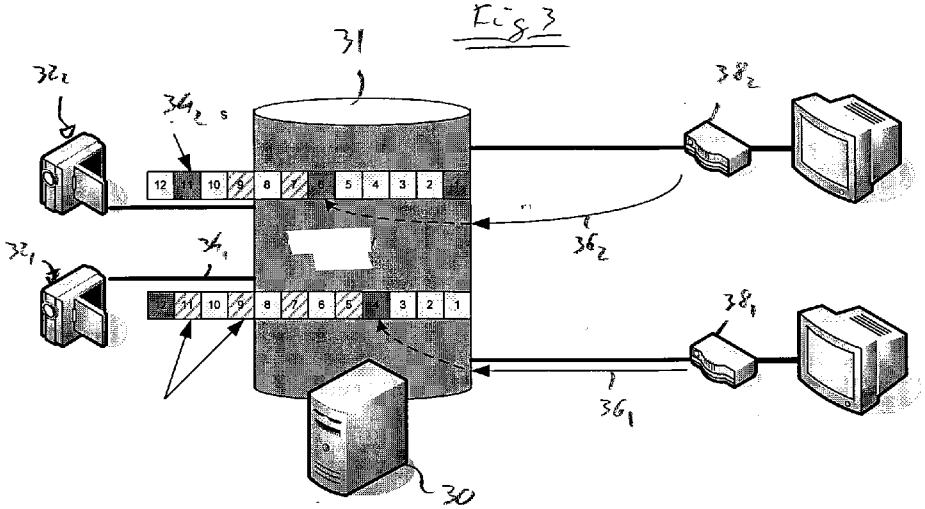

31
32₂
34₂
38₂
36₂
32₁
34₁
38₁
36₁
30

Fig 4

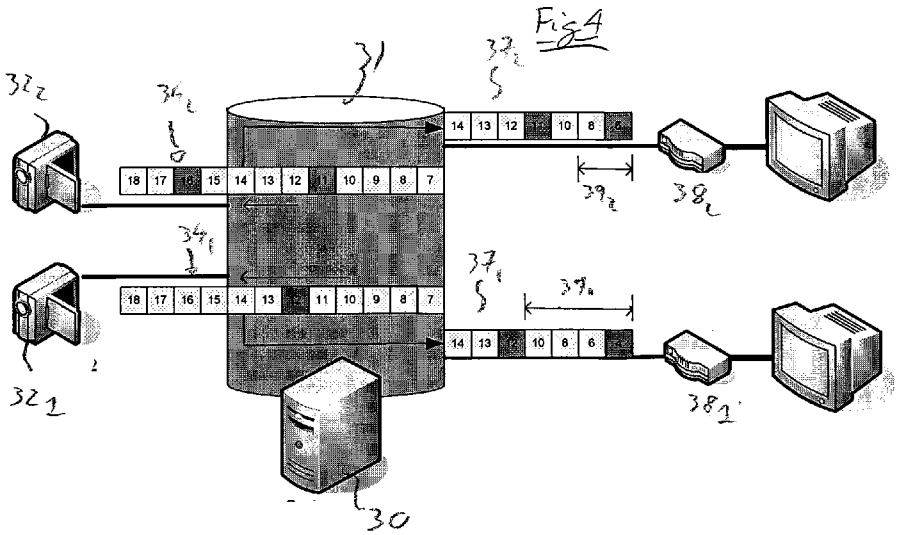

31
32₂
34₂
37₂
38₂
39₂
34₁
37₁
39₁
38₁
32₁
30

Fig 5

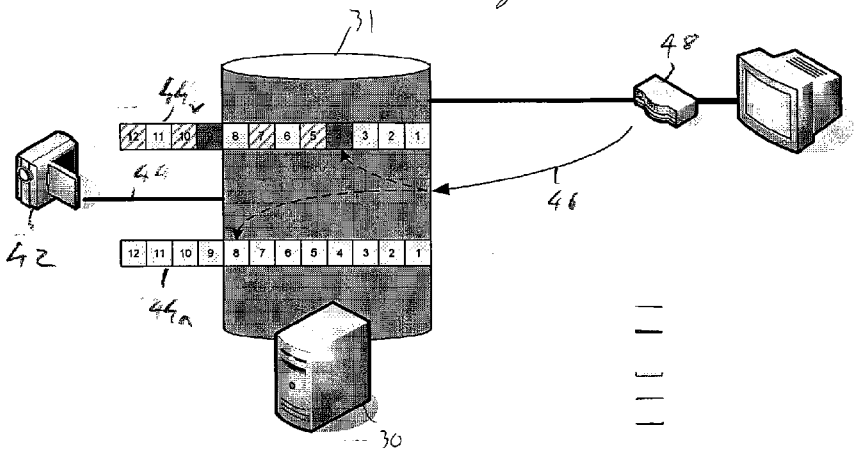


Fig 6

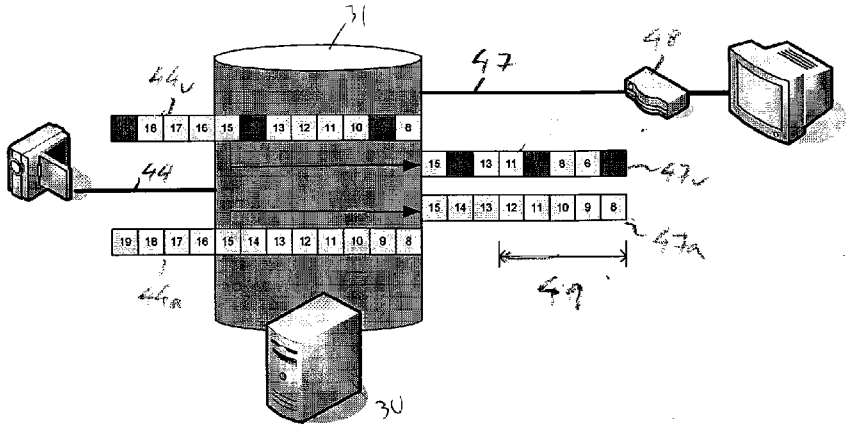
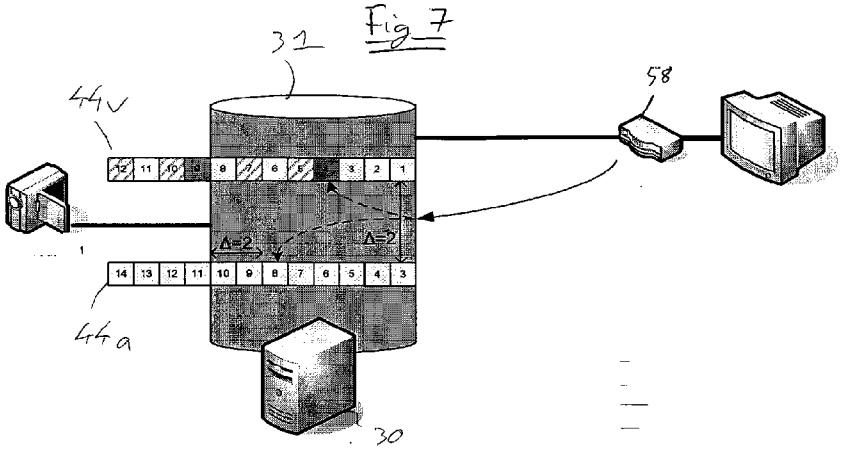


Fig 7



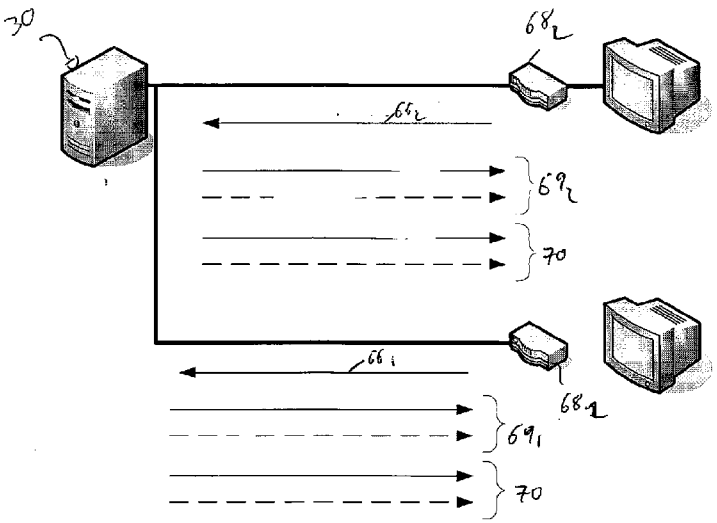


Fig 8

Fig 9

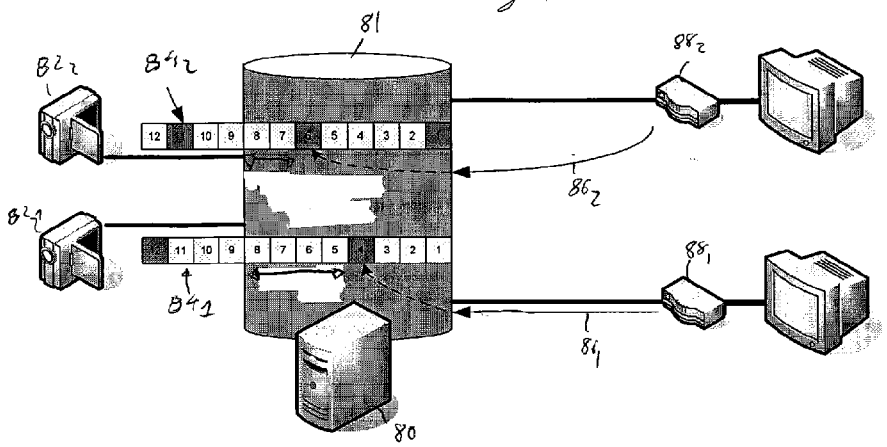
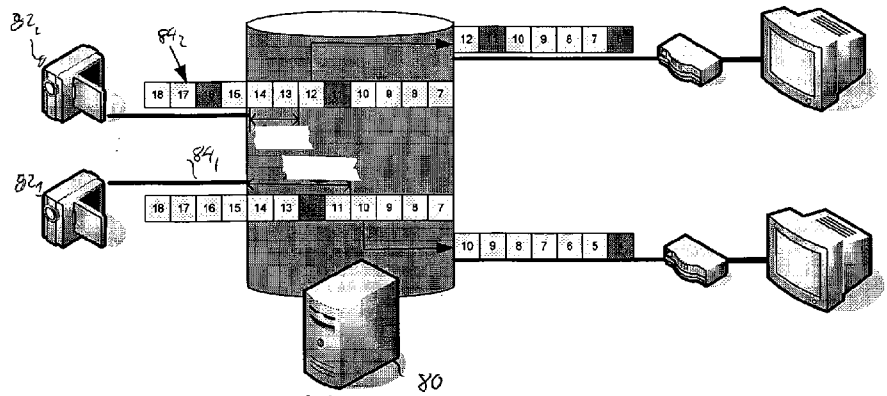


Fig 10



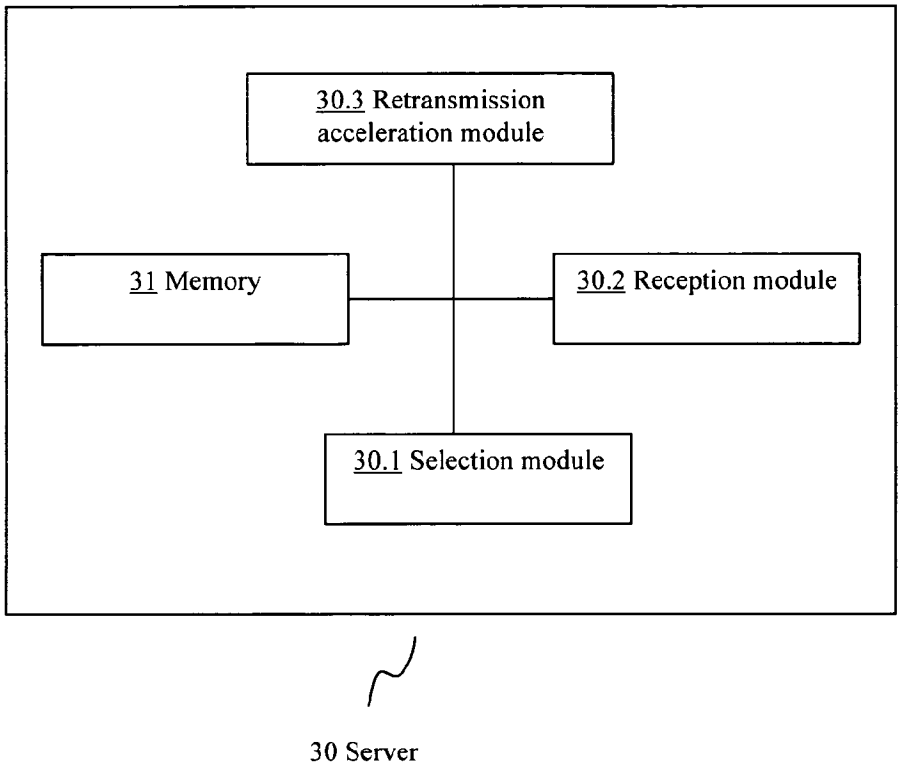

30.3 Retransmission acceleration module
31 Memory
30.2 Reception module
30.1 Selection module
30 Server

FIG. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/065057

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N7/24

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

B. FIELDS SEARCHED

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

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2006/143669 A1 (COHEN NOAM [IL]) 29 June 2006 (2006-06-29) abstract paragraphs [0003] - [0006], [0009], [0010], [0012] - [0019], [0023], [0024], [0026], [0034], [0035], [0037], [0038], [0042] - [0050] figures 2-4 claims 1,3,5,9,10,12,14,18,20	1-5, 7-12,14

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 February 2010	05/03/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Beaudet, J

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/065057

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	US 6 747 991 B1 (HEMY MICHAEL [US] ET AL) 8 June 2004 (2004-06-08) column 6, line 13 - line 32	1-5, 7-12,14

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/065057

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	POON W-F ET AL: "A hierarchical video-on-demand system with double-rate batching" JOURNAL OF VISUAL COMMUNICATION AND IMAGE REPRESENTATION, ACADEMIC PRESS, INC, US, vol. 16, no. 1, 1 February 2005 (2005-02-01), pages 1-18, XP004660724 ISSN: 1047-3203 paragraphs [02.1], [02.2] -----	13
A	EP 1 718 079 A1 (ALCATEL USA SOURCING LP [US]) 2 November 2006 (2006-11-02) abstract paragraphs [0002], [0003], [0005], [0006], [0008], [0011] - [0014], [0017], [0018], [0020], [0021] claims 1-3,8 figure 1 -----	1,14

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International application No
PCT/EP2009/065057

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