

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Franck DENOUAL	Confirmation No.:	Unknown
Application No.:	N/A		
Filed:	HEREWITH	Examiner:	Unknown
For:	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA	Art Unit:	Unknown

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

PRELIMINARY AMENDMENT

Dear Sir / Madam:

Prior to the examination of the above-identified application, please enter the Preliminary Amendment as follows:

Amendments to the Specification begin 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 10 of this paper.

Amendments to the Specification:

Please insert the following paragraph in the Specification after the Title of the Invention but before the 'Field of the Invention' heading:

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. Pat. Application No. 14/434,741, filed on April 09, 2015, that is the National Phase application of PCT Application No. PCT/EP2013/071370, filed on October 11, 2013 and titled "Method and corresponding device for streaming video data." This application claims the benefit under 35 U.S.C. § 119(a)-(d) of United Kingdom Patent Application Nos. GB1218370.3, filed on October 12, 2012 and titled "Method and corresponding device for streaming video data", and GB1306897.8 filed on April 16, 2013 and titled "Method and corresponding device for streaming video data." The above cited patent applications are incorporated herein by reference in their entirety.

Amendments to the Specification:

Please amend the abstract of the invention according to the following paragraph:

~~The present invention provides a~~ A method for streaming data corresponding to a given video, each of a plurality of frames ~~frame~~ of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks. ~~The method comprises:~~ the method includes transmitting, by a server, a description file to a client device, ~~said the~~ the description file including data about ~~[[the]] a spatial organization~~ position of each of the n spatial tiles ~~the n video sub-tracks~~ and including data about at least n URLs corresponding to the n spatial tiles ~~respectively designating each video sub-track~~, ~~selecting~~ determining by the client device one or more URLs according to the data about the spatial position included in the description file ~~one Region Of Interest chosen by the client device or a client device's user~~, receiving from the client device, by ~~[[the]] a~~ a server, one or more request messages for requesting one or more spatial tiles ~~a resulting number of video sub-tracks~~, each request message comprising one of the URLs ~~selected~~ determined by the client device, and transmitting to the client device, by the server, video data corresponding to the one or more spatial tiles ~~requested video sub-tracks~~, in response to one or more ~~the~~ request messages.

~~(Figure 1b)~~

Amendments to the Claims:

Please amend the claims as shown below. This Listing of Claims will replace prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Original) A method for streaming data corresponding to a given video, each frame of the video being divided into n partitions, n being an integer, in order to create n independent partial videos, the method comprising:
transmitting, by a server, a notification to a client, said notification including spatial information about a spatial organization of the n partial videos,
receiving from the client which received the notification, by the server, one or more messages for requesting one or more partial videos according to a Region Of Interest selected based on an operation by a user of the client, and
transmitting to the client, by the server, video data corresponding to the one or more partial videos, in response to the one or more messages from the client.
2. (Original) The method according to claim 1, wherein the spatial information represents a spatial position of each of the n partial videos.
3. (Original) The method according to claim 2, wherein the spatial position is represented by a coordinate value of a top-left corner, a width and a height of a partial video.
4. (Original) A transmitting method for transmitting video data to a client, the method comprising:
transmitting, to the client, a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the videos,

receiving, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client, and

transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client.

5. (Original) The method according to claim 4, wherein the spatial position information represents a coordinate value of each of the n spatial regions.

6. (Original) The method according to claim 4, wherein the spatial position information represents a coordinate value of a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions.

7. (Original) The method according to claim 5, wherein the spatial position information represents an x -coordinate value and a y -coordinate value of each of the n spatial regions.

8. (Original) The method according to claim 4, wherein the spatial position information represents a partition number in the video of each of the n spatial regions.

9. (Original) The method according to claim 4, wherein the notification further includes partition number information representing a number of partitions of the video corresponding to the n spatial regions in the horizontal direction and in the vertical direction.

10. (Original) The method according to claim 4, wherein a spatial size of at least one spatial region is different from a spatial size of another spatial region, and

the spatial size information represents a spatial size of each of the n spatial regions.

11. (Original) The method according to claim 4, wherein the spatial size information further represents a spatial size of a video corresponding to the n spatial regions.

12. (Original) The method according to claim 4, wherein each frame of the video corresponding to the n spatial regions is divided into n rectangles

13. (Original) The method according to claim 4, wherein each frame of the video corresponding to the n spatial regions is divided into n partitions and compressed independently in order to create the n spatial regions.

14. (Original) A method for receiving video data from a server, the method comprising:

receiving, from the server, a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video,

transmitting, to the server, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted from the server, and

receiving, from the server, the video data corresponding to the one or more spatial regions according to the information transmitted to the server.

15. (Original) The method according to claim 14, wherein the spatial position information represents a coordinate value of each of the n spatial regions.

16. (Original) The method according to claim 14, wherein the spatial position information represents a coordinate value of a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions.

17-21. (Canceled)

22. (Original) An apparatus for transmitting video data to a client, the apparatus comprising:

- a hardware processor; and
- a memory storing one or more programs configured to be executed by the hardware processor, the one or more programs including instructions for:
 - transmitting, to the client, a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video;
 - receiving, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client; and
 - transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client.

23. (Original) The apparatus according to claim 22, wherein the spatial position information represents a coordinate value of each of the n spatial regions.

24. (Original) The apparatus according to claim 22, wherein the spatial position information represents a coordinate value of a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions.

25. (Original) The apparatus according to claim 23, wherein the spatial position information represents an x-coordinate value and a y-coordinate value of each of the n spatial regions.

26. (Original) The method according to claim 4, wherein the information received from the client includes one or more URLs associated with the one or more spatial regions.

27. (Original) The method according to claim 4, wherein the information received from the client includes one or more HTTP addresses associated with the one or more spatial regions.

28. (Original) The method according to claim 4, wherein, in a case where a spatial position of the n spatial regions for a first time period and a spatial position of the n spatial regions for a second time period are different from each other, a first notification for the first time period and a second notification for the second time period are transmitted to the client.

29. (Original) The method according to claim 28, wherein the first notification includes (i) first spatial position information representing a spatial position of each of the n spatial regions for the first time period and (ii) first spatial size information representing a spatial size of each of the n spatial regions for the first time period, and the second notification includes (iii) second spatial position information representing a spatial position of each of the n spatial regions for the second time period and (iv) second spatial size information representing a spatial size of each of the n spatial regions for the second time period.

30. (Original) The method according to claim 4, wherein the notification further includes a parameter relating to at least one of an image resolution, a frame rate and a bandwidth of the video.

31. (Canceled)

32. (Original) The apparatus according to claim 22, further comprising a camera unit for performing capturing to obtain the video data.

33. (Original) The method according to claim 14, further comprising determining a Region Of Interest based on a signal from a user interface, wherein the one or more spatial regions include the Region Of Interest.

REMARKS

Prior to examination of the above-identified application, please enter the Preliminary Amendment. No new matter has been added. Should the Examiner have any questions, the Examiner may contact Applicant's representative at the telephone number below.

Respectfully submitted,

10/13/2017

/Amichai Kotev/

Date

Amichai Kotev, Reg. No. 57,668
Attorney for Applicant

Canon U.S.A. Inc., Intellectual Property Division
15975 Alton Parkway
Irvine, CA 92618-3731

Telephone: (949) 932-3313
Fax: (949) 932-3560

METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

FIELD OF THE INVENTION

5 The invention relates to a method and a device for transmitting media data, and more particularly Web-accessed compressed videos. Preferably, the streaming of media data is made over IP networks (like the Internet) by using the protocol HTTP.

BACKGROUND OF THE INVENTION

10 A media presentation is usually composed of several media contents such as audio, video or text. They can be sent from a server to a client for being jointly played by the client device. Those media contents are downloaded by the client from a
15 server.

 In this context, a new standard called DASH (for "Dynamic Adaptive Streaming over HTTP") has recently emerged (see "ISO/IEC 23009-1, Dynamic adaptive streaming over HTTP (DASH), Part1: Media presentation description and segment formats"). This standard enables to create an association between a compact
20 description of the content(s) of a media presentation and the HTTP addresses. Usually, this association is described in a file called a manifest file or description file. In the context of DASH, this manifest file is a file also called the MPD file (for Media Presentation Description).

 When the MPD file is sent to the client device, the description of each
25 media content can be easily known by the client. By reading the manifest file, the client is aware of the kind of media contents proposed in the media presentation and is aware of the HTTP addresses for downloading the associated media contents. Therefore, it can decide which media content to download (via HTTP requests) and to play (decoding and play after reception of the media data segments).

30 In addition to this association, the DASH standard proposes to split each media content into small periods of time. The time decomposition is added in the MPD file. Thus it describes the association between HTTP addresses (or URLs) and the compact description of each media content over a small period of time.

35

The invention focuses on a video description in a manifest file (by taking the DASH MPD as reference). Even if the other elements of the media representation (e.g. audio, text,...) are not directly taken into account, they can easily be incorporated in a more global media description as will be explained below.

5

The spatial resolution of the video becomes more and more important. In this perspective, 4K2K videos begin to emerge on the market. However, mobile applications cannot display such a resolution with a high quality.

A solution proposes to split the video into tiles. If the user of a mobile application wants to display or focus on sub-parts of the video, only the tiles corresponding to the sub-part are transmitted. This process allows keeping a video portion with a good quality.

In the context of DASH, the known standard "ISO BMFF" ("Base Media File Format") is used to encapsulate media contents into media data segments in order to form the media presentation.

Classically, by using DASH, each track would be described in the manifest as independent media content, even if the track corresponds to a sub-part of the video. There is no way in the manifest to signal that each track is a sub-part of the same video. Indeed current MPD definition doesn't allow describing tiled video. In practice, the user would have to download a first initialization segment (in addition to the manifest) for knowing that each video described in the MPD is a sub-part of a tiled video. Then they would have to download, as a minimum, the beginning of each first media data segment of each video content to retrieve the association between tile locations and video content. The downloading of this initialization information conducts to delays and additional and useless HTTP requests.

In another prior art which is not compatible with the use of DASH, the article "*In packet video 2010, An Interactive Region Of Interest Video Streaming System for Online Lecture Viewing*", A. Mavlankar, P. Agrawal, D. Pang, D. Halawa, N. Cheung, B. Girod, proposes a specific manifest ("proprietary manifest") describing tiles for a scalable video. The specific manifest provides an identifier and a piece of location information for each tile. From a URL associated to a base layer, and tiles information provided by the proprietary manifest, an HTTP query is built to access a particular tile, this query being associated to a tile index. This type of HTTP query requires

processing at server-side to retrieve, from the HTTP query, the byte-range and consequently the tile to be sent to the client device to fulfill its request. This can be done only by a very specific server.

5 SUMMARY OF THE INVENTION

The present invention has been devised to address one or more of the foregoing concerns.

According to a first aspect of the invention, there is proposed a method for
10 streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks.

The method comprises:

- transmitting, by a server, a description file to a client device, said description file
15 including data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating each video sub-track,
- selecting by the client device one or more URLs according to one Region Of Interest chosen by the client device or a client device's user,
- receiving from the client device, by the server, one or more request messages
20 for requesting a resulting number of video sub-tracks, each request message comprising one of the URLs selected by the client device, and
- transmitting to the client device, by the server, video data corresponding to the requested video sub-tracks, in response to the request messages.

25 It is specified that spatial tiles are composed of rows and columns of pixels.

In other words, the first aspect of the invention proposes to include directly the URLs of video sub-tracks in a description file (meaning an MPD in DASH) so that the client is aware of the division of the frames into tiles and is able to directly send URL
30 request messages to the server.

The first aspect of the invention allows the limiting of the number of requests for the streaming of the data between the server and the client device. Moreover, when it receives the description file, the client is already aware of the presence and the spatial organization of the tiles, and consequently, it knows how to display the corresponding
35 video sub-tracks.

5 In an embodiment, the description file further comprises a URL designating a track corresponding to the full given video, and if the client device does not select any URL according to one Region Of Interest, the server receives from the client device a request message comprising the URL of the full video track and transmits, to the client device, video data corresponding to the full video track in response to the request message.

10 In an embodiment, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and said video further comprising a base layer video track, said description file further comprising the URL of the base layer track, and if the client device selects at least one URL according to one Region Of Interest, it also selects the
15 URL of the base layer, and the server further receives from the client device one request message for requesting the base layer track, said request message including the URL of the base layer track, and the server further transmits, to the client device, video data corresponding to the requested base layer track, in response to the request message.

20 According to a variant, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and each frame of the base layer also being divided into n spatial tiles, each tile of the base layer corresponding to a tile in the enhancement layer, in
25 order to create n independent base layer sub-tracks, and if the client device selects at least one URL according to one Region Of Interest, it also selects the URLs of the corresponding base layer sub-tracks, and the server further receives from the client device one request message for requesting the base layer sub-tracks, said request message including the URLs of the base layer sub-tracks, and the server further transmits, to the client device, video data corresponding
30 to the requested base layer sub-tracks, in response to the request message.

In an embodiment, the configuration of the n spatial tiles is defined in the description file by a grid subdivided into a given number of rows and columns, each one having a pre-determined height and width.

- 5 In an embodiment, the configuration of the n spatial tiles defines spatial tiles having a uniform or a non-uniform area.

In an embodiment, each spatial tile is a rectangular region.

- 10 In an embodiment, if the spatial tiles have a uniform area, the grid is specified by its number of boundaries in both horizontal and vertical dimensions.

- In an embodiment, if the spatial tiles have a non-uniform area the grid is specified by its number of rows and columns and the positions of the borders of the rows and the
15 columns.

In an embodiment, the data are streamed according to the DASH standard, said description file being a Media Presentation Description file.

- 20 In an embodiment, each URL designates a segment of track or video sub-track for a pre-defined period of time.

- In an embodiment, the configuration of the n spatial tiles being defined for each period of time by using a syntax element relative to an entire period of time.
25

- In an embodiment, the description file comprising a set of parameters defined for each video sub-track for every period of time,
the set of parameters including a descriptor which incorporates data about:
a. the type of the track: video track or video sub-track, and/or
30 b. if the track is a video sub-track, the position of the spatial tile and the configuration of the n spatial tiles.

In an embodiment, the description file comprising for every period of time, a set of parameters being defined for each tile and,

the set of parameters including a descriptor called a Role element which incorporates data about:

the type of the track: video track or video sub-track, and/or

b. if the track is a video sub-track, a reference to the configuration of the n spatial tiles.

5

In an embodiment, if the track is a video sub-track, the descriptor further comprise a scheme to specify the position of the considered tile relative to the configuration of the n spatial tiles.

10 In an embodiment, the position of the spatial tile being indicated by referring to the indexes of the rows and the columns of the grid.

In an embodiment, the position of the spatial tile being indicated by referring to the position in pixels of the top-left corner of the tile and the width and height of the tile.

15

In an embodiment, the position of the spatial tile being indicated by positions in a specified coordinates system.

20 In an embodiment, the position of the spatial tile being expressed as a spatial Media Fragments.

In an embodiment, the video data corresponds to m videos representing the same content, m being an integer, each of the m videos having a different resolution, and each frame of each video being divided into n spatial tiles, in order to create $m \cdot n$ independent video sub-tracks.

25

In an embodiment, the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

30

This enables the client-side selection of any subset of sub-tracks with guarantee for correct display without the need, in the specific case of tile, of upsampling or downsampling the received data.

35

In an embodiment, the method further comprises:

- acquiring the data corresponding to the given video,
- compressing the acquired data,
- encapsulating the compressed data, said encapsulating comprising:

- 5 • generating a given number of video segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
- generating an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks, and
- generating the description file from the encapsulated data.

10

In an embodiment, the description file further comprises a URL associated to the initialization segment.

In an embodiment, the initialization data comprises values indicating the width and the height of each video sub-track.

15

In an embodiment, the initialization data further comprises a transformation matrix which enables the display of each video sub-track at the right position.

- 20 According to another aspect of the invention, it is proposed a method for providing data by a server device to a client device, said data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks.

The method comprises:

- 25 • generating a description file, said description file including data about the spatial organization of the n video sub-tracks, and at least n URLs respectively designating each video sub-track,
- transmitting said description file to the client device, and
- transmitting video data corresponding to a given number of video sub-tracks
- 30 based on one or more client device or client device user's requests, each request comprising one of the URLs.

In an embodiment, the description file further comprises a URL designating a track corresponding to the full given video, and the server transmits, to the client device,

video data corresponding to the full video track based on a client device requests comprising the URL of the full video track.

5 In an embodiment, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and said video further comprising a base layer track, said description file further comprising the URL of the base layer track, and the server further transmits, to the client device, video data corresponding to the base layer track based on a client device requests comprising the URL of the base layer track.

10

According to a variant, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and each frame of the base layer also being divided into n spatial tiles, each tile of the base layer corresponding to a tile in the enhancement layer, in order to create n independent base layer sub-tracks, said description file further comprising the URL of the base layer sub-tracks, and the server further transmits, to the client device, video data corresponding to the base layer sub-tracks based on a client device requests comprising the URL of the base layer sub-tracks.

20

In an embodiment, the configuration of the n spatial tiles is defined in the description file by a grid subdivided into a given number of rows and columns, each one having a pre-determined height and width.

25 In an embodiment, the configuration of the n spatial tiles defines spatial tiles having a uniform or a non-uniform area.

In an embodiment, each spatial tile is a rectangular region.

30 In an embodiment, if the spatial tiles have a uniform area, the grid is specified by its number of boundaries in both horizontal and vertical dimensions.

In an embodiment, if the spatial tiles have a non-uniform area the grid is specified by its number of rows and columns and the positions of the borders of the rows and the columns.

35

In an embodiment, the data are transmitted according to the DASH standard, said description file being a Media Presentation Description file.

- 5 In an embodiment, each URL designates a segment of track or sub-track for a pre-defined period of time.

In an embodiment, the configuration of the n spatial tiles being defined for each period of time by using a syntax element relative to an entire period of time.

10

In an embodiment, the description file comprising a set of parameters defined for each video sub-track for every period of time,

the set of parameters including a descriptor which incorporates data about:

- a. the type of the track: video track or video sub-track, and/or
 15 b. if the track is a video sub-track, the position of the spatial tile and the configuration of the n spatial tiles.

In an embodiment, the description file comprises for every period of time, a set of parameters being defined for each tile,

- 20 the set of parameters including a descriptor called a Role element which incorporates data about:

the type of the track: video track or video sub-track, and/or

b. if the track is a video sub-track, a reference to the configuration of the n spatial tiles.

- 25 In an embodiment, if the track is a video sub-track, the descriptor further comprise a scheme to specify the position of the considered tile relative to the configuration of the n tile.

In an embodiment, the position of the spatial tile being indicated by referring to the
 30 indexes of the rows and the columns of the grid.

In an embodiment, the position of the spatial tile being indicated by referring to the position in pixels of the top-left corner of the tile and the width and height of the tile.

In an embodiment, the position of the spatial tile being indicated by positions in a specified coordinates system.

5 In an embodiment, the position of the spatial tile being expressed as a spatial Media Fragments.

In an embodiment, the method further comprises preliminarily to the step of generating a description file:

- 10 - acquiring data corresponding to the given video,
- compressing the acquired data,
- encapsulating the compressed data, said encapsulating comprising:
 - generating a given number of media segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
 - generating an initialization segment associated to the media files segments,
- 15 which comprises initialization data about the video track and the video sub-tracks.

20 In an embodiment, the video data includes m video tracks representing the same content, m being an integer, each of the m video tracks having a given resolution, and each frame of each video track being divided into n spatial tiles, in order to create m*n independent video sub-tracks.

25 In an embodiment, the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

30 According to another aspect of the invention, it is proposed a method for obtaining data corresponding to a given video by a client device, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks. The method comprises:

- receiving a description file including data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating each video sub-track,

- selecting by the client device or client device's user at least one Region Of Interest in the video,
 - obtaining one or more URLs according to the chosen Region Of Interest, based on the description file, and
 - 5 - sending one or more request messages for requesting the video sub-tracks, each request message comprising one of the URLs selected by the client device,
 - receiving video data corresponding to the requested video sub-tracks, in response to the request messages.
- 10 In an embodiment, the description file further comprises a URL designating a track corresponding to the full given video, and if the client device does not select any Region Of Interest, the method further comprises sending a request message for requesting the full video track and receiving video data corresponding to the requested full video track, in response to the request message.
- 15 In an embodiment, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and said video further comprising a base layer video sub-track, said description file further comprising the URL of the base layer track, and if the client
- 20 device chooses one Region Of Interest, and the method further comprises:
- obtaining by the client device the URL of the base layer,
 - sending request message which includes the URL of the base layer track, and
 - receiving video data corresponding to the requested base layer track, in response to the request message.
- 25 According to a variant, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and each frame of the base layer also being divided into n spatial tiles, each tile of the base layer corresponding to a tile in the enhancement layer, in
- 30 order to create n independent base layer sub-tracks, said description file further comprising the URLs of the base layer sub-tracks, and if the client device chooses one Region Of Interest, and the method further comprises:
- obtaining by the client device the URLs of the base layer sub-tracks,
 - sending request message which includes the URLs of the base layer sub-tracks, and

- receiving video data corresponding to the requested base layer sub-tracks, in response to the request message.

5 In an embodiment, the configuration of the n spatial tiles is defined in the description file by a grid subdivided into a given number of rows and columns, each one having a pre-determined height and width.

10 In an embodiment, the configuration of the n spatial tiles defines spatial tiles having a uniform or a non-uniform area.

In an embodiment, each spatial tile is a rectangular region.

15 In an embodiment, if the spatial tiles have a uniform area, the grid is specified by its number of boundaries in both horizontal and vertical dimensions.

In an embodiment, if the spatial tiles have a non-uniform area the grid is specified by its number of rows and columns and the positions of the borders of the rows and the columns.

20 In an embodiment, the data are defined according to the DASH standard, said description file being a Media Presentation Description file.

In an embodiment, each URL designates a segment of track or sub-track for a pre-defined period of time.

25 In an embodiment, the configuration of the n spatial tiles being defined for each period of time by using a syntax element relative to an entire period of time.

30 In an embodiment, the description file comprising a set of parameters defined for each video sub-track for every period of time,
the set of parameters including a descriptor which incorporates data about:
a. the type of the track: video track or video sub-track, and/or
b. if the track is a video sub-track, the position of the spatial tile and the configuration of the n spatial tiles.

35

In an embodiment, the description file comprising for every period of time, a set of parameters being defined for each tile and,
the set of parameters including a descriptor called a Role element which incorporates data about:

- 5 the type of the track: video track or video sub-track, and/or
- b. if the track is a video sub-track, a reference to the configuration of the n spatial tiles.

10 In an embodiment, if the track is a video sub-track, the descriptor further comprise a scheme to specify the position of the considered tile relative to the configuration of the n tile.

In an embodiment, the position of the spatial tile being indicated by referring to the indexes of the rows and the columns of the grid.

- 15 In an embodiment, the position of the spatial tile being indicated by referring to the position in pixels of the top-left corner of the tile and the width and height of the tile.

In an embodiment, the position of the spatial tile being indicated by positions in a specified coordinates system.

- 20 In an embodiment, the position of the spatial tile being expressed as a spatial Media Fragments.

- 25 In an embodiment, the video data corresponds to m videos representing the same content, m being an integer, each of the m videos having a different resolution, and each frame of each video being divided into n spatial tiles, in order to create $m \times n$ independent video sub-tracks.

- 30 In an embodiment, the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

69. A method according to any one of claims 48 to 68, wherein the received video data comprises:

- a given number of video segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
- an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks.

5

In an embodiment, the description file further comprises a URL associated to the initialization segment.

10 In an embodiment, the initialization data comprises values indicating the width and the height of each video sub-track.

In an embodiment, the initialization data further comprises a transformation matrix which enables the display of each video sub-track at the right position.

15 According to another aspect of the invention, it is proposed a computer program product for a programmable apparatus, the computer program product comprising a sequence of instructions for implementing a method as detailed above when loaded into and executed by the programmable apparatus.

20 According to another aspect of the invention, it is proposed a computer-readable storage medium storing instructions of a computer program for implementing a method as detailed above.

25 According to another aspect of the invention, it is proposed a device for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said device having means for implementing a method for streaming data as detailed above.

30 According to another aspect of the invention, it is proposed a server device for providing data to a client device, said data corresponding to a given video each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said server device having means for implementing a method for providing data as detailed above.

According to another aspect of the invention, it is proposed a client device for obtaining data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said client device having means for implementing a method for obtaining data as detailed
5 above.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Other particularities and advantages of the invention will also emerge from the following description, the invention being described purely by way of example and being illustrated by the accompanying drawings, in which:

15

Figure 1a illustrates a block diagram about an example of the general principle of the Media streaming over HTTP;

20

Figure 1b is a flow chart, explaining more in detail the media streaming over HTTP according to an embodiment of the invention, in particular when a frame is divided into tiles;

Figure 1c schematically represents a frame divided into tiles and a Region Of Interest, according to an embodiment of the invention;

25

Figure 1d schematically represents a frame from spatially scalable video divided into tiles and a Region Of Interest, according to an embodiment of the invention;

Figure 2 is a block diagram illustrating an example of the general principle of generating a media presentation and a manifest file;

Figure 3 schematically represents the classical organization of a Media presentation for being streamed using DASH;

30

Figure 4 illustrates a description file/manifest where no sub-track is involved;

Figure 5 schematically describes an embodiment for pre-processing an initial video into video sub-tracks according to the invention;

35

Figure 5a schematically describes the division into slice and slice segment of a tiled video frames;

Figure 6 schematically describes an embodiment for encoding and encapsulating video sub-tracks into a file format, according to the invention;

Figure 7 schematically describes an embodiment of the boxes of the file format that can be used for carrying the location of each video sub-track, according to the invention;

Figure 8, 8a and 8b describe different syntaxes of a manifest/description file according to the invention;

Figure 9 gives a complete example of manifest/description file for a media presentation with video sub-tracks, according to the invention;

Figure 10 is a schematic block diagram of a computing device for implementation of one or more embodiments of the invention,

Figure 11 illustrates another example of manifest/description file for a media presentation with video sub-tracks, according to the invention, and

Figure 12 illustrates another syntax used in a manifest/description file for a media presentation with video sub-tracks, according to the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Figure 1a describes the general principle of the Media streaming over HTTP, like DASH in particular. Most of the new protocols and standards for Media streaming over HTTP are based on this principle.

A media server 100 contains different media presentations. An example of media presentation 101 is illustrated. It contains here audio and video data. It is considered here that the video is integral, meaning it is not divided into tiles. In this example, we consider that audio and video are interleaved in a same file. The way this media presentation is constructed is described below in the figure 2. This media presentation has been temporally split into small independent and consecutive temporal segments 102, 102a and 103 (for example mp4 segments) meaning that the interleaved audio/video data of the media presentation is split into three consecutive temporal periods. Those temporal segments can be addressed and downloaded independently. The downloading addresses of the media content are HTTP addresses. (One HTTP address associated to each temporal segment of the audio/video media content.) They are set by the server 100 for each one of these temporal segments.

A manifest file 104 (or description file) is an XML document. It describes the content of the temporal media segments e.g. type of media (audio, video, audio-video, text...), coding format, time duration of the segment. Moreover it associates an URL to each media content segment that is described.

5 The manifest file 104 is sent to a client device 110 related to a client or a user. By reading the received manifest file 105, the client can know the association between temporal segments of the different media content and the HTTP addresses designating the temporal segments. Moreover, the manifest file 105 gives the information about the content (interleaved audio/video in this example) of the media
10 presentation. For instance, the information may include resolution and/or bit-rate.

The client device 110 can therefore emit HTTP requests 106 for downloading the temporal segments that he wants, those temporal segments being described in the received manifest file 105.

As a response, the server 100 sends the requested temporal segments,
15 107. These temporal segments can be decoded 108 by the client device 110 for display 109.

Figure 1b illustrates more precisely the Media streaming over HTTP (particularly in DASH) according to the invention. It is considered here that the
20 streamed video data includes a video track such that each frame of the video track is divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks.

First a client device receives a description file (or MPD in DASH) from a server, step 1008. This description file includes data about the spatial organization of
25 the n video sub-tracks and at least n URLs respectively designating the video sub-tracks.

The client chooses a Region of Interest (ROI) that he wants to display. For instance, he wants to zoom in on a specific zone as illustrated in figure 1c.

30 **Figure 1c** illustrates a frame 1100 which is here divided into eight tiles T1, T2, ..., T8. In this frame the client decided to zoom on a portion 1110 at the right bottom part of the image. As illustrated in the figure 1c, this chosen portion 1110 or ROI is encompassed by two tiles T6 and T8.

Figure 1d illustrates a frame 1120 which is encoded as a scalable video with a base layer 1121 and a spatial enhancement layer 1122 here divided into eight tiles T1, T2, ..., T8. The base layer frame 1121 is not tiled, as such each tile in the enhancement layer 1222 depends on the whole base layer. In this frame, when the user decides to zoom on a portion 1123 at the right bottom part of the image 1122, he needs the two selected tiles but also the base layer.

As illustrated in the figure 1d, this chosen portion 1123 or ROI is encompassed by two tiles T6 and T8 plus the base layer 1121. The right part of the figure 1d represents a frame 1130 which is encoded as a tiled base layer 1131 and a tiled spatial enhancement layer 1132 with spatial dependencies that are tiled-based: one tile at enhancement layer 1132 depends only on the tiles at the same position in the base layer 1131. In this configuration, when the user selects the ROI 1133, he needs the two selected tiles 1133 plus the two reference tiles T06 and T08 in the base layer 1131.

In figure 1b, the client chooses an ROI, step 1010, as illustrated in figure 1c or 1d, depending on the video configuration in terms of scalability and tiling.

The URLs corresponding to the tiles covered by the ROI chosen by the client (the URLs of T6 and T8 in the example of the figure 1c) are selected by the client device, step 1020.

The selection is also based on some compatibility criteria which are developed more in detail later.

Requested messages are sent from the client device to the server, step 1030. Each request message comprises the URL of one tile covered by the ROI chosen by the client. As explained more in detail below, the video sub-tracks corresponding to the tiles are organized into temporal segments. So, one URL designates the video sub-track corresponding to the tile, over a whole segment.

In response to the request messages, the server sends to the client device the video data (meaning the segments as detailed below), step 1040. If video sub-tracks/tiles are requested, the segments designated by the URLs in the request messages are sent to the client device.

Figure 2 illustrates the main steps for the generation of both a media presentation and a manifest file.

In parallel steps 200 and 201, audio and video data are acquired. Then, the audio data is compressed, step 202. For example, the MP3 standard can be used for this step. In parallel the video data is compressed, step 203. Video compression algorithms like MPEG4, AVC, HEVC or SVC can be used. Once the compression stage is conducted, audio and video elementary streams 204, 205 are available.

The elementary streams 204, 205 are encapsulated as a global media presentation, step 206.

A global media presentation 207 results from the encapsulation. For example, the ISO BMFF standard (or the extension of this ISO BMFF standard to AVC, SVC, HEVC...) can be used for describing as a global media presentation the content of the encoded audio and video elementary streams.

The encapsulated media presentation 207 is used for generating, step 208, an XML manifest file 209.

Figure 3 illustrates an example of the hierarchical content of a DASH manifest file. It describes the content of the media presentation available at the server and the association between each media component, also called media data, and the HTTP addresses.

For example, the media presentation may be temporally split into coarse-grained periods called *Period* (splicing of arbitrary content).

A "*Period*" at MPD level describes all media components that are available for a period of time (could be the complete duration of the media presentation if there is only one Period). Within this period, a media content component can be composed of several data segments corresponding to small period of time previously mentioned, to allow easy streaming/random accessing/switching.

The XML MPD will contain all the data related to each period. By receiving this information, the client will be aware of the content of each period of time. For example, a Media Presentation 300 is divided into several elements, each one corresponding to a Period. For example the second Period is comprised into 100s and 294s.

Each Media Presentation's Period contains data that describes the available media content component for the corresponding period of time. One of the Media Presentation's Period 301 is illustrated more in detail.

In addition several "adaptation set" elements are incorporated: one for video description and one for audio description. Each adaptation set is associated to a

given track. In this example, the first group adaptation set is associated to the video track, and the second adaptation set is associated to the audio track corresponding to said video track for the considered time period.

An adaptation set structure 302 contains information about the different possible representations of the encoded video available at the server. In this example, the first representation is an encoded video of spatial resolution 640x480 encoded at the bit rate of 500 kbit/s. The second representation is the same video but encoded at 250 kbit/s. Each of this video can be downloaded by HTTP requests if the client knows the HTTP addresses related to the video. The association between content of each representation and HTTP addresses is done by using an additional temporal sub-layer.

As illustrated by the reference 303, the video representation 302 is split into temporal segments (of 10 seconds in this example).

The first representation 302 gets a bandwidth of 500 kbits/s, a width of 640 pixels and a height of 480 pixels. More parameters are given by the field "Segment Info" 303.

The second representation gets a bandwidth of 250 kbits/s, a width of 640 pixels and a height of 480 pixels. This second representation may represent a decrease in quality compared to the first representation for instance. The client will be able to switch between those representations depending on the available bandwidth on the network.

Each temporal segment 303 is a content stored at the server that is accessible through an HTTP address. In addition, an initialization segment is available. This initialization segment contains MP4 initialization information (if the video has been encapsulated by using the ISO BMFF or extensions) describing the MP4 content of the encapsulated video. For example, it helps the client to instantiate the decoding algorithms related to the video. The HTTP addresses of the initialization segment and the media segments are given in the MPD (or description) file, which is illustrated more in detail below.

Figure 4 gives an example of known manifest file for a given media presentation. This manifest is a DASH manifest (also called MPD). For more clarity only the main characteristics of the MPD are described here.

In this MPD, two media are described. The first one is an English audio stream and the second one is a video stream. The English audio stream is introduced

through the 'adaptation set' banner. Two representations are related to this audio stream:

- The first one (with an id equal to "1") is an MP4 encapsulated elementary stream with a bit-rate of 64000 bit/s. The codec for handle this elementary stream (once parsed by an mp4 parser) is defined in the standard by the attribute 'mp4a.0x40'. It is accessible by a request at the relative address: *7657412348.mp4*.
- The second one (with an id equal to "2") is an MP4 encapsulated elementary stream with a bit-rate of 32000 bit/s.

The adaptation set related to the video contains six representations whose Representation_ids are "6", "7", "8", "9", "A", and "B". These representations contain videos at different spatial resolutions (320x240, 640x480, 1280x720) and at different bit rates (from 256000 to 2048000 bits per second). For each of these representations, a different URL is associated. The client can therefore choose between these representations of the same video according to different criteria like estimated bandwidth or screen resolution for instance.

Now, the following figures focus more particularly on embodiments of the invention.

As previously described, the adaptation set of the manifest file carries (through the representation banner) the information for a same video encoded at different spatial resolutions and at different bit-rates.

The invention allows representations to describe sub-parts of the video. Indeed, in the DASH standard known in the prior art, no attribute for describing sub-parts of the same video is defined. In other words, by using the DASH standard, it is not possible to send directly the absolute or relative localization information for different sub-parts of a video.

In this embodiment (through the following figures), it is shown how this possibility can be added.

Figure 5 describes the notion of video tiling and how this notion is applied to a video. A video 500 is symbolized through three frames. Each frame 501 is divided into eight rectangles called T_n (with n varying from 1 to 8). Of course, the number and the shape of the tiles can be different. For example, the tiles of the video can have different dimensions.

However, in this example we consider that the tiling will be the same whatever the index of the video frame 501. We also consider that the tiles have the same horizontal and vertical size.

The result 502 of this tiling is given at the bottom of the figure 5. Eight
5 independent video sub-tracks are obtained. These video sub-tracks are partitions of the whole global video. According to a preferred embodiment, these video sub-tracks are considered as independent video and are compressed independently.

It is noticed that the invention could easily apply to a scalable video with one base layer and at least one enhancement layer. In a first embodiment, only the
10 enhancement layer(s) is (are) divided into tiles. Consequently, when tiles are requested, the corresponding base layer is also requested by the client and consequently sent by the server to the client.

In another embodiment, the base layer and the enhancement layers are both divided into tiles. In this case, the URLs of corresponding tiles in each layer can
15 be sent to the server, and in response the server sends to the client device the corresponding tiles in each layer.

Figure 5a describes the specific tiles and slices organization in the HEVC format. HEVC standard defines different spatial subdivision of pictures: tiles, slices and
20 slice segments. These different partitions have been introduced for different purposes: the slices are related to streaming issues while the tiles and the slice segments have been defined for being able to do parallel processing.

A tile defines a rectangular region of a picture that contains an integer number of Coding Tree Units (CTU) 553 originally called LCU (Largest Coding Unit) by
25 the man skilled in the art. The tiling is only defined by row and column boundaries 551, 552 as depicted on figure 5a. This makes the tiles good candidates for regions of interest description in terms of position and sizes. However, the HEVC bitstream organization in terms of syntax and its encapsulation into Network Abstract Layer (NAL) units is rather based on slices (as in Advanced Video Coding).

A slice in HEVC is a set of slice segments, with at least the first slice
30 segment being an independent slice segment, the others, if any, being dependent slice segments. A slice segment contains an integer number of consecutive (in raster scan order) CTUs. It has not necessarily a rectangular shape (thus less appropriate than tiles for ROI representation). A slice segment is encoded in the HEVC bitstream as two
35 parts: a slice_segment_header followed by slice_segment_data.

Independent slice segments and dependent slice segments differ by their header: the dependent slice segment has a shorter header because reusing information from the independent slice segment's header. Both independent and dependent slice segments contain a list of entry points in the bitstream: either to tiles or to entropy decoding synchronization points. An entry point defines a position in a HEVC bitstream. It is identifiable by using a particular code or by being referenced in a table. It corresponds to a particular syntax element: the beginning of a NAL unit or a slice segment for instance.

To better understand the relationships between slice, slice segments and tiles, we illustrate different configurations in 560 and 570, on figure 5a. These configurations differ from a first configuration 550. The configuration 550 would correspond to a case where one tile has one slice (containing only one independent slice segment). On the second configuration 560, the picture is partitioned in two vertical tiles 561, 562 separated by a bold dashed line and one slice (with five slice segments).

On the right part of the figure, the picture 570 is split in two tiles 571, 572 illustrated by the bold dashed line. The left tile 571 has two slices (each with two slice segments, one dependent and one independent slice segments) delimited by a bold plain line and the right tile 572 has one slice (with two slice segments, one dependent and one independent slice segment). The HEVC standard defines organization rules between tiles and slice segments that can be summarized as follows (one or both conditions have to be met):

- All CTUs in a slice segment belong to the same tile.
- All CTUs in a tile belong to the same slice segment.

In order to match the Region Of Interest's support and transport, we preferably consider the configuration 550 of figure 5a where one tile contains one slice with one independent segment. However the encapsulation solution would work with the other configurations 560 or 570.

The tiles are signaled in HEVC bitstream in Picture Parameter Set 590 as shown on figure 5a. If a regular tiling is used, the parameter "uniform_spacing_flag" takes the value "1" and only the number of tiles columns 551 and rows 552 is required. Otherwise, it is set to "0" and each column and line position is coded in number of coding tree units (typically of size 64x64 pixels).

Figure 6 shows the encapsulation stage. Before being streamed, the data corresponding to each tile must be processed for being encapsulated in a standard format.

Data corresponding to the eight tiles are acquired, step 600 for being the input of the encoding step 601. The data corresponding to each tile is independently compressed and encoded, step 601. Any video compression algorithm can be used. For example, H264, HEVC, MPEG-2 can be used. Once the data corresponding to the tiles is encoded, step 601, the resulting elementary streams have to be encapsulated in a file format. The ISO BMFF (or the extension of this media file) can be used (as proposed in the standard DASH).

In following those eight video tracks containing the eight sub-part of the video will be referred as “video sub-tracks”. As data corresponding to eight video sub-tracks have been encoded, eight video sub-tracks will be defined in the ISO BMFF file. The whole eight video sub-tracks can be viewed as different tracks of a same media presentation. Of course, additional tracks like audio or text tracks could be used. However, for more clarity, we will not describe the insertion of other kind of media in this figure.

First, during an encapsulation process 602, a media presentation 602a is generated. A piece of location information is set in an initialization segment 603. This initialization segment contains the initialization data associated to the corresponding video sub-tracks. Among these data, the location of each video sub-track is preferably specified (as described more in detail in the next figure).

In addition to the initialization segment 603, the encapsulation process 602 generates a set of segment files 604, 605 (media segments that can be accessed through an URL when the MPD will be generated) that correspond to small periods of time. In the example of this figure, two small periods of time are defined. It means that each video sub-track is temporally split into two small periods of time. A different set of segment files is attributed to each video sub-track for a given period of time. By using such a process, the client could request any of the proposed video sub-tracks for any proposed period of time.

The first set of media segments 604 correspond to the different tracks (sub-video) for a first period of time. The second set of media segments 605 are related to the second and following period of time for the same video tracks. Of course, the invention is not limited to two periods of time. The number of periods of time is not

limited. It is noticed that the box 604 and 605 are represented with dotted lines, given that they are not existing containers.

An URL is associated to each segment file so that a client can request the tiles covered by a selected ROI as described below.

5

It is noticed that in the figure 3, two temporal decompositions are described:

- In the block 300, the splicing of arbitrary content, and
- In the blocks 302/303, the generation of small periods of time.

In the figure 6, we have considered that the splicing of arbitrary content
10 generates only one global period and data corresponding to each video sub-track is encapsulated into two media segments corresponding to two small periods of time.

Figure 7 shows how the initialization segment referenced 603 in the figure 6 can be constructed for carrying the location of each video sub-track. It is recalled that
15 the video sub-tracks are video tracks in the syntax of the file format. The initialization segment is an ISO file 700.

As defined in the ISO BMFF standard, this file contains several boxes. The known boxes are not described for more clarity. As eight video sub-tracks (meaning eight video tracks) are defined in this example, a 'moov' box of the encapsulated media
20 presentation shall contain eight "trak" boxes 701.

An example of this "trak" box is referenced 702. It is associated with the first video sub-track. This 'trak' box also contains several boxes. A first box "tkhd" 703 is used for carrying the location of the video sub-track. This box contains several attributes. An attribute used in particular in this invention is a matrix 704. This matrix
25 contains the width and height of the video sub-track and a deformation matrix that enables to display the corresponding track at the right position.

The parameters of this matrix given in the figure 7 are just example. These parameters must be tuned according to the shape of the different video sub-tracks: this matrix is fulfilled so that the simultaneous display of the video sub-tracks covers the
30 area of the initial video referenced 500 in the figure 5.

Figure 8 illustrates a description file (or MPD in the DASH standard). In the DASH standard, the syntax of the manifest (the MPD syntax) does not allow to take into account the notion of tiles.

The figure 8 shows the elements that may be included in the manifest/description file (the DASH MPD) for notifying the client about the presence and the locations of the different video sub-tracks. A partial view of a MPD is given in the figure 8.

5 An example of a tiled video frame 800 is represented on the left part of the MPD in order to link a tile to its representation in the MPD. In this example, the tiled video frame comprises four tiles 1:1, 1:2, 2:1 and 2:2, their width and height being indicated on the left and top side of the tiled video frame 800.

10 A partial view 801 describes an adaptation set that contains information about a video sub-track. Only data related to one video sub-track is displayed in this figure for more clarity. So, the other sub-videos are not described. However, the description of the other sub-videos is similar (it used the same syntax but with other URLs).

15 The adaptation set ("*AdaptationSet*") 801 is used to describe one video sub-track which is a tile of the whole initial video. This adaptation set contains one representation of one video sub-track, this representation being defined by criteria like resolution but also frame rate or bandwidth for instance. Those criteria allow the client device to select or not several representations of video sub-tracks together or successively. Indeed, in an embodiment, a video sub-track with a first value of resolution or frame rate cannot be selected with another sub-track having a second value of resolution or frame rate.

25 In the adaptation set 801, an additional element (compared to the prior art) is proposed for signaling that this adaptation set represents a video sub-track in the media presentation. This additional element is a new scheme 802 that signals both the presence and the location of the tile corresponding to a video sub-track.

30 In particular, according to the invention, a new scheme for the 'Role' descriptor of the DASH standard is proposed. This new scheme of the "Role" descriptor is defined through the "schemeldUri" attribute. A new type called "tiling" is defined for the "schemeldUri" attribute. In addition, the new type of the schemeldUri is completed by additional attributes, which are used to indicate which tile amongst the existing tiles is represented.

In other words, if N tiles are available, the attribute "schemeldUri" of the Role descriptor is equal for example to "urn:mpeg:dash:tiling:2013" (any value provided that is unique in the context of DASH). Then the Role descriptor signals via its

attributes the tiles that can be put together and the location of each of these tiles. A preferred syntax of this new scheme in the role descriptor is the following one:

<Role schemeIdUri="urn:mpeg:DASH:tiling:2013" Id='T' value ="x:y"/>.

5 The attribute "Id" is an identifier attribute indicating the possible or forbidden associations.

The variable 'T' identifies a set of tiles that can be merged together. A same 'Id=T' variable means that the tiles are issued from the same initial video, meaning with the same resolution. As a consequence, they can be streamed together for being assembled by the client. The variable 'Id=T' is optional. By default, if not present, all
10 defined tiles can be composed together (they are issued of the same initial video). 'T' is an integer.

The attribute "value" allows identifying the position of the tile(s). The integer 'x' and 'y' signal the horizontal and vertical location of the current tile among the set of tiles from left to right and up to bottom. The integers 'x' and 'y' are strictly positive. For
15 example, if the initial video has been split into two horizontal lines of tiles and if each horizontal line is split into four columns of tiles (eight tiles are generated), a value="3:2" means that the tile is on the third column and on the second line. If the 'x' and 'y' values are set to "0", it means that the video associated to the scheme is a non-tiled version of the initial video, i.e. it is the full-frame video. By default if the tiling role is not
20 present, a video is a non-tiled video. It may be useful when there is a risk of confusion in MPD interpretation.

In this example, the value of the scheme 802 designates the video associated to the tile "1:2".

Optionally, the proposed scheme can also be used for media components
25 (or media data) that are not video (but for instance audio or text) when it is necessary to clarify the grouping of non-video media components with tiled video components. In such a case, only the Id value has to be used. A same Id for different media components enables to make the association between them (the different media components can be played simultaneously).

30 In this preferred embodiment, the "value" attribute is composed of two integer values. However, other variants could exist. For example, the syntax of the value attribute could be:

- value="x:X;y:Y" or coma separated: value="x:X,y:Y" or whatever separator character between horizontal and vertical positions as on example 812,
35 with the following signification:

- 'x' signals the horizontal location of the tile (index of the tile) amongst the whole set of columns;

- 'X' signals the number of columns;

- 'y' signals the vertical location of the tile (index of the tile) amongst the whole set of lines; and

- 'Y' signals the number of lines.

For example, in reference to the figure 5, the signaling of the tile T6 will be:

- `<Role schemeldUri="urn:mpeg:DASH:tiling:2013" Id='1' value="2:4:2:2"/>` or coma separated: `schemeldUri="urn:mpeg:DASH:tiling:2013" Id='1' value="2:4,2:2"/>` or whatever separator character between horizontal and vertical positions. The value of the scheme 812 designates the video associated to the tile "1:2" and provides the information that the tiling is a 2x2" grid.

In the example illustrated by the video frame 800, the initial video is split into tiles of same size as it is explained below in figure 8a. However, this is not restrictive. Tiles could have different sizes. For example, tiles could be generated from a quadtree partition. In such a case, the syntax of the @schemeldURI equal to "urn:mpeg:dash:tiling:2013" should take into account the nature of the tile partition. The new syntax could be:

- `<Role schemeldUri="urn:mpeg:DASH:tiling:2013" Id='T' value="coordinates" coordinate_system="C"/>`.

The "coordinates" would be a value (or a set of values) that could be identified from the optional identifier of the coordinate system ('the value "C" in this example). An example of coordinate system could be to define absolute location of the tile in pixels, actually the default case. Coordinates would be the location (x, y) in pixels of the top-left corner of the tile. When no "coordinate_system" attribute is specified, it is assumed that coordinates given in the attribute "value" are expressed into pixel positions, unless a ':' character is present in the value that indicates positions in the tiling grid. Size of the tile would be defined by the standard attributes width and height of the representation. For example, in a code portion referenced 821 in the figure 8, the tile position is signaled using pixel coordinate system using syntax `value="x, y"`. In a line referenced 822, the tile with top-left corner at position column=0, row=240 is described. All code portion examples 801, 811, 821 provide tile position with or without tiling information. The tile size has to be parsed from the associated "Representation" element.

Figure 8a provides alternative signaling of tiles positions and sizes in the particular context of HEVC tiles. In the right part of this figure 8a, three examples 860, 870 and 875 of a tiled video frame are provided. Each one corresponds to a specific configuration as detailed below.

5 As explained in reference to figure 5a, HEVC tiles are signaled in the bitstream via tile rows and columns borders positions (for instance, back to the figure 5a, the tiled video frame referenced 550 shows two rows 551 and two columns 552 borders, leading to a 3x3 tiling configuration). As such, it is proposed to put in the “*Role*” element 862 describing a tile, the tiling organization as in the example 861 in the
10 figure 8a. In this example, an attribute “*grid*” is used to indicate as first value whether the tiling is regular or not. This directly translates in MPD the *uniform_space_flag* from the HEVC bitstream defined in the HEVC standard.

 When the tiling is regular as in the tiled video frame 860, the other values in the *grid* attribute provide the number of tile columns minus 1 and the number of tile
15 rows minus 1 (as encoded in the HEVC bitstream). This number of tiles in the horizontal dimension is directly computed from the HEVC bitstream parameter *num_tiles_columns_minus1* and the number of tiles in the vertical dimension is directly computed from the HEVC bitstream parameter *num_tiles_rows_minus1* (defined in the HEVC Standard), as in the line referenced 862 for the tiled video frame 860. This
20 notation enables to directly translate HEVC Picture Parameter Sets’ values in the MPD (*num_tiles_columns_minus1* and *num_tiles_rows_minus1*). In addition to the *grid* attribute, the sizes of the full-frame video are required to be able to compute the tiles sizes and positions (see the line referenced 862).

 In case the tiling is not uniform, as represented on the tiled video frames
25 871 or 873, the *grid* attribute with first value being equal to 0 implies that the “*Role*” element must allow retrieving the list of positions for each column and the list of positions for each row, given in pixels. In such case, the number of tile borders defining the rows and columns is contained in the subsequent values of the “*grid*” attribute. The tiled video frame 872 provides possible names for the attributes to indicate the row and
30 column borders positions (it could be different names however without affecting the invention at both generation and parsing times). Row and column border positions are specified into pixels (see the line 872) with the width and height of the full-frame video.

 As another embodiment (not represented), for regular tiling, the *grid* and *width* and *height* attributes can be simplified into one single attribute like for example,
35 grid=“w, h, W, H” where w and h respectively provides the size (width and height in

pixels) of a tile and W, H the size in pixels of the full-frame video. Applied to the examples 861, 862, this leads to *grid*="320, 240, 640, 480". It has the advantage to makes an easier to parse syntax for DASH clients (one attribute providing all the 4 values instead of three different attributes in 862).

5 Another embodiment for the tiling configuration signalization is to have the tiling information at a highest level of signalization. Thus, it can be described once and used from all the fields "*Representation*" associated to a tile. This reduces the description cost and the size of the manifest potentially reducing the download time of the manifest and reducing the startup delay of the streaming application.

10

In figure 8b, portions of code 881 and 886 illustrate as example, such element to describe the tiling configuration. These portions of code 881 and 886 are related to two tiled video frames 880 and 885 schematically illustrated in the right part of the figure 8b.

15

Any tile representation coming from this tiling configuration can refer to it via the "*id*" attribute of the tiling "*Role*" element previously mentioned. The *uniform* attribute indicates whether the tiling is regular or not, direct translation of the *uniform_spacing_flag* HEVC flag. When set to 1, the following attributes *cols* (for columns) and *rows* indicate the number of tiles columns minus 1 and the number of tiles rows minus 1.

20

In the example referenced 880, there is only one tile row boundary and 1 tile column boundary. The two last attributes provide the dimensions width and height of the full-frame video. When the tiling is not uniform as on the tiled video frame 885, then the "*tiling*" element contains children elements that provide the positions in pixels of the tiles columns and rows (one element per dimension, as shown in a line 887). In case the tiling configuration changes along time, a new period of time (<Period>) is created. This new period contains the new tiling configuration.

25

In case the manifest describes via the "*tiling*" element multiple tiling configurations, the tiling applied to a given tile can be referenced via its "*id*" attribute by adding a new attribute in the *Role* describing the tile. For example: <*Role* *schemeldUri*="urn:mpeg:DASH:tiling:2013" *Id*=' **tiling_1**' *value*="0,0" />. Then, there are two alternatives to inform streaming clients about the tiling configuration. This information is useful, for example to inform the user about the addressable spatial areas in the videos. The approach with attributes duplicates information for each tile. Consequently, it is less compact, but it has the benefit to keep all the tile related

30

35

information in the same element. This offers robustness in case of transformations applied to the manifest by any intermediate node in content distribution networks.

Considering the robustness aspect and self-description of a tile via the “*Role*” element, it is also interesting to put in the “*value*” attribute the size information in addition to position information. In this embodiment, the “*value*” attribute specifies a coma-separated list of four integers, in the following order: the x and y position of the top-left corner and the width and height of a tile. For example: *value*=“x, y, w, h” as in the figure 12 described later. The coordinate system used to express the position of a tile is a 2D coordinate system, where the origin is arbitrary but shall be the same for all representations sharing the same id for the tiling role. Additionally, the x-axis is assumed to be oriented towards the right of the screen and the y-axis oriented towards the bottom. The width and height may be used by a viewer to render multiple tiles and align them spatially.

Another embodiment proposes to indicate the positions and sizes of the tile by using the syntax for spatial fragments defined in the W3C MediaFragments URI 1.0. This leads to a “*value*” attribute like: *value*=“#xywh=0,0,320,240” to describe the first tile in the picture 860 (see the figure 8a). This provides the advantage for streaming clients that also support the Media Fragments URI specification. Indeed, if for example, a Media Fragments URI is used to link to a video to display, the client with Media Fragments URI support will automatically match the “*Representation*” with the correct spatial fragment thus making easier the choice of the adaptation logic. Moreover, when the server also supports Media Fragment URIs, the streaming client can use the *BaseURL* in the MPD and put the value of the *value* attribute into a HTTP Range header as specified by the Media Fragments URI specification to directly request the corresponding tile. Another advantage of using Media Fragments URI syntax is that the so-formed URL can be bookmarked and distributed by the client so that any other Media Fragments URI client can access the same tile.

When each tile is described separately in its own “*AdaptationSet*” it is difficult for a client to identify to which full-frame video “*Representation*” it is related to. It was proposed earlier to use the special *value*=“0:0” in the “*Role*” element describing the tile, i.e. the “tiling Role”. However, the full-frame video can be described in the same way. The “*Representation*” of the tiles is annotated, i.e. using a “tiling” *Role* (not represented). In such case, the “tiling” *Role* associated to the “*Representation*” of the full-frame video has its “*id*” attribute set to the same value as the “*id*” attributes of the “tiling” *Roles* of the tiles composing this full-frame video. By default, when a tiling “*Role*”

is associated to a video "*Representation*" without any *value* attribute, this "*Representation*" has to be considered as the full-frame video. To be more explicit this "*Representation*" can carry a *value* attribute. In such case, the x and y fields take 0, 0 as value for the top-left corner while w and h take the values of the width and height of the full-frame video. In case a "*tiling*" element is declared, the tiling Role for the full-frame video "*Representation*" can of course refer to this tiling via its "*id*" so that the relation from tile to full-frame video is explicit for the streaming clients. Any of the above description for full-frame video signaling has the advantage of avoiding ambiguities for the clients using the manifest. However, to remain as close as possible to the standard, we can also use the classical Role element with standard "*alternate*" and "*main*" fields respectively assigned to the adaptation set containing the tiles "*Representation*" and to the adaptation set containing the full-frame video "*Representation*". When all these Representations are declared in the same AdaptationSet, one ContentComponent element per Representation can be used to describe the respective Role of each Representation.

This is described more in detail in the figure 11. This example describes a HD video (Representation 'R0' in 1106) that is composed of four spatial tiles of 960x540 (Representations 1101, 1102, 1103, 1104). Each tile has its own "*AdaptationSet*" and associated "*Representation*" plus a "*tiling*" *Role*. There are only one set of four tiles which can be associated, identified by "TS1".

Two subsets 1105 are defined to indicate the alternative between the full-frame video in the first subset and any tile or composition of tiles from the second subset. It can be easily extrapolated from example of the figure 11, that when several "*Representations*" schemes are available for a given tile, for example in terms of bandwidth, the dynamic switching mechanism provided by DASH is not broken.

Figure 9 is a complete example that illustrates the usage of the new scheme defined in the invention. This example takes the DASH standard (MPD) as reference. In this figure, a media presentation (video and audio media) is described. Two subsets are described:

- the first one contains the adaptation sets with Id: '0', '1', '2' and '3', and
- the second one contains the adaptation sets tag Id: '4', '5' and '6'.

As mentioned above, the usage of subsets enables to specify that some adaptation sets cannot be streamed together. Adaptation sets of the second subset cannot be streamed with the adaptation sets of the first subset. In the first subset, audio and video representations (with and without the new scheme) are available.

Such representations give to the client the possibility of streaming media data even if the scheme 'tiling' is not supported (the MPD syntax without the scheme is always understood).

5 In the first subset, the adaptation set that contains the first video representation is described by using a line 900:

- *<Role schemeIdUri="urn:mpeg:DASH:tiling:2013" Id="1" value="0:0"/>*.

This line indicates that the representations associated to this adaptation set are non-tiled versions of the video (value="0:0").

10 A line with the scheme proposed in this invention is associated to the adaptation set that contains the audio media, 910:

- *<Role schemeIdUri="urn:mpeg:DASH:tiling:2013" Id="1"/>*.

This line indicates that the audio media included in this adaptation set is related to the non-tiled version of the video. The optional field 'value="0:0"' could be also added but it is useless in this example.

15 In the second subset (adaptation set with Id= "4", "5" and "6"), two video sub-tracks are described through the new scheme. The representation element related to the first tile is contained in the adaptation set with 'Id' equal to '4'. A line 920 that specifies the first video sub-track is:

- *<Role schemeIdUri="urn:mpeg:DASH:tiling:2013" Id="1" value="1:1"/>*.

20 A line 930 that specifies the second video sub-track is:

- *<Role schemeIdUri="urn:mpeg:DASH:tiling:2013" Id="1" value="1:2"/>*.

This line specifies that the representations that are included in the adaptation set contain the URL related to the first tile of the second line of tile.

25 A line 940 with the scheme proposed in the invention is associated to the adaptation set (of the second subset) that contains the audio media:

- *<Role schemeIdUri="urn:mpeg:DASH:tiling:2013" Id="1"/>*.

This line indicates that the audio media included in this adaptation set is related to one of the tiled version of the video sub-tracks.

30 **Figure 10** is a schematic block diagram of a computing device 1000 for implementation of one or more embodiments of the invention. The computing device 1000 may be a device such as a micro-computer, a workstation or a light portable device. The computing device 1000 comprises a communication bus connected to:

- a central processing unit 1001, such as a microprocessor, denoted CPU;

-a random access memory 1002, denoted RAM, for storing the executable code of the method of embodiments of the invention as well as the registers adapted to record variables and parameters necessary for implementing the method for reading and writing the manifests and/or for encoding the video and/or for reading or generating the Data under a given file format, the memory capacity thereof can be expanded by an optional RAM connected to an expansion port for example;

-a read only memory 1003, denoted ROM, for storing computer programs for implementing embodiments of the invention;

-a network interface 1004 is typically connected to a communication network over which digital data to be processed are transmitted or received. The network interface 1004 can be a single network interface, or composed of a set of different network interfaces (for instance wired and wireless interfaces, or different kinds of wired or wireless interfaces). Data are written to the network interface for transmission or are read from the network interface for reception under the control of the software application running in the CPU 1001;

- a user interface 1005 for receiving inputs from a user or to display information to a user;

- a hard disk 1006 denoted HD;

- an I/O module 1007 for receiving/sending data from/to external devices such as a video source or display.

The executable code may be stored either in read only memory 1003, on the hard disk 1006 or on a removable digital medium such as for example a disk. According to a variant, the executable code of the programs can be received by means of a communication network, via the network interface 1004, in order to be stored in one of the storage means of the communication device 1000, such as the hard disk 1006, before being executed.

The central processing unit 1001 is adapted to control and direct the execution of the instructions or portions of software code of the program or programs according to embodiments of the invention, which instructions are stored in one of the aforementioned storage means. After powering on, the CPU 1001 is capable of executing instructions from main RAM memory 1002 relating to a software application after those instructions have been loaded from the program ROM 1003 or the hard-disc (HD) 1006 for example. Such a software application, when executed by the CPU 1001, causes the steps of the flowcharts shown in the previous figures to be performed.

In this embodiment, the apparatus is a programmable apparatus which uses software to implement the invention. However, alternatively, the present invention may be implemented in hardware (for example, in the form of an Application Specific Integrated Circuit or ASIC).

5

Although the present invention has been described hereinabove with reference to specific embodiments, the present invention is not limited to the specific embodiments, and modifications will be apparent to a person skilled in the art which lie within the scope of the present invention.

10

For example, the present invention may be embedded in a device like a camera, a smartphone or a tablet that acts as a remote controller for a TV, for example to zoom in onto a particular region of interest. It can also be used from the same devices to have personalized browsing experience of the TV program by selecting specific areas of interest. Another usage from these devices and methods by a user is to share with other connected devices some selected sub-parts of his preferred videos. It can also be used in smartphone or tablet to monitor what happened in a specific area of a building put under surveillance provided that the surveillance camera supports the method for providing data according to the invention.

15

20

Many further modifications and variations will suggest themselves to those versed in the art upon making reference to the foregoing illustrative embodiments, which are given by way of example only and which are not intended to limit the scope of the invention, that scope being determined solely by the appended claims. In particular the different features from different embodiments may be interchanged, where appropriate.

25

1. A method for streaming data corresponding to a given video, each frame of the video being divided into n partitions, n being an integer, in order to create n independent partial videos, the method comprising:

transmitting, by a server, a notification to a client, said notification including spatial information about a spatial organization of the n partial videos,

receiving from the client which received the notification, by the server, one or more messages for requesting one or more partial videos according to a Region Of Interest selected based on an operation by a user of the client, and

transmitting to the client, by the server, video data corresponding to the one or more partial videos, in response to the one or more messages from the client.

2. The method according to claim 1, wherein the spatial information represents a spatial position of each of the n partial videos.

3. The method according to claim 2, wherein the spatial position is represented by a coordinate value of a top-left corner, a width and a height of a partial video.

4. A transmitting method for transmitting video data to a client, the method comprising:

transmitting, to the client, a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the videos,

receiving, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client, and

transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client.

5. The method according to claim 4, wherein the spatial position information

represents a coordinate value of each of the n spatial regions.

6. The method according to claim 4, wherein the spatial position information represents a coordinate value of a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions.
7. The method according to claim 5, wherein the spatial position information represents an x-coordinate value and a y-coordinate value of each of the n spatial regions.
8. The method according to claim 4, wherein the spatial position information represents a partition number in the video of each of the n spatial regions.
9. The method according to claim 4, wherein the notification further includes partition number information representing a number of partitions of the video corresponding to the n spatial regions in the horizontal direction and in the vertical direction.
10. The method according to claim 4, wherein a spatial size of at least one spatial region is different from a spatial size of another spatial region, and the spatial size information represents a spatial size of each of the n spatial regions.
11. The method according to claim 4, wherein the spatial size information further represents a spatial size of a video corresponding to the n spatial regions.
12. The method according to claim 4, wherein each frame of the video corresponding to the n spatial regions is divided into n rectangles.

13. The method according to claim 4, wherein each frame of the video corresponding to the n spatial regions is divided into n partitions and compressed independently in order to create the n spatial regions.
14. A method for receiving video data from a server, the method comprising:
receiving, from the server, a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video,
transmitting, to the server, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted from the server, and
receiving, from the server, the video data corresponding to the one or more spatial regions according to the information transmitted to the server.
15. The method according to claim 14, wherein the spatial position information represents a coordinate value of each of the n spatial regions.
16. The method according to claim 14, wherein the spatial position information represents a coordinate value of a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions.
17. An apparatus for transmitting video data according to a request from a client, the apparatus comprising:
a notification transmitting unit configured to transmit, to the client, a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video;
a receiving unit configured to receive, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more

spatial regions corresponding to video data to be transmitted to the client; and
 a video transmitting unit configured to transmit, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client.

18. The apparatus according to claim 17, wherein the spatial position information represents a coordinate value of each of the n spatial regions.

19. The apparatus according to claim 17, wherein the spatial position information represents a coordinate value of a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions.

20. The apparatus according to claim 18, wherein the spatial position information represents an x-coordinate value and a y-coordinate value of each of the n spatial regions.

21. The apparatus according to claim 17, wherein each frame of the video corresponding to the n spatial regions is divided into n partitions and compressed independently in order to create the n spatial regions.

22. An apparatus for transmitting video data to a client, the apparatus comprising:

a hardware processor; and

a memory storing one or more programs configured to be executed by the hardware processor, the one or more programs including instructions for:

transmitting, to the client, a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video;

receiving, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to

video data to be transmitted to the client; and

transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client.

23. The apparatus according to claim 22, wherein the spatial position information represents a coordinate value of each of the n spatial regions.

24. The apparatus according to claim 22, wherein the spatial position information represents a coordinate value of a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions.

25. The apparatus according to claim 23, wherein the spatial position information represents an x-coordinate value and a y-coordinate value of each of the n spatial regions.

26. The method according to claim 4, wherein the information received from the client includes one or more URLs associated with the one or more spatial regions.

27. The method according to claim 4, wherein the information received from the client includes one or more HTTP addresses associated with the one or more spatial regions.

28. The method according to claim 4, wherein, in a case where a spatial position of the n spatial regions for a first time period and a spatial position of the n spatial regions for a second time period are different from each other, a first notification for the first time period and a second notification for the second time period are transmitted to the client.

29. The method according to claim 28, wherein the first notification includes (i) first spatial position information representing a spatial position of each of the n spatial regions for the first time period and (ii) first spatial size information

representing a spatial size of each of the n spatial regions for the first time period, and the second notification includes (iii) second spatial position information representing a spatial position of each of the n spatial regions for the second time period and (iv) second spatial size information representing a spatial size of each of the n spatial regions for the second time period.

- 30. The method according to claim 4, wherein the notification further includes a parameter relating to at least one of an image resolution, a frame rate and a bandwidth of the video.
- 31. The apparatus according to claim 17, further comprising a camera unit for performing capturing to obtain the video data.
- 32. The apparatus according to claim 22, further comprising a camera unit for performing capturing to obtain the video data.
- 33. The method according to claim 14, further comprising determining a Region Of Interest based on a signal from a user interface, wherein the one or more spatial regions include the Region Of Interest.

ABSTRACT

METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

The present invention provides a method for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks. The method comprises:

- transmitting, by a server, a description file to a client device, said description file including data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating each video sub-track,
- selecting by the client device one or more URLs according to one Region Of Interest chosen by the client device or a client device's user,
- receiving from the client device, by the server, one or more request messages for requesting a resulting number of video sub-tracks, each request message comprising one of the URLs selected by the client device, and
- transmitting to the client device, by the server, video data corresponding to the requested video sub-tracks, in response to the request messages.

(Figure 1b)

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		
First Named Inventor/Applicant Name:		Franck DENOUAL		
Filer:		Amichai Kotev/Ming Armstrong		
Attorney Docket Number:		1000-18542-NP-cont-CINC		
Filed as Large Entity				
Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4000	4000
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	7	80	560
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	420	420

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous-Filing:				
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				6720

Electronic Acknowledgement Receipt	
EFS ID:	30657306
Application Number:	15783999
International Application Number:	
Confirmation Number:	4207
Title of Invention:	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA
First Named Inventor/Applicant Name:	Franck DENOUAL
Customer Number:	34904
Filer:	Amichai Kotev/Jocelyn Lin
Filer Authorized By:	Amichai Kotev
Attorney Docket Number:	1000-18542-NP-cont-CINC
Receipt Date:	13-OCT-2017
Filing Date:	
Time Stamp:	19:57:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$6720
RAM confirmation Number	101617INTEFSW00006092502456
Deposit Account	502456
Authorized User	Michael Kavetsky
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)					
37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	TrackOne Request	10131471WOUS02_1000-1854 2-NP-cont-CINC_PrioritizedExam.pdf	113879	no	2
			6d03a4c318dc8b31d6a3e05c96eb836fd31e275		
Warnings:					
Information:					
2	Drawings-only black and white line drawings	10131471WOUS02_1000-1854 2-NP-cont-CINC_Drawings.pdf	535036	no	18
			ce9d3d498de8dbf3a65317a8f76491f35ee54b1		
Warnings:					
Information:					
3	Oath or Declaration filed	10131471WOUS01_1000-1854 2-NP-CINC_Declarations.pdf	4658257	no	5
			ac79895609cbc43596026b24a6823dbbcb22bb34		
Warnings:					
Information:					
4	Application Data Sheet	10131471WOUS02_1000-1854 2-NP-cont-CINC_ADS.pdf	1824119	no	10
			39e0268c1fa2dac0f207aaf1b542f02893a0f350		
Warnings:					
Information:					
5	Power of Attorney	10131471WOUS02_1000-1854 2-NP-cont-CINC_POA.pdf	320193	no	2
			6d57d1b0f16f4a4e8732a68083f3aefa38c141c		
Warnings:					
Information:					
6		10131471WOUS02_1000-1854 2-NP-cont-CINC_PA.pdf	98979	yes	10
			7d286a1a5ed0f26d8389ad1a76814921560c18a4		
	Multipart Description/PDF files in .zip description				
	Document Description	Start	End		

	Preliminary Amendment		1	1	
	Specification		2	3	
	Claims		4	9	
	Applicant Arguments/Remarks Made in an Amendment		10	10	
Warnings:					
Information:					
7		10131471WOUS02_1000-1854 2-NP-cont-CINC_Spec_asfiled. pdf	418438	yes	42
			07f72dc57a2d64272eb7840f6e17a84d055cd5e		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	35	
	Claims		36	41	
	Abstract		42	42	
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	43169	no	2
			4d7aad5803fd997476d3cbbd0358b2363d081adca8		
Warnings:					
Information:					
Total Files Size (in bytes):			8012070		

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.

**CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION
UNDER 37 CFR 1.102(e)** (Page 1 of 1)

First Named Inventor:	Franck DENOUAL	Nonprovisional Application Number (if known):	
Title of Invention:	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently \$0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.
2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.
3. The applicable box is checked below:

I. ☒ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

- i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.
---OR---
(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.
- ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, or the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

- i. A request for continued examination has been filed with, or prior to, this form.
- ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
- iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
- iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
- v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

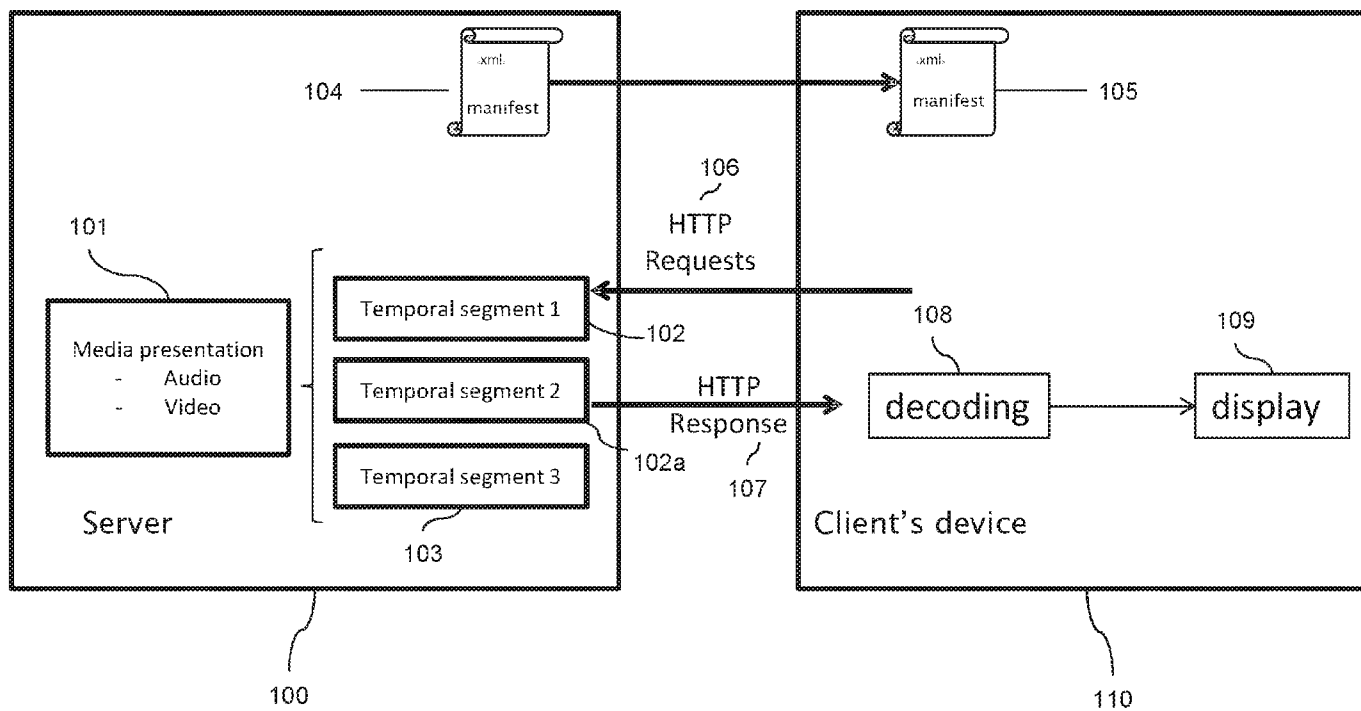
Signature <u>/Amichai Kotev/</u>	Date <u>10/13/2017</u>
Name (Print/Typed) <u>Amichai Kotev</u>	Practitioner Registration Number <u>57668</u>
Note: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.*	
☐ *Total of _____ forms are submitted.	

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.



1/18

Figure 1a

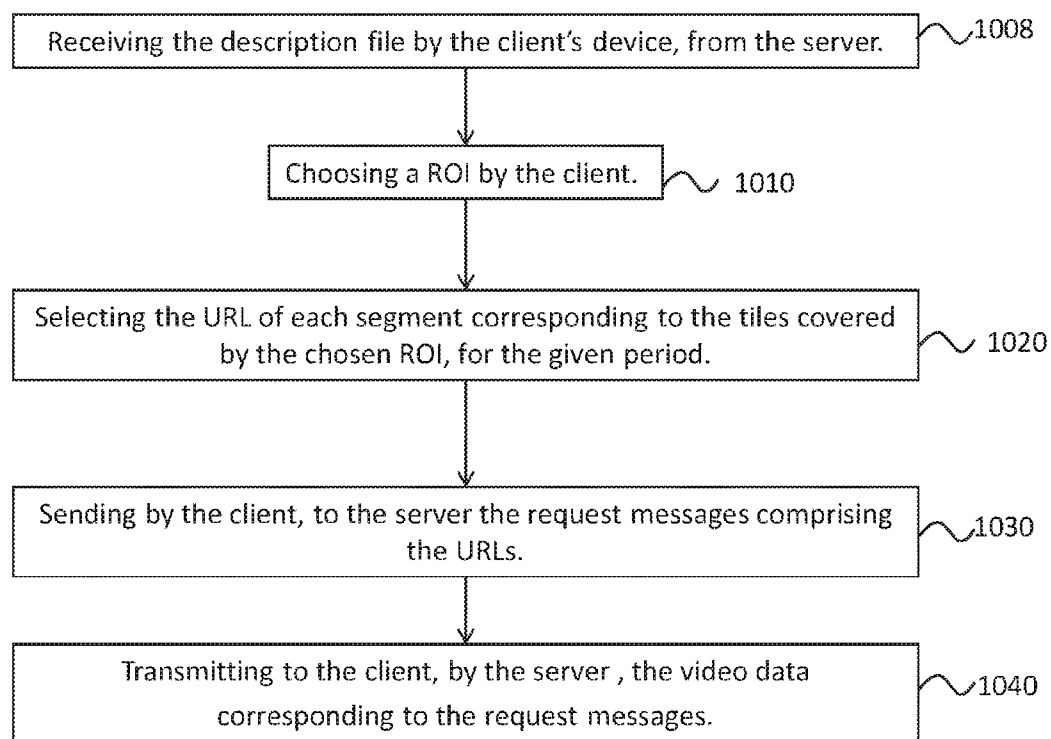
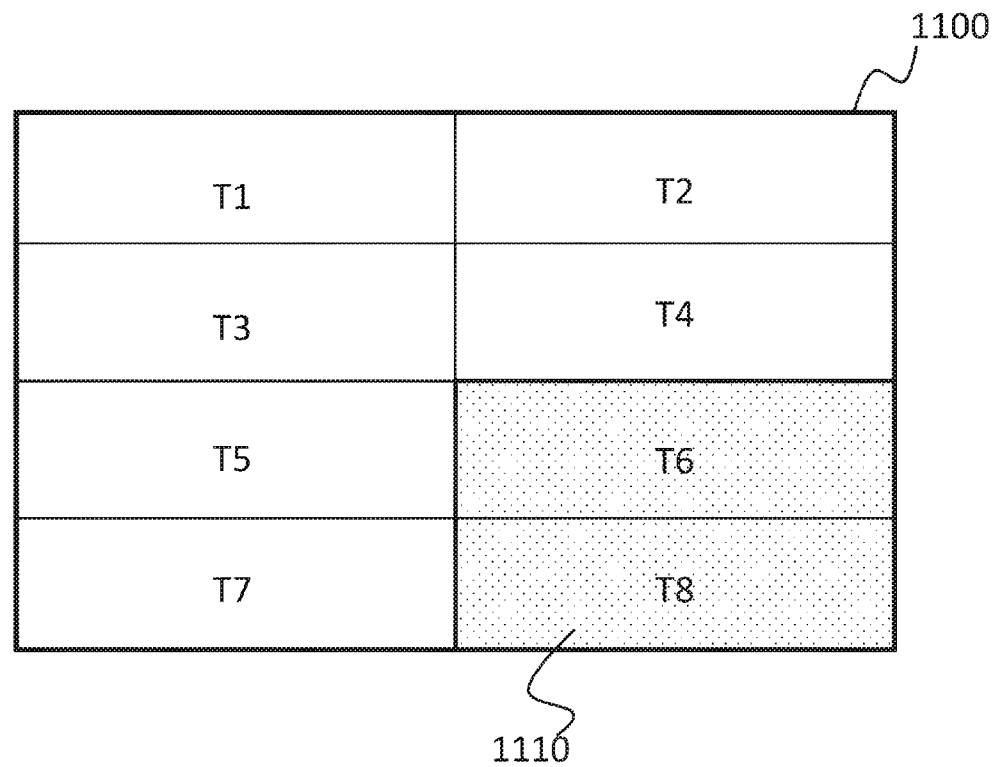


Figure 1b



3/18

Figure 1c

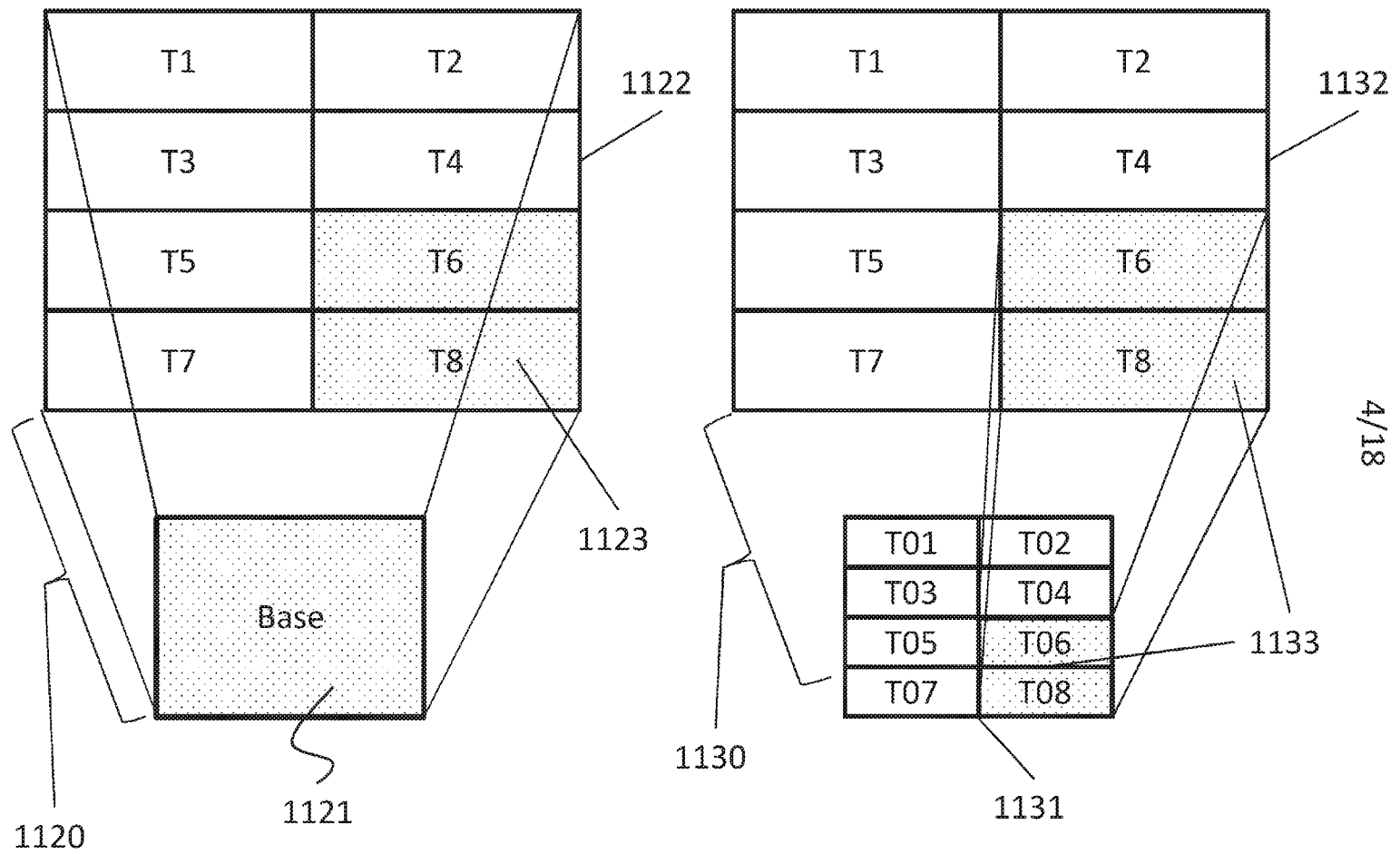
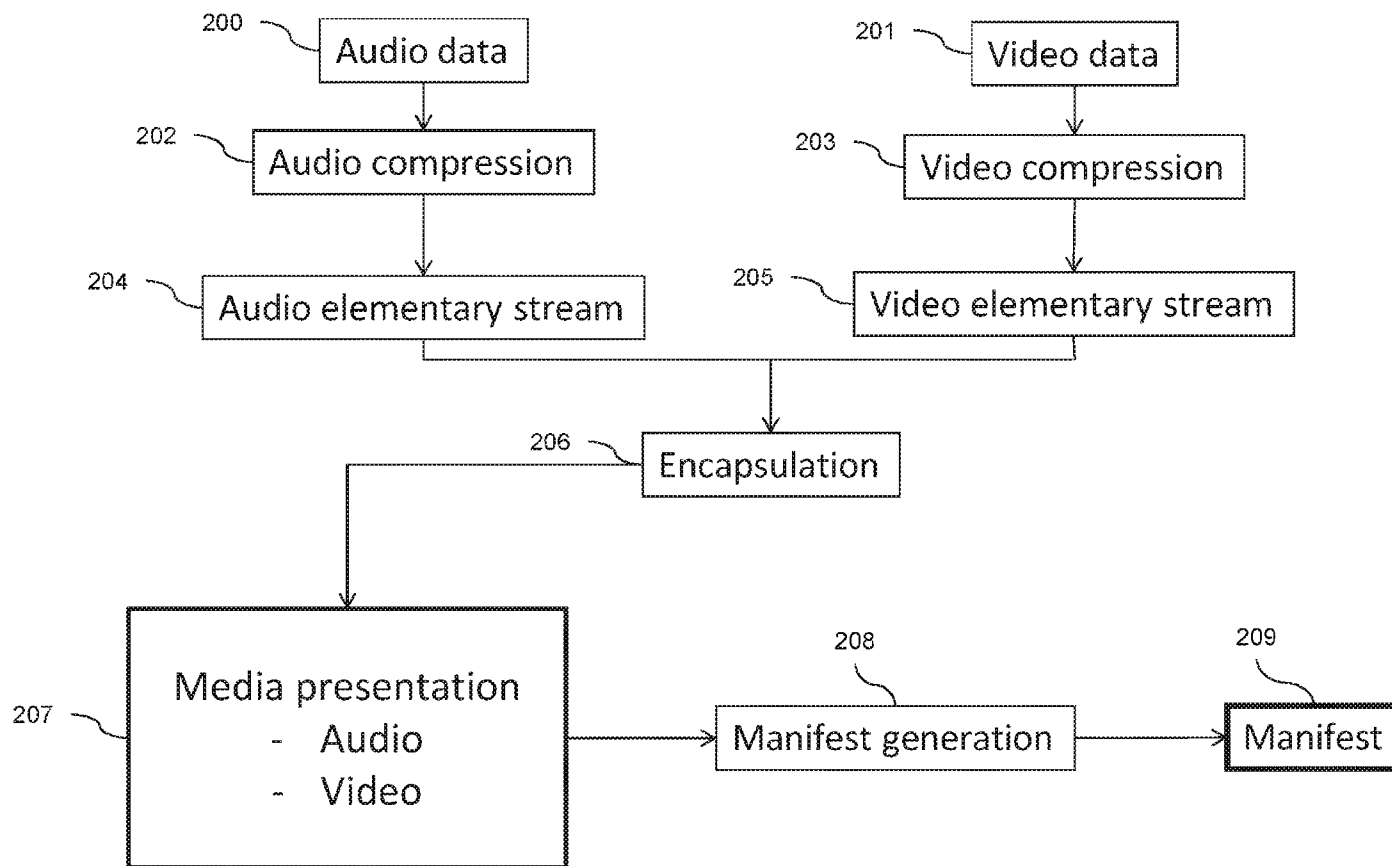


Figure 1d



5/18

Figure 2

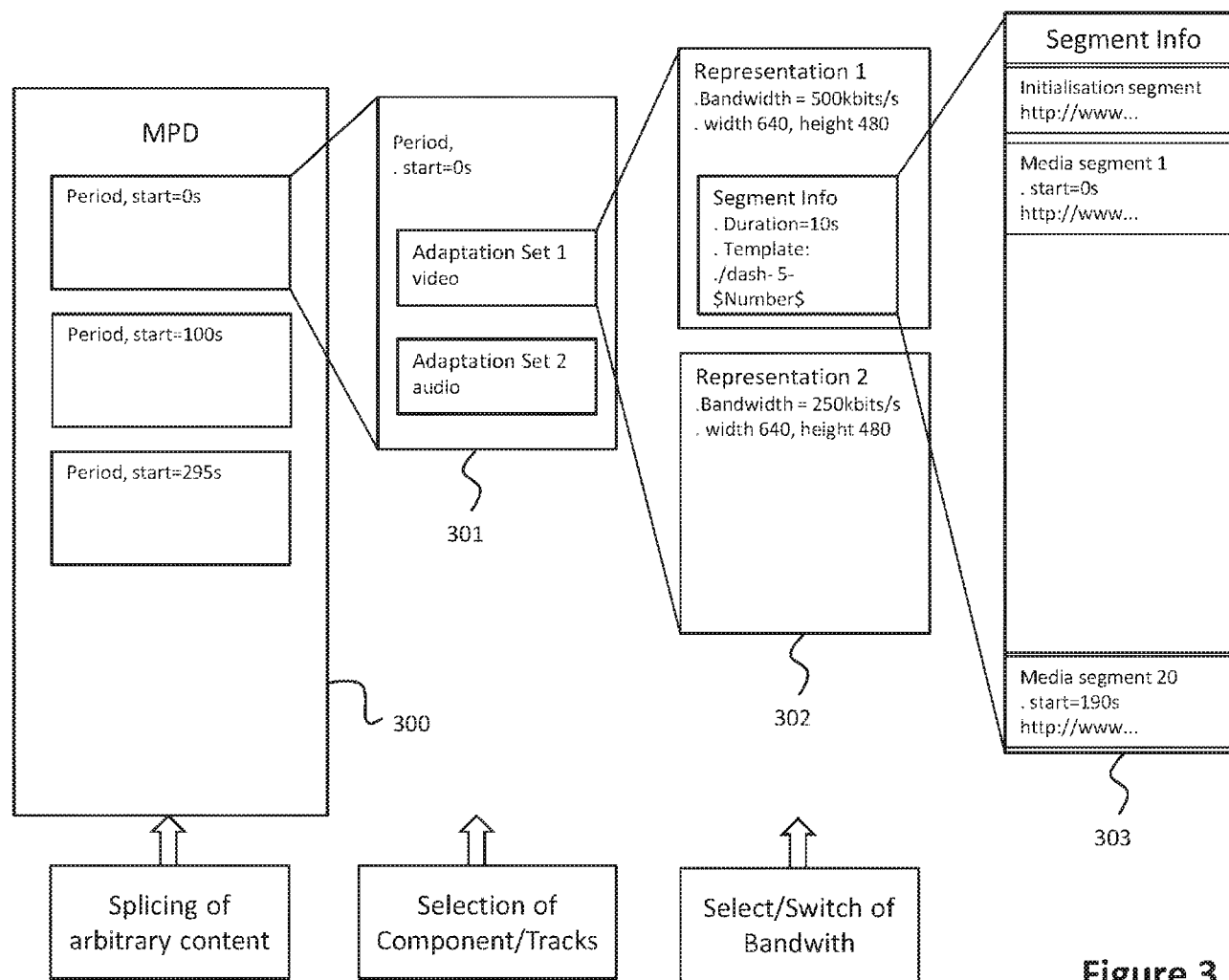


Figure 3

```

<?xml version="1.0"?>
<MPD xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="urn:mpeg-DASH:schema-MPD:2011"
  xsi:schemaLocation="urn:mpeg-DASH:schema-MPD:2011 DASH-MPD.xsd"
  type="static"
  mediaPresentationDuration="PT12.56S"
  minBufferTime="PT1.25S"
  profiles="urn:mpeg-dash-profile:isoff-on-demand:2011">
  <BaseURL>http://cdn1.example.com/</BaseURL>
  <BaseURL>http://cdn2.example.com/</BaseURL>
  </Period>
  <!-- English Audio -->
  <AdaptationSet mimeType="audio/mp4" codecs="mp4a.0x40" lang="en"
    subsegmentAlignment="true" subsegmentStartsWithSAP="1">
    <ContentProtection schemeIdUri="urn:mpeg706D6953-655C-5244-4D48-
      656164657221"/>
    <Representation id="1" bandwidth="64000">
      <BaseURL>7657412346.mp4</BaseURL>
    </Representation>
    <Representation id="2" bandwidth="32000">
      <BaseURL>3463646346.mp4</BaseURL>
    </Representation>
  </AdaptationSet>
  <!-- Video -->
  <AdaptationSet mimeType="video/mp4" codecs="avc1.400228"
    subsegmentAlignment="true" subsegmentStartsWithSAP="1">
    <ContentProtection schemeIdUri="urn:mpeg706D6953-655C-5244-4D48-
      656164657221"/>
    <Representation id="6" bandwidth="256000" width="120" height="240">
      <BaseURL>8563456473.mp4</BaseURL>
    </Representation>
    <Representation id="7" bandwidth="512000" width="320" height="240">
      <BaseURL>50363634.mp4</BaseURL>
    </Representation>
    <Representation id="8" bandwidth="1024000" width="640" height="480">
      <BaseURL>552465736.mp4</BaseURL>
    </Representation>
    <Representation id="9" bandwidth="1534000" width="640" height="480">
      <BaseURL>41325645.mp4</BaseURL>
    </Representation>
    <Representation id="A" bandwidth="1536000" width="1280" height="720">
      <BaseURL>80045635.mp4</BaseURL>
    </Representation>
    <Representation id="B" bandwidth="2048000" width="1280" height="720">
      <BaseURL>23535745734.mp4</BaseURL>
    </Representation>
  </AdaptationSet>
</Period>
</MPD>

```

Figure 4

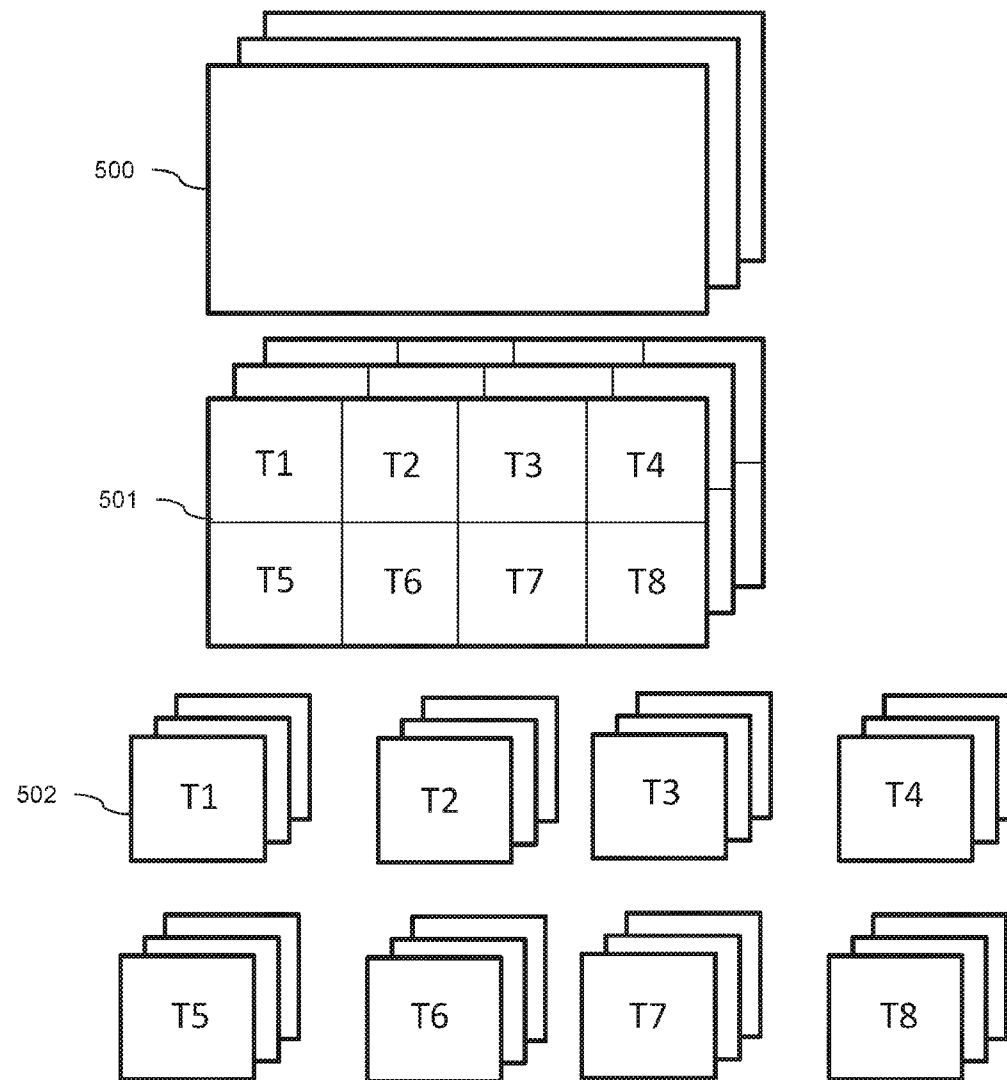
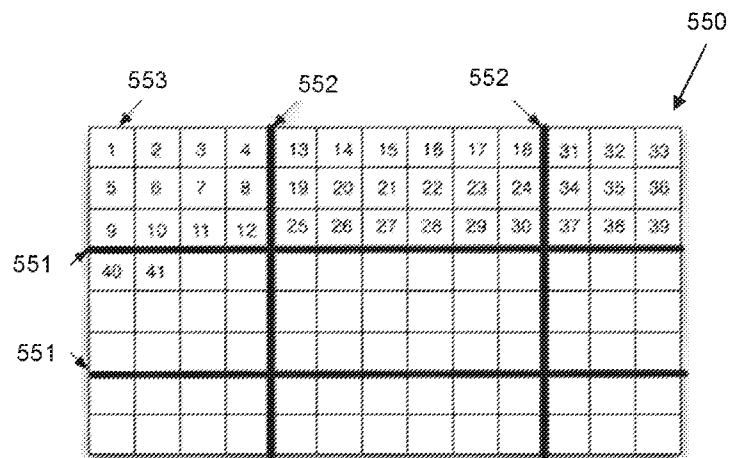


Figure 5



if (tiles_enabled_flag) {	
num_tile_columns_minus1	ue(v)
num_tile_rows_minus1	ue(v)
uniform_spacing_flag	u(1)
if (uniform_spacing_flag) {	
for(i=0; i<num_tile_columns_minus1; i++)	
column_width_minus1[i]	ue(v)
for(i=0; i<num_tile_rows_minus1; i++)	
row_height_minus1[i]	ue(v)
}	
loop_filter_across_tiles_enabled_flag	u(1)
}	

9/18

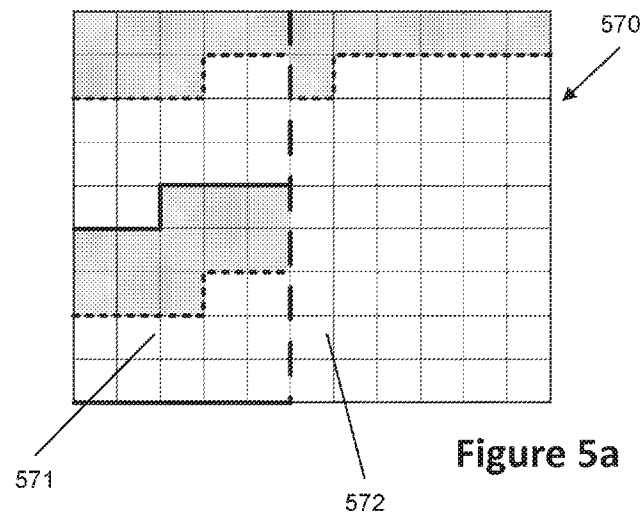
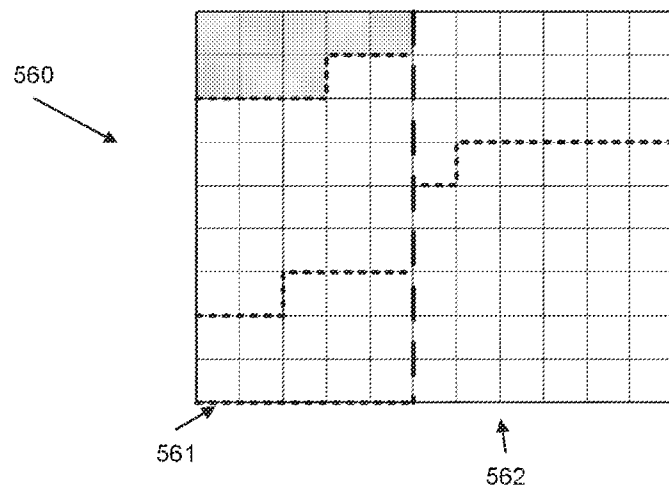


Figure 5a

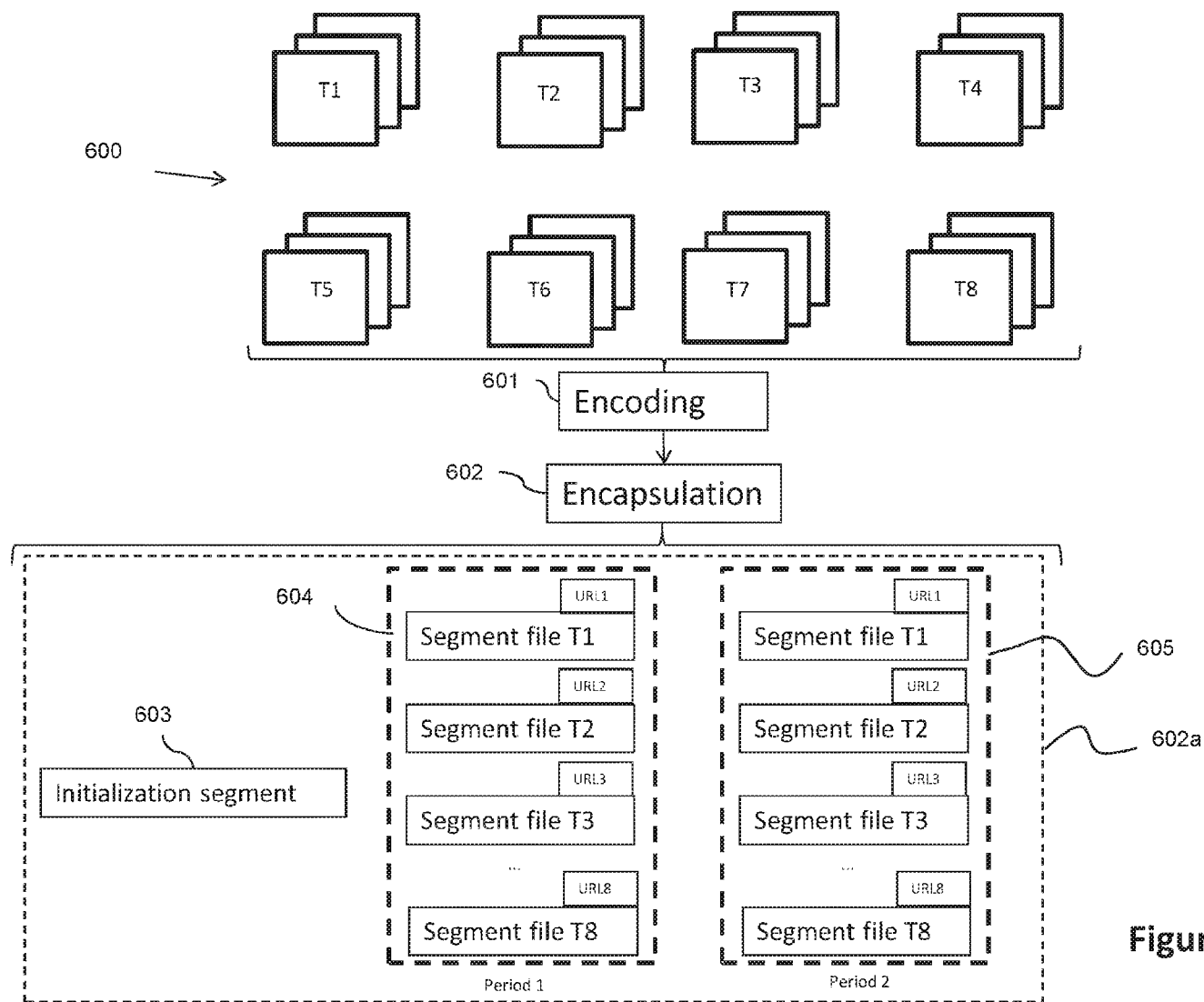
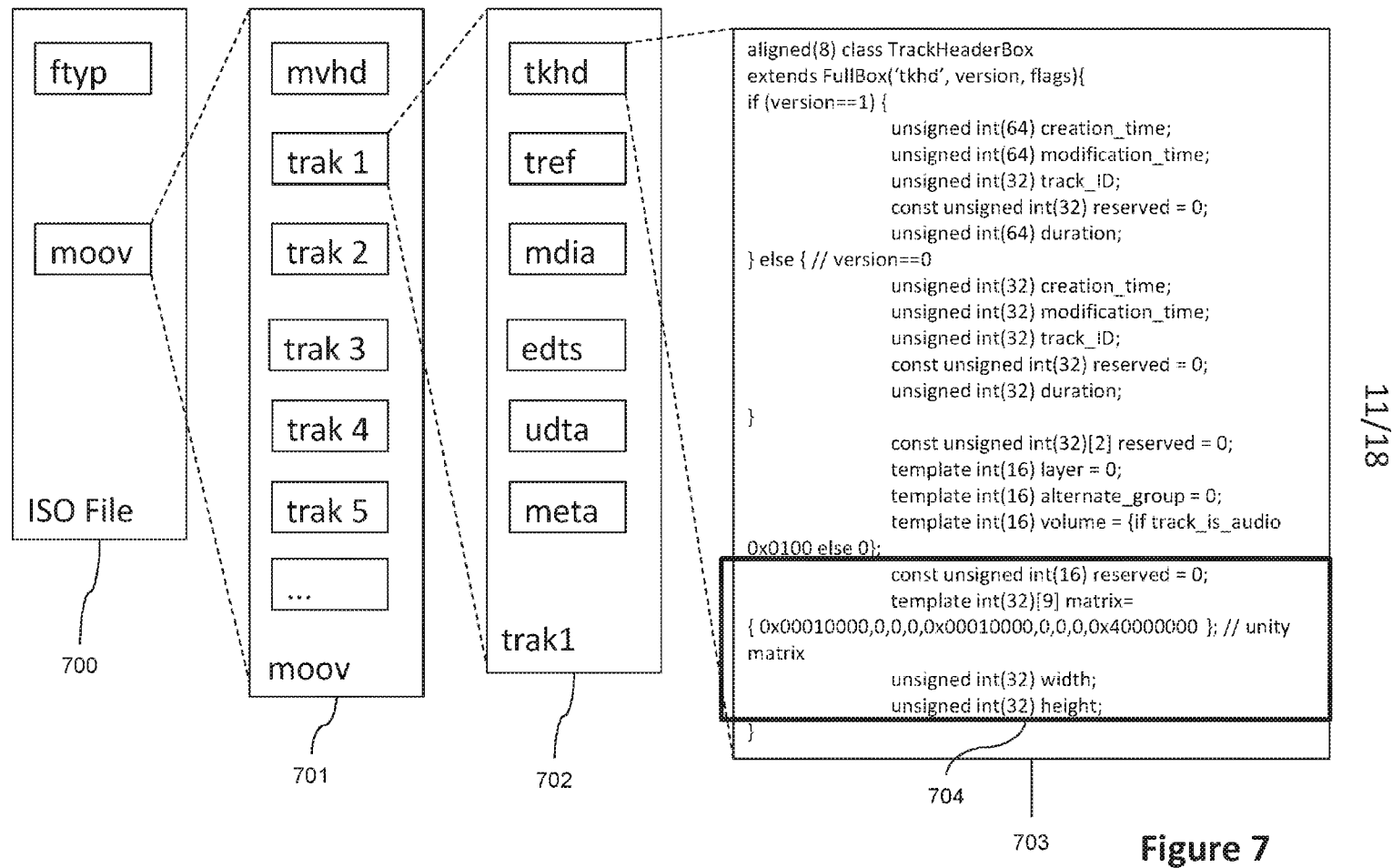


Figure 6

10/18



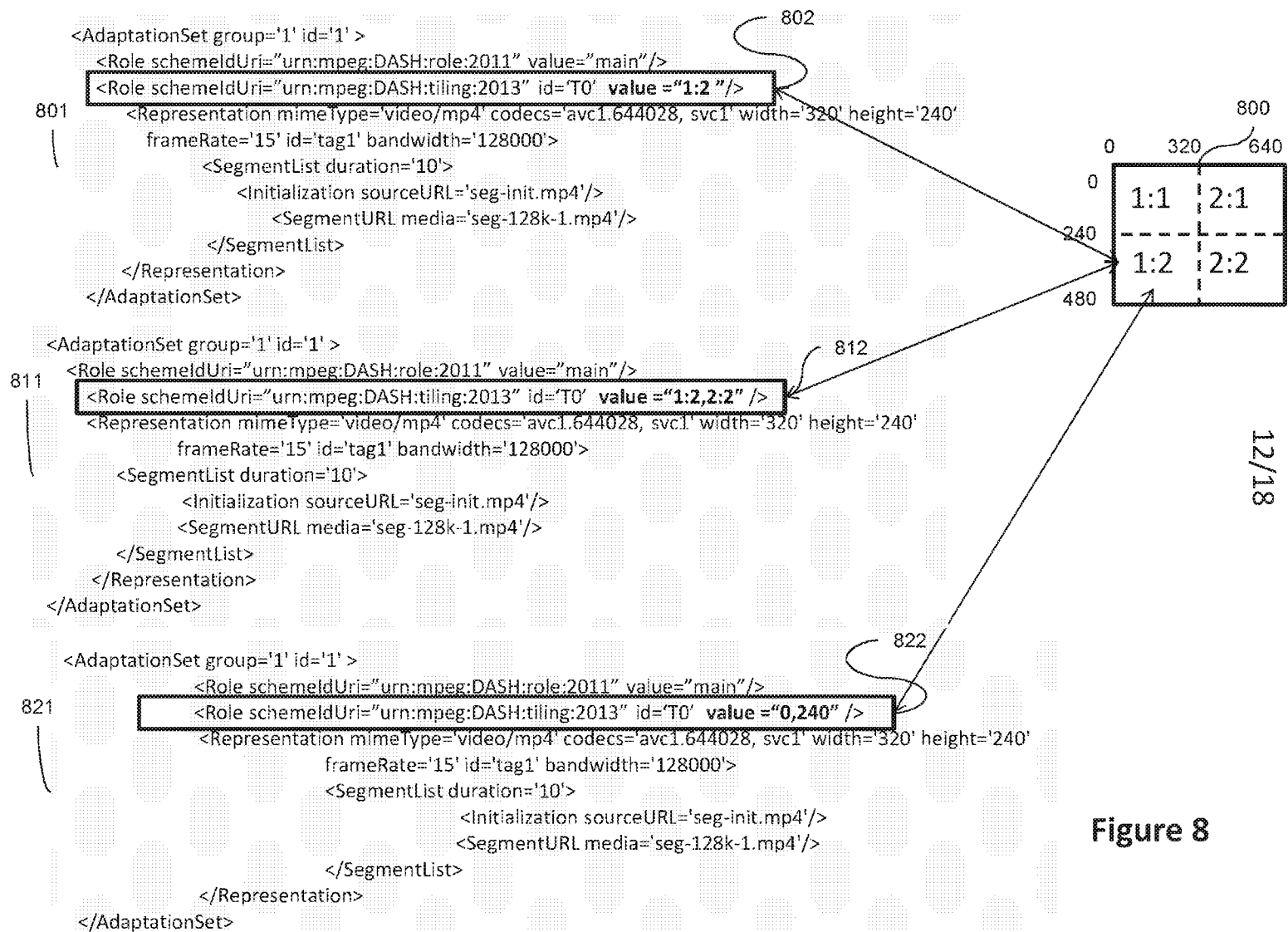
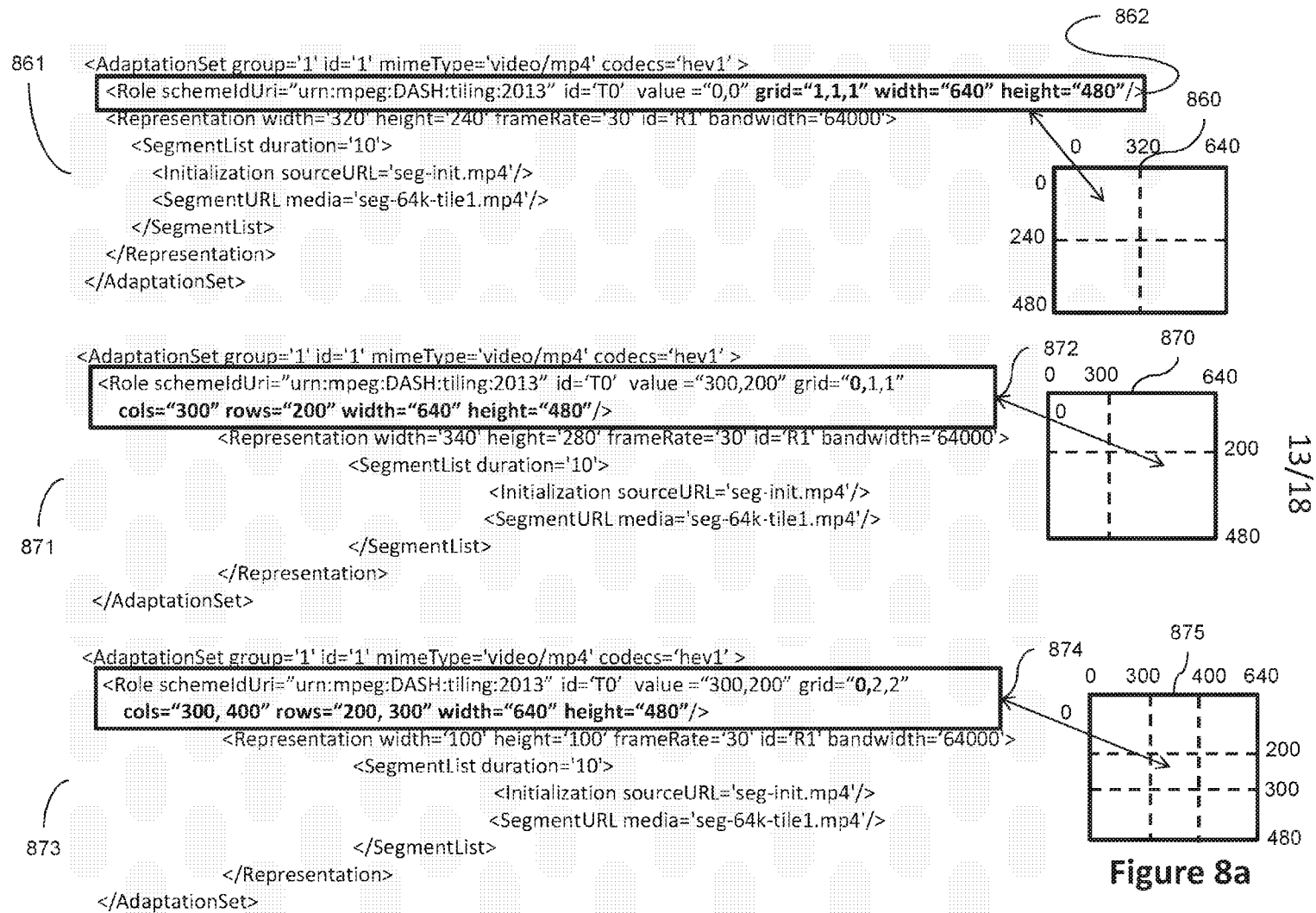


Figure 8



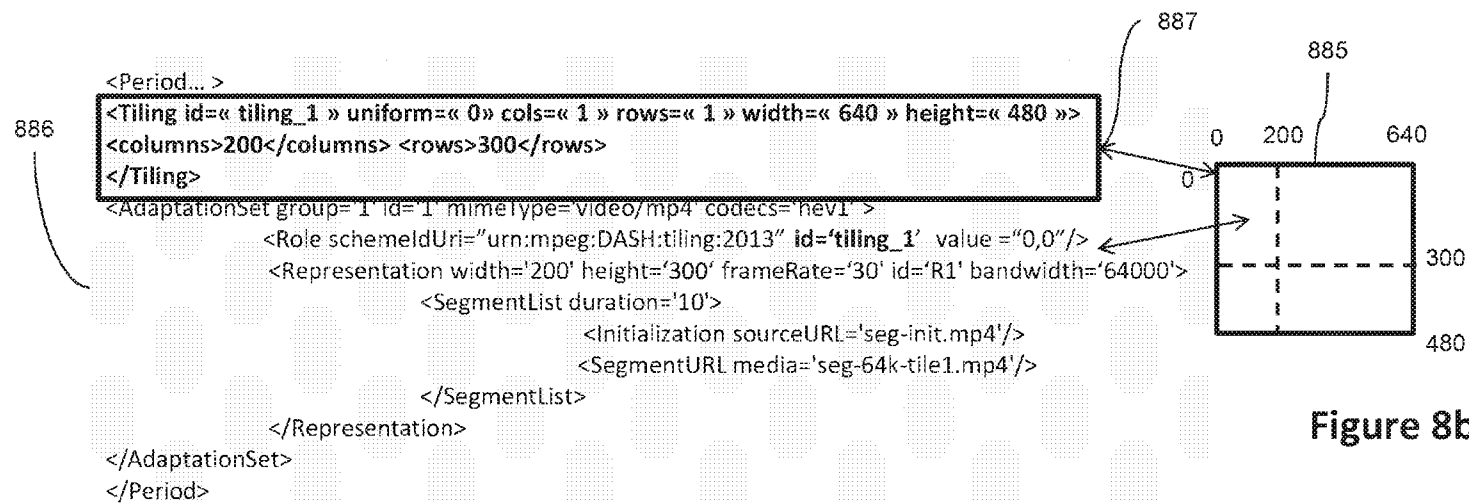
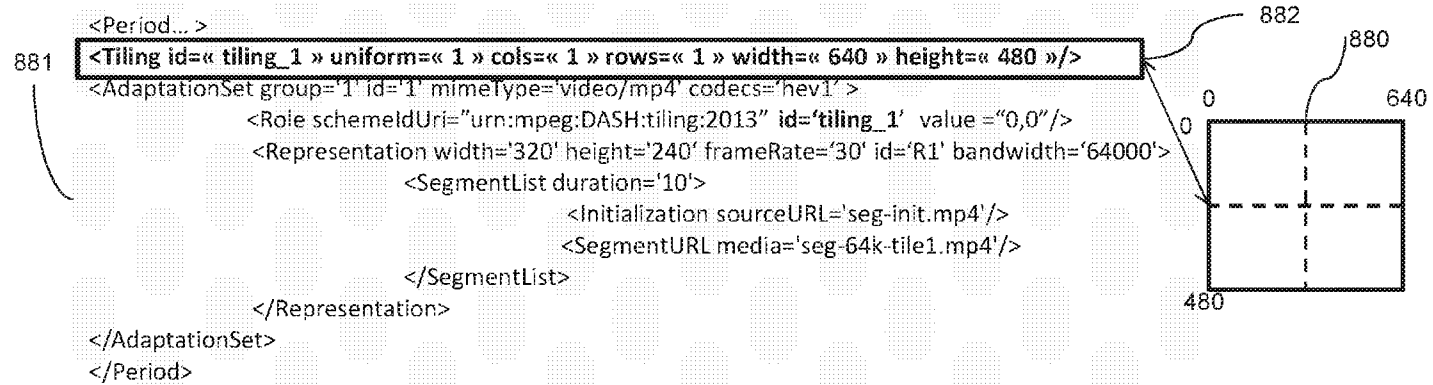


Figure 8b

14/18

```

<?xml version='1.0' encoding='UTF-8'?>
<MPD
  xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
  xmlns='urn:mpeg:DASH:schema:MPD:2011'
  xmlns:xlink='http://www.w3.org/1999/xlink'
  xsi:schemaLocation='urn:mpeg:DASH:schema:MPD:2011
http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-DASH_schema_files/...
... DASH-MPD.xsd'
  minBufferTime='PT10.00S'
  mediaPresentationDuration='PT3256S'
  type='dynamic' availabilityStartTime='2001-12-17T09:40:57Z'
  profiles='urn:mpeg:dash:profile:full:2011'
  <Period start='PT0S'>
    <subset contains='0 1 2 3'> </subset>
    <subset contains='4 5 6'> </subset>
    <AdaptationSet group='1' id='0'>
      <Representation mimeType='video/mp4' codecs='avc1.644028, ...
...svc1' width='640' height='480'
                                frameRate='15' id='tag0' bandwidth='128000'>
        <SegmentList duration='10'>
          <Initialization sourceURL='seg-init.mp4'/?>
          <SegmentURL media='seg-128k-1.mp4'/?>
        </SegmentList>
      </Representation>
    </AdaptationSet>
    <AdaptationSet group='1' id='1'>
      <Role schemeIdUri='urn:mpeg:DASH:role:2011' value='main'/?>
      900 -----> <Role schemeIdUri='urn:mpeg:DASH:tiling:2013' id='1' value='0:0'/?>
      <Representation mimeType='video/mp4' codecs='avc1.644028, svc1' ...
... width='640' height='480' frameRate='15' id='tag1' bandwidth='128000'>
        <SegmentList duration='10'>
          <Initialization sourceURL='seg-init.mp4'/?>
          <SegmentURL media='seg-128k-1.mp4'/?>
        </SegmentList>
      </Representation>
    </AdaptationSet>
    <AdaptationSet group='2' id='2'>
      <Representation mimeType='audio/mp4' id='tag2' bandwidth='128000' ...
... codecs='mp4a.0x40'>
        <SegmentList duration='10'>
          <Initialization sourceURL='seg-s-init.mp4'/?>
          <SegmentURL media='seg-s3-128k-1.mp4'/?>
        </SegmentList>
      </Representation>
    </AdaptationSet>

```

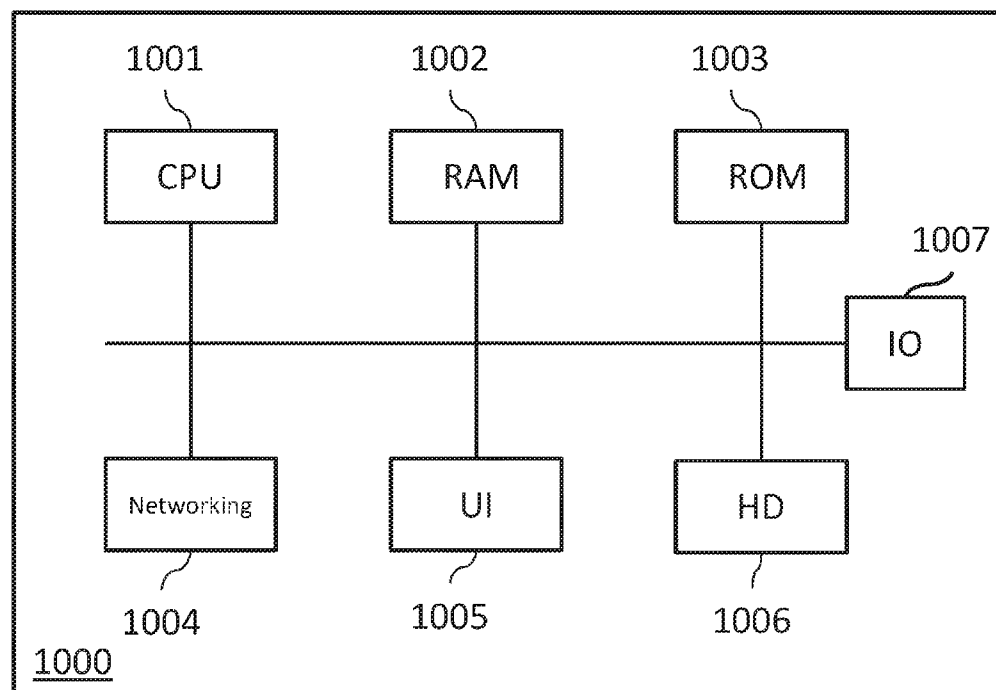
```

<AdaptationSet group='2' id='3'>
  910 → <Role schemeIdUri='urn:mpeg:DASH:role:2011' value='main'/?>
        <Role schemeIdUri='urn:mpeg:DASH:tiling:2013' id='1' value='1'/?>
        <Representation mimeType='audio/mp4' id='tag3' bandwidth='128000'
        <SegmentList duration='10'>
          <Initialization sourceURL='seg-s-init.mp4'/?>
          <SegmentURL media='seg-s3-128k-1.mp4'/?>
        </SegmentList>
      </Representation>
    </AdaptationSet>
    <AdaptationSet group='3' id='4'>
      920 → <Role schemeIdUri='urn:mpeg:DASH:role:2011' value='main'/?>
        <Role schemeIdUri='urn:mpeg:DASH:tiling:2013' id='1' value='1:1'/?>
        <Representation mimeType='video/mp4' codecs='avc1.644028, svc1' ...
...width='320' height='240' frameRate='15' id='tag4' bandwidth='128000'>
        <SegmentList duration='10'>
          <Initialization sourceURL='seg-s-init.mp4'/?>
          <SegmentURL media='seg-s1-128k-1.mp4'/?>
        </SegmentList>
      </Representation>
    </AdaptationSet>
    <AdaptationSet group='4' id='5'>
      930 → <Role schemeIdUri='urn:mpeg:DASH:role:2011' value='main'/?>
        <Role schemeIdUri='urn:mpeg:DASH:tiling:2013' id='1' value='1:2'/?>
        <Representation mimeType='video/mp4' codecs='avc1.644028, svc1' width='320'
...height='240' frameRate='15' id='tag5' bandwidth='128000'>
        <SegmentList duration='10'>
          <Initialization sourceURL='seg-s-init.mp4'/?>
          <SegmentURL media='seg-s2-128k-1.mp4'/?>
        </SegmentList>
      </Representation>
    </AdaptationSet>
    <AdaptationSet group='5' id='6'>
      940 → <Role schemeIdUri='urn:mpeg:DASH:role:2011' value='main'/?>
        <Role schemeIdUri='urn:mpeg:DASH:tiling:2013' id='1' value='1'/?>
        <Representation mimeType='audio/mp4' id='tag6' bandwidth='128000' ...
...codecs='mp4a.0x40'>
        <SegmentList duration='10'>
          <Initialization sourceURL='seg-s-init.mp4'/?>
          <SegmentURL media='seg-s3-128k-1.mp4'/?>
        </SegmentList>
      </Representation>
    </AdaptationSet>
  </Period>
</MPD>

```

15/18

Figure 9



16/18

Figure 10


```

<?xml version="1.0"?>
<MPD
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="urn:mpeg:DASH:schema:MPD:2011"
  xsi:schemaLocation="urn:mpeg:DASH:schema:MPD:2011 DASH-MPD.xsd"
  profiles="urn:mpeg:dash:profile:full:2011"
  minBufferTime="PT5.0S"
  type="static"
  mediaPresentationDuration="PT3256S">
  <BaseURL>http://www.example.com/server/Segments/</BaseURL>

1105 <Period start="PT0.00S" duration="PT3256S">
  → <Subset contains="AS1"/>
    <Subset contains="AS2 AS3 AS4 AS5"/>
    <SegmentList duration="10">
      <Initialization sourceURL='seg-init.mp4'/>
    </SegmentList>

    <!--Description of full-frame video -->
    <AdaptationSet id="AS1" mimeType='video/mp4' codecs='hev1' >
1100 <Role schemeldUri="urn:mpeg:DASH:role:2011" value="main"/>
    → <Representation id="R0" width='1920' height='1080' frameRate='30' ...
      ...bandwidth='256000'>
        <SegmentList duration='10'>
          <SegmentURL media='seg-full-1.mp4'/>
        ...
      </SegmentList>
    </Representation>
  </AdaptationSet>

  <!--Description of first tile -->
  <AdaptationSet id="AS2" mimeType='video/mp4' codecs='hev1' >
    <Role schemeldUri="urn:mpeg:DASH:role:2011" value="alternate"/>
1101 <Role schemeldUri="urn:mpeg:DASH:tiling:2013" id='TS1' value="0,0,960,540"/>
    → <Representation width='960' height='540' frameRate='30' bandwidth='64000'>
      <SegmentList duration='10'>
        <SegmentURL media='seg-tile1-1.mp4'/>
      ...
    </SegmentList>
  </Representation>
  </AdaptationSet>

  <!--Description of second tile -->
  <AdaptationSet id="AS3" mimeType='video/mp4' codecs='hev1' >
    <Role schemeldUri="urn:mpeg:DASH:role:2011"
    value="alternate"/>
    <Role schemeldUri="urn:mpeg:DASH:tiling:2013" id='TS1' ...
    ...value="0,960,960,540"/>
1102 <Representation width='960' height='540' frameRate='30'
    → bandwidth='64000'>
      <SegmentList duration='10'>
        <SegmentURL media='seg-tile2-1.mp4'/>
      ...
    </SegmentList>
  </Representation>
  </AdaptationSet>

  <!--Description of third tile -->
  <AdaptationSet id="AS4" mimeType='video/mp4' codecs='hev1' >
    <Role schemeldUri="urn:mpeg:DASH:role:2011" ...
    ...value="alternate"/>
    <Role schemeldUri="urn:mpeg:DASH:tiling:2013" id='TS1' value
    ="0,540,960,540"/>
1103 <Representation width='960' height='540' frameRate='30'
    → bandwidth='64000'>
      <SegmentList duration='10'>
        <SegmentURL media='seg-tile3-1.mp4'/>
      ...
    </SegmentList>
  </Representation>
  </AdaptationSet>

  <!--Description of fourth tile -->
  <AdaptationSet id="AS5" mimeType='video/mp4' codecs='hev1' >
    <Role schemeldUri="urn:mpeg:DASH:role:2011" ...
    ...value="alternate"/>
    <Role schemeldUri="urn:mpeg:DASH:tiling:2013" id='TS1' value
    ="960,540,960,540"/>
1104 <Representation width='960' height='540' frameRate='30'
    → bandwidth='64000'>
      <SegmentList duration='10'>
        <SegmentURL media='seg-tile4-1.mp4'/>
      ...
    </SegmentList>
  </Representation>
  </AdaptationSet>
</Period>
</MPD>

```

Figure 11

1200

1201

```

<AdaptationSet id='AS1' mimeType='video/mp4' codecs='hev1' >
  <Role schemeIdUri="urn:mpeg:DASH:tiling:2013" id='TS1' value = "0,0,960,540"/>
  <Representation width='960' height='540' frameRate='30' id='R1' bandwidth='64000'>
    <SegmentList duration='10'>
      <SegmentURL media='seg-tile1.mp4' />
      ...
    </SegmentList>
  </Representation>
</AdaptationSet>

```

18/18

Figure 12

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	Method and corresponding device for streaming video data
As the below named inventor, I hereby declare that: This declaration is directed to: ☐ The attached application, or ☒ United States application or PCT international application number <u>PCT/EP2013/071370</u> filed on <u>October 11, 2013</u>. The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I have reviewed and understand the contents of the above-identified application, including the claims. I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR § 1.56. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five(5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR	
Inventor: <u>FRANCK DENOUAL</u> Date: <u>17 April 2015</u>	
Signature: <u>FRANCK DENOUAL</u>	
Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional form for each additional inventor.	

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	Method and corresponding device for streaming video data
As the below named inventor, I hereby declare that: This declaration is directed to: ☐ The attached application, or ☒ United States application or PCT international application number <u>PCT/EP2013/071370</u> filed on <u>October 11, 2013</u> The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I have reviewed and understand the contents of the above-identified application, including the claims. I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR § 1.56. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five(5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR	
Inventor: <u>HERVÉ LE FLOCH</u> Date: <u>17 April 2015</u>	
Signature: <u>Hervé LE FLOCH</u>	
Note: An application data sheet (PTO/SR/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional form for each additional inventor.	

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	Method and corresponding device for streaming video data
As the below named inventor, I hereby declare that: This declaration is directed to: ☐ The attached application, or ☒ United States application or PCT international application number <u>PCT/EP2013/071370</u> filed on <u>October 11, 2013</u>. The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I have reviewed and understand the contents of the above-identified application, including the claims. I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR § 1.56. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five(5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR	
Inventor: <u>FREDERIC MAZE</u> Date: <u>17 April 2015</u>	
Signature: <u>Fredéric MAZE</u>	
Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional form for each additional inventor.	

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	Method and corresponding device for streaming video data
As the below named inventor, I hereby declare that: This declaration is directed to: ☐ The attached application, or ☒ United States application or PCT International application number <u>PCT/EP2013/071370</u> filed on <u>October 11, 2013</u>. The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I have reviewed and understand the contents of the above-identified application, including the claims. I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR § 1.56. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five(5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR	
Inventor: <u>Cyril CONCOLATO</u> Date: <u>17 April 2015</u>	
Signature: <u>Cyril CONCOLATO</u>	
Note: An application data sheet (PTO/SF14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional form for each additional inventor.	

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	Method and corresponding device for streaming video data
As the below named inventor, I hereby declare that: This declaration is directed to: ☐ The attached application, or ☒ United States application or PCT international application number <u>PCT/EP2013/071370</u> filed on <u>October 11, 2013</u>. The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I have reviewed and understand the contents of the above-identified application, including the claims. I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR § 1.56. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five(5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a)) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR	
Inventor: <u>Jean LE FEUVRE</u> Date: <u>17 April 2015</u>	
Signature: <u>Jean LE FEUVRE</u>	
Note: An application data sheet (PTO/SR/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional form for each additional inventor.	

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1000-18542-NP-cont-CINC
		Application Number	
Title of Invention	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Frack		DENOVAL		
Residence Information (Select One) US Residency • Non US Residency Active US Military Service					
City	Saint Domineuc		Country of Residence ⁱ	FR	
Mailing Address of Inventor:					
Address 1	c/o CANON KABUSHIKI KAISHA				
Address 2	30-2, Shimomaruko 3-chome, Ohta-ku				
City	Tokyo		State/Province		
Postal Code	146-8501		Country ⁱ	JP	
Inventor	2				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Hervé		E FLOCH		
Residence Information (Select One) US Residency • Non US Residency Active US Military Service					
City	Rennes		Country of Residence ⁱ	FR	
Mailing Address of Inventor:					
Address 1	c/o CANON KABUSHIKI KAISHA				
Address 2	30-2, Shimomaruko 3-chome, Ohta-ku				
City	Tokyo		State/Province		
Postal Code	146-8501		Country ⁱ	JP	
Inventor	3				Remove
Legal Name					

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1000-18542-NP-cont-CINC
		Application Number	
Title of Invention	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Frédéric		MAZE	
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service				
City	LANGAN		Country of Residence ⁱ	FR

Mailing Address of Inventor:

Address 1	c/o CANON KABUSHIKI KAISHA			
Address 2	30-2, Shimomaruko 3-chome, Ohta-ku			
City	Tokyo	State/Province		
Postal Code	146-8501	Country ⁱ	JP	
Inventor	4	Remove		
Legal Name				

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jean		E FEUVRE	
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service				
City	Cachan		Country of Residence ⁱ	FR

Mailing Address of Inventor:

Address 1	c/o CANON KABUSHIKI KAISHA			
Address 2	30-2, Shimomaruko 3-chome, Ohta-ku			
City	Tokyo	State/Province		
Postal Code	146-8501	Country ⁱ	JP	
Inventor	5	Remove		
Legal Name				

Prefix	Given Name	Middle Name	Family Name	Suffix
	Cyril		CONCOLATO	
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service				
City	Combs la Ville		Country of Residence ⁱ	FR

Mailing Address of Inventor:

Address 1	c/o CANON KABUSHIKI KAISHA			
Address 2	30-2, Shimomaruko 3-chome, Ohta-ku			
City	Tokyo	State/Province		
Postal Code	146-8501	Country ⁱ	JP	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1000-18542-NP-cont-CINC
		Application Number	
Title of Invention	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ An Address is being provided for the correspondence information of this application.

Customer Number	34904		
Email Address	IPdocketing@cusa.canon.com	Add Email	Remove Email

Application Information:

Title of the Invention	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		
Attorney Docket Number	1000-18542-NP-cont-CINC	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	18	Suggested Figure for Publication (if any)	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1000-18542-NP-cont-CINC
		Application Number	
Title of Invention	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	34904		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78. When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	14434741	2015-04-09
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14434741	a 371 of international	PCT/EP2013/071370	2013-10-11
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)	Remove
1306897.8	GB	2013-04-16	9C0F	
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)	Remove
1218370.3	GB	2012-10-12	AD83	
Additional Foreign Priority Data may be generated within this form by selecting the Add button.				Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1000-18542-NP-cont-CINC
		Application Number	
Title of Invention	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. ☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1000-18542-NP-cont-CINC
		Application Number	
Title of Invention	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1000-18542-NP-cont-CINC
		Application Number	
Title of Invention	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant	1		Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
Clear			
☒ Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	CANON KABUSHIKI KAISHA		
Mailing Address Information For Applicant:			
Address 1	30-2, Shimomaruko 3-chome, Ohta-ku		
Address 2			
City	Tokyo	State/Province	
Country	JP	Postal Code	146-8501
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1000-18542-NP-cont-CINC
		Application Number	
Title of Invention	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				Remove
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country i		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

Signature:[Remove](#)

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Amichai Kotev/		Date (YYYY-MM-DD)	2017-10-13
First Name	Amichai	Last Name	Kotev	Registration Number
				57668
Additional Signature may be generated within this form by selecting the Add button.				Add

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	1000-18542-NP-cont-CINC
		Application Number	
Title of Invention	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		

This collection of information is required by 37 CFR 1.76. 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 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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, U.S. Department of Commerce, 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, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	N/A
Filing Date	N/A
First Named Inventor	Franck DENOUAL
Title	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA
Art Unit	N/A
Examiner Name	N/A
Attorney Docket Number	1000-18542-NP-cont-CINC

SIGNATURE of Applicant or Patent Practitioner			
Signature	/Amichai Kotev/	Date (Optional)	
Name	Amichai Kotev	Registration Number	57668
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.			
☐ *Total of _____ forms are submitted.			

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 1.11 and 1.14. This collection is estimated to take 3 minutes 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, U.S. Department of Commerce, 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, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

- ☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 34904
- OR
- ☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

- ☒ The address associated with the above-mentioned Customer Number
- OR
- ☐ The address associated with Customer Number:
- OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Canon Kabushiki Kaisha

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	<u>Kenichi Nagasawa</u>	Date (Optional)	<u>13 APR 2016</u>
Name	Kenichi Nagasawa		
Title	Managing Executive Officer, Group Executive, Corporate Intellectual Property and Legal Headquarters		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.331, 1.332, and 1.333. 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 1.11 and 1.14. This collection is estimated to take 3 minutes 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, U.S. Department of Commerce, 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, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

SCORE Placeholder Sheet for IFW Content

Application Number: 15783999

Document Date: 10/13/2017

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

- Drawing

At the time of document entry (noted above):

- USPTO employees may access SCORE content via eDAN using the Supplemental Content tab, or via the SCORE web page.
- External customers may access SCORE content via PAIR using the Supplemental Content tab.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
15/783,999	10/13/2017		2580	1000-18542-NP-cont-CINC	27	4

CONFIRMATION NO. 4207

FILING RECEIPT

34904
CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION
15975 ALTON PARKWAY
IRVINE, CA 92618-3731



CC000000093073112

Date Mailed: 10/31/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Franck DENOUAL, Saint Domineuc, FRANCE;
Hervé LE FLOCH, Rennes, FRANCE;
Frédéric MAZE, LANGAN, FRANCE;
Jean LE FEUVRE, Cachan, FRANCE;
Cyril CONCOLATO, Combs la Ville, FRANCE;

Applicant(s)

CANON KABUSHIKI KAISHA, Tokyo, JAPAN;

Power of Attorney: The patent practitioners associated with Customer Number 34904

Domestic Priority data as claimed by applicant

This application is a CON of 14/434,741 04/09/2015 PAT 9819767
which is a 371 of PCT/EP2013/071370 10/11/2013

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

UNITED KINGDOM 1306897.8 04/16/2013 Access Code Provided
UNITED KINGDOM 1218370.3 10/12/2012 Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

Request to Retrieve - This application either claims priority to one or more applications filed in an intellectual property Office that participates in the Priority Document Exchange (PDX) program or contains a proper **Request to Retrieve Electronic Priority Application(s)** (PTO/SB/38 or its equivalent). Consequently, the USPTO will attempt to electronically retrieve these priority documents.

If Required, Foreign Filing License Granted: 10/27/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/783,999**

Projected Publication Date: 02/08/2018

Non-Publication Request: No

Early Publication Request: No
Title

METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

page 2 of 4

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/783,999	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	27	minus 20 = 7			OR	x 80 =	560
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4	minus 3 = 1				x 420 =	420
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2580
APPLICATION AS AMENDED - PART II							
AMENDMENT A	(Column 1)	(Column 2)	(Column 3)	SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	x	=	OR	x
	Independent (37 CFR 1.16(h))	*	Minus ***	x	=	OR	x
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
AMENDMENT B	(Column 1)	(Column 2)	(Column 3)	SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	x	=	OR	x
	Independent (37 CFR 1.16(h))	*	Minus ***	x	=	OR	x
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.							



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-cont-CINC	4207
34904 7590 11/20/2017 CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION 15975 ALTON PARKWAY IRVINE, CA 92618-3731			EXAMINER	
			ART UNIT	PAPER NUMBER
			2441	
			NOTIFICATION DATE	DELIVERY MODE
			11/20/2017	ELECTRONIC

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 the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mklein@cusa.canon.com
skalminov@cusa.canon.com
IPDocketing@cusa.canon.com



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Doc Code:
TRACK1.GRANT

Decision Granting Request for Prioritized Examination (Track I or After RCE)	Application No.:15/783,999
1. THE REQUEST FILED <u>October 13, 2017</u> IS <u>GRANTED</u>. The above-identified application has met the requirements for prioritized examination A. ☒ for an original nonprovisional application (Track I). B. ☐ for an application undergoing continued examination (RCE). 2. The above-identified application will undergo prioritized examination. The application will be accorded special status throughout its entire course of prosecution until one of the following occurs: A. filing a <u>petition for extension of time</u> to extend the time period for filing a reply; B. filing an <u>amendment to amend the application to contain more than four independent claims, more than thirty total claims</u>, or a multiple dependent claim; C. filing a <u>request for continued examination</u>; D. filing a notice of appeal; E. filing a request for suspension of action; F. mailing of a notice of allowance; G. mailing of a final Office action; H. completion of examination as defined in 37 CFR 41.102; or I. abandonment of the application. Telephone inquiries with regard to this decision should be directed to Kimberly Inabinet at 571-272-4618. <i>/Kimberly Inabinet/</i> Paralegal Specialist, Office of Petitions	

Office of Petitions: Routing Sheet



Application No.

This application is being forwarded to your office for further processing. A decision has been rendered on a petition filed in this application, as indicated below. For details of this decision, please see the document PET.OP.DEC filed on the same date as this document.

- ☒ **GRANTED**
- ☐ **DISMISSED**
- ☐ **DENIED**

Office of Petitions: Decision Count Sheet

Mailing Month

11

Application No.

15783999



For US serial numbers: enter number only, no slashes or commas. Ex: 10123456

For PCT: enter "51+single digit of year of filing+last 5 numbers", Ex. for PCT/US05/12345, enter 51512345

Deciding Official:

Kimberly Inabinet

Count (1) - Palm Credit

15783999

Decision: GRANT

FINANCE WORK NEEDED

☐ Select Check Box for YES

Decision Type: 643 - Track One request



Notes:

Count (2)

Decision: n/a

FINANCE WORK NEEDED

☐ Select Check Box for YES

Decision Type: NONE

Notes:

Count (3)

Decision: n/a

FINANCE WORK NEEDED

☐ Select Check Box for YES

Decision Type: NONE

Notes:

Initials of Approving Official (if required)

If more than 3 decisions, attach
2nd count sheet & mark this box

Printed on: 11/16/2017

Office of Petitions Internal Document - Ver. 5.0

CERTIFICATE OF AVAILABILITY OF A CERTIFIED PATENT DOCUMENT IN A DIGITAL LIBRARY

The International Bureau certifies that a copy of the patent application indicated below has been available to the WIPO Digital Access Service since the date of availability indicated, and that the patent application has been available to the indicated Office(s) as of the date specified following the relevant Office code:

Document details: Country/Office: GB

Filing date: 12 Oct 2012 (12.10.2012)

Application number: 1218370.3

Date of availability of document: 26 Nov 2012 (26.11.2012)

The following Offices can retrieve this document by using the access code:

JP, US, SE, NZ, KR, EA, BR, GB, AU, ES, IB, EE, CN, MA, FI

Date of issue of this certificate: 02 Feb 2018 (02.02.2018)

34, chemin des Colombettes
1211 Geneva 20, Switzerland
www.wipo.int

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

Certified Office Copy

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with patent application GB1218370.3 filed on 12 October 2012 and as stored electronically on the Patents Electronic Case file System.

The Patents Electronic Case-file System is compliant with British Standard BS10008 - Evidential weight and legal admissibility of information stored electronically and ISO15801 - Electronic imaging – information stored electronically, recommendations for trustworthiness and reliability.

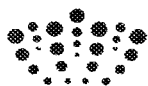
In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed A HAYES

Dated 17 October 2012



Patents Form 1

Patents Act 1977 (Rule 12)

Request for grant of a patent

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

Application number **GB 1218370.3**

1. Your reference	CRF-01356-GB		
2. Full name, address and postcode of the applicant or of each applicant	CANON KABUSHIKI KAISHA 30-2 SHIMOMARUKO 3-CHOME OHTA-KU 146-8501 Tokyo Japan		
Patents ADP number (if you know it)			
3. Title of the invention	Method and corresponding device for streaming video data		
4. Name of your agent (if you have one) "Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) (including the postcode)	Canon Europe Ltd Canon Europe Ltd 3 The Square Stockley Park Uxbridge UB11 1ET Middlesex United Kingdom		
Patents ADP number (if you know it)			
5. Priority declaration: Are you claiming priority from one or more earlier-filed patent applications? If so, please give details of the application(s)			
	Country	Application number	Date of filing
			Date available on PDAS
6. Divisionals etc: Is this application a divisional application, or being made following resolution of an entitlement dispute about an earlier application. If so, please give the application number and filing date of the earlier application		Number of earlier UK application	Date of filing (day / month / year)
7. Inventorship: (Inventors must be individuals not companies)			
Are all the applicants named above also inventors?	No		
8. Are you paying the application fee with this form?	Yes		

Patents Form 1

9. Accompanying documents: please enter the number of pages of each item accompanying this form.

Continuation sheets of this form

Description: **24**

Claim(s): **8**

Abstract: **1**

Drawing(s): **12**

If you are not filing a description, please give details of the previous application you are going to rely upon

Country	Application number	Date of filing	Date available on PDAS

10. If you are also filing any of the following, state how many against each item.

Priority documents: **0**

Statement of inventorship and right to grant of a patent
(Patents Form 7): **1**

Request for search (Patents Form 9A): **1**

Request for a substantive examination (Patents Form 10): **1**

Any other documents (please specify): **PDAS Registration Form**

11. I/We request the grant of a patent on the basis of this application.

Signature: **Subject: GB, Canon Europe Ltd, C. Derham** Date: **12 Oct 2012**
19126; Issuer: European Patent Office,
European Patent Office CA

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant	DERHAM, Cassandra Email: cassandra.derham@canon-europe.com Telephone: +44 (0) 20 8588 8926 Fax: +44 (0) 20 8588 8017

Warning

After an application for a patent has been filed, the Comptroller will consider whether publication or communication of the invention should be prohibited or restricted under section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you are resident in the United Kingdom and your application contains information which relates to military technology, or would be prejudicial to national security or the safety of the public, section 23 of the Patents Act 1977 prohibits you from applying for a patent abroad without first getting written permission from the Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked. Until such time or until the revocation of any direction, for any such application the address for service referred to at part 4 above must be in the United Kingdom.

Although you may have an address for service in the Channel Islands, any agent instructed to act for you must reside or have a place of business in the European Economic Area or Isle of Man.

METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

FIELD OF THE INVENTION

5 The invention relates to a method and a device for transmitting media data, and more particularly Web-accessed compressed videos. Preferably, the streaming of media data is made over IP networks (like the Internet) by using the protocol HTTP.

BACKGROUND OF THE INVENTION

10 A media presentation is usually composed of several media contents such as audio, video or text. They can be sent from a server to a client for being jointly played by the client device. Those media contents are downloaded by the client from a
15 server.

 In this context, a new standard called DASH (for "Dynamic Adaptive Streaming over HTTP") has recently emerged (see "ISO/IEC 23009-1, Dynamic adaptive streaming over HTTP (DASH), Part1: Media presentation description and segment formats"). This standard enables to create an association between a compact
20 description of the content(s) of a media presentation and the HTTP addresses. Usually, this association is described in a file called a manifest file or description file. In the context of DASH, this manifest file is a file also called the MPD file (for Media Presentation Description).

 When the MPD file is sent to the client device, the description of each
25 media content can be easily known by the client. By reading the manifest file, the client is aware of the kind of media contents proposed in the media presentation and is aware of the HTTP addresses for downloading the associated media contents. Therefore, it can decide which media content to download (via HTTP requests) and to play (decoding and play after reception of the media data segments).

30 In addition to this association, the DASH standard proposes to split each media content into small periods of time. The time decomposition is added in the MPD file. Thus it describes the association between HTTP addresses (or URLs) and the compact description of each media content over a small period of time.

35

The invention focuses on a video description in a manifest file (by taking the DASH MPD as reference). Even if the other elements of the media representation (e.g. audio, text,...) are not directly taken into account, they can easily be incorporated in a more global media description as will be explained below.

5

The spatial resolution of the video becomes more and more important. In this perspective, 4K2K videos begin to emerge on the market. However, mobile applications cannot display such a resolution with a high quality.

A solution proposes to split the video into tiles. If the user of a mobile application wants to display or focus on sub-parts of the video, only the tiles corresponding to the sub-part are transmitted. This process allows keeping a video portion with a good quality.

In the context of DASH, the known standard "ISO BMFF" ("Base Media File Format") is used to encapsulate media contents into media data segments in order to form the media presentation.

Classically, by using DASH, each track would be described in the manifest as independent media content, even if the track corresponds to a sub-part of the video. There is no way in the manifest to signal that each track is a sub-part of the same video. Indeed current MPD definition doesn't allow describing tiled video. In practice, the user would have to download a first initialization segment (in addition to the manifest) for knowing that each video described in the MPD is a sub-part of a tiled video. Then they would have to download, as a minimum, the beginning of each first media data segment of each video content to retrieve the association between tile locations and video content. The downloading of this initialization information conducts to delays and additional and useless HTTP requests.

In another prior art which is not compatible with the use of DASH, the article "*In packet video 2010, An Interactive Region Of Interest Video Streaming System for Online Lecture Viewing*", A. Mavlankar, P. Agrawal, D. Pang, D. Halawa, N. Cheung, B. Girod, proposes a specific manifest ("proprietary manifest") describing tiles for a scalable video. The specific manifest provides an identifier and a piece of location information for each tile. From a URL associated to a base layer, and tiles information provided by the proprietary manifest, an HTTP query is built to access a particular tile, this query being associated to a tile index. This type of HTTP query requires

processing at server-side to retrieve, from the HTTP query, the byte-range and consequently the tile to be sent to the client device to fulfill its request. This can be done only by a very specific server.

5

SUMMARY OF THE INVENTION

The present invention has been devised to address one or more of the foregoing concerns.

According to a first aspect of the invention, there is proposed a method for
10 streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks. The method comprises:

- transmitting, by a server, a description file to a client, said description file including data about the spatial organization of the n video sub-tracks and at least n
15 URLs respectively designating each video sub-track,
- selecting by the client device one or more URLs according to one Region Of Interest chosen by the client,
- receiving from the client, by the server, one or more request messages for requesting the video sub-tracks, each request message comprising one of the URLs
20 selected by the client, and
- transmitting to the client, by the server, video data corresponding to the requested video sub-tracks, in response to the request messages.

It is noticed that a video sub-track in the invention, is a video track associated to a tile.

25 In other words, the first aspect of the invention proposes to include directly the URLs of video sub-tracks in a description file (meaning an MPD in DASH) so that the client is aware of the division of the frames into tiles and is able to directly send URL request messages to the server.

30 The first aspect of the invention allows the limiting of the number of requests for the streaming of the data between the server and the client device. Moreover, when it receives the description file, the client is already aware of the presence and the spatial organization of the tiles, and consequently, it knows how to display the corresponding video sub-tracks.

In an embodiment, the description file further comprises a URL designating a track corresponding to the full given video, and if the client's device does not select any URL according to one Region Of Interest, the server receives from the client a request message comprising the URL of the full video track and transmit to the client video data
5 corresponding to the full video track in response to the request message.

In an embodiment, the given video is a scalable video comprising a base layer and at least one enhancement layer, said description file further comprising the URL of the base layer track, and if the client device select at least one URL according to one
10 Region Of Interest, it also selects the URL of the base layer, the server further receives from the client one request message for requesting the base layer track, said request message including the URL of the base layer track, and the server further transmits to the client video data corresponding to the requested base layer track, in response to the request message.

15

In an embodiment, each URL designates a segment of tracks for a pre-defined period of time.

In an embodiment, each spatial tile is a rectangular region.
20

In an embodiment, each spatial tile comprises p lines and q rows, p and q being integers.

In an embodiment, each spatial tile is referenced by an index value.
25

In an embodiment, each spatial tile is referenced by using Cartesian coordinates.

In an embodiment, the video data corresponds to m videos representing the same content, m being an integer, but each of the m videos having a different
30 resolution, and each frame of each video being divided into n spatial tiles, in order to create $m*n$ independent video sub-tracks.

As being well-known by the man skilled in the art, the resolution criterion can be replaced by a frame rate or a bandwidth criterion.
35

In an embodiment, the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

5

In an embodiment, the parameters further include data about

a. the type of the track: video track or video sub-track, and/or

b. the spatial position of each video sub-track relative to the other video sub-tracks,

10 said parameters being described by a Role element if the data are streamed according to the DASH standard.

In an embodiment, the method further comprises:

- acquiring the data corresponding to the given video,

15

- compressing the acquired data,

- encapsulating the compressed data, said encapsulating comprising:

- generating a given number of video segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and

20

- generating an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks, and

- generating the description file from the encapsulated data.

25

In an embodiment, the description file further comprises an URL associated to the initialization segment.

In an embodiment, the initialization data comprises values indicating the width and the height of each video sub-track.

30

In an embodiment, the initialization data further comprises a transformation matrix which enables the display of each video sub-track at the right position.

35 In an embodiment, the data are streamed according to the DASH standard, said description file being a Media Presentation Description file.

According to a second aspect of the invention, there is proposed a method for providing data by a server device to a client device, said data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks. The method comprises:

- generating a description file, said description file including data about the spatial organization of the n video sub-tracks, and at least n URLs respectively designating each video sub-track,
- transmitting said description file to the client device, and
- transmitting video data corresponding to the video sub-tracks based on one or more client device requests, each request comprising one of the URLs.

In an embodiment, the description file further comprises a URL designating a track corresponding to the full given video, and the server transmits to the client video data corresponding to the full video track based on a client device request comprising the URL of the full video track.

In an embodiment, the given video is a scalable video comprising a base layer and at least one enhancement layer, said description file further comprising the URL of the base layer track, and the server further transmits to the client video data corresponding to the base layer track based on a client device request comprising the URL of the base layer track.

In an embodiment, each URL designates a segment of tracks for a pre-defined period of time.

In an embodiment, the method further comprises, prior to the step of generating a description file:

- acquiring data corresponding to the given video,
- compressing the acquired data,
- encapsulating the compressed data, said encapsulating comprising:
 - generating a given number of media segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and

- generating an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks.

5 In an embodiment, each spatial tile is a rectangular region.

In an embodiment, each spatial tile comprises p lines and q rows, p and q being integers.

10 In an embodiment, each spatial tile is referenced by an index value.

In an embodiment, each spatial tile is referenced by using Cartesian coordinates.

15 In an embodiment, the video data includes m video tracks representing the same content frames, m being an integer, but each one of the m video tracks having a given resolution, each frame of each video track being divided into n spatial tiles, in order to create m*n independent video sub-tracks.

20 In an embodiment, the description file comprises parameters video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

25 In an embodiment, the parameters further include data about:

- a. the type of the track: video track or video sub-track, and/or
- b. and the spatial position of each video sub-track relatively to the other video sub-tracks,

said parameters being described by a Role element if the data are streamed according to the DASH standard.

30

According to a third aspect of the invention, it is proposed a method for obtaining data corresponding to a given video by a client device, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n

35 independent video sub-tracks. The method comprises:

- receiving a description file including data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating each video sub-tracks,
- selecting at least one Region Of Interest in the video,
- 5 - obtaining one or more URLs according to the chosen Region Of Interest, based on the description file, and
- sending one or more request messages for requesting the video sub-tracks, each request message comprising one of the URLs selected by the client,
- receiving video data corresponding to the requested video sub-tracks, in
- 10 response to the request messages.

In an embodiment, the description file further comprises a URL designating a track corresponding to the full given video, and if the client's device does not select any Region Of Interest, the method further comprises sending a request message for

15 requesting the full video track and receiving video data corresponding to the requested full video track, in response to the request message.

In an embodiment, the given video is a scalable video comprising a base layer and at least one enhancement layer, said description file further comprising the URL of the base layer track, and if the client's device chooses one Region Of Interest, and the

20 method further comprising:

- obtaining by the client's device the URL of the base layer,
- sending request message which includes the URL of the base layer track, and
- receiving video data corresponding to the requested base layer track, in
- 25 response to the request message.

In an embodiment, each URL designates a segment of tracks for a pre-defined period of time.

30 In an embodiment, each spatial tile is a rectangular region.

In an embodiment, each spatial tile comprises p lines and q rows, p and q being integers.

In an embodiment, each spatial tile is referenced by an index value.

35

In an embodiment, each spatial tile is referenced by using Cartesian coordinates.

5 In an embodiment, the video data corresponds to m videos representing the same content, m being an integer, but each one of the m videos having a different resolution, each frame of each video being divided into n spatial tiles, in order to create $m \cdot n$ independent video sub-tracks.

10 In an embodiment, the description file comprises parameters video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identification attribute if the data are streamed according to the DASH standard.

In an embodiment, the parameters further include at least data about:

15 a. the type of the track: video track or video sub-track, and/or

b. the spatial position of each video sub-track relatively to the other video sub-tracks,

said parameters being described by a Role element if the data are streamed according to the DASH standard.

20 In an embodiment, the received video data comprises:

- a given number of video segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
- an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks.

25 In an embodiment, the description file further comprises an URL associated to the initialization segment.

30 In an embodiment, the initialization data comprises values indicating the width and the height of each video sub-track.

In an embodiment, the initialization data further comprises a transformation matrix which enables to display each video sub-track at the right position.

According to a fourth aspect of the invention, there is proposed a computer program product for a programmable apparatus, the computer program product comprising a sequence of instructions for implementing a method as mentioned above, when loaded into and executed by the programmable apparatus.

5

According to a fifth aspect of the invention, there is proposed a computer-readable storage medium storing instructions of a computer program for implementing a method, as mentioned above.

10

According to a sixth aspect of the invention, there is proposed a device for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said device implementing a streaming method as mentioned.

15

According to a seventh aspect of the invention, there is proposed a server device for providing data to a client device, said data corresponding to a given video each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said server device implementing a providing method as mentioned above.

20

According to a seventh aspect of the invention, there is proposed a client device for obtaining data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said client's device implementing an obtaining method as mentioned above.

25

BRIEF DESCRIPTION OF THE DRAWINGS

Other particularities and advantages of the invention will also emerge from the following description, the invention being described purely by way of example and being illustrated by the accompanying drawings, in which:

30

Figure 1a illustrates a block diagram about an example of the general principle of the Media streaming over HTTP;

Figure 1b is a flow chart, explaining more in detail the media streaming over HTTP according to an embodiment of the invention, in particular when a frame is divided into tiles;

Figure 1c schematically represents a frame divided into tiles and a Region Of Interest, according to an embodiment of the invention;

Figure 2 is a block diagram illustrating an example of the general principle of generating a media presentation and a manifest file;

Figure 3 schematically represents the classical organization of a Media presentation for being streamed using DASH;

Figure 4 illustrates a description file/manifest where no sub-track is involved;

Figure 5 schematically describes an embodiment for pre-processing an initial video into video sub-tracks according to the invention;

Figure 6 schematically describes an embodiment for encoding and encapsulating video sub-tracks into a file format, according to the invention;

Figure 7 schematically describes an embodiment of the boxes of the file format that can be used for carrying the location of each video sub-track, according to the invention;

Figure 8 describes a new syntax of a manifest/description file according to the invention;

Figure 9 gives a complete example of manifest/description file for a media presentation with video sub-tracks, according to the invention; and

Figure 10 is a schematic block diagram of a computing device for implementation of one or more embodiments of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Figure 1a describes the general principle of the Media streaming over HTTP, like DASH in particular. Most of the new protocols and standards for Media streaming over HTTP are based on this principle.

A media server 100 contains different media presentations. An example of media presentation 101 is illustrated. It contains here audio and video data. It is considered here that the video is integral, meaning it is not divided into tiles. In this example, we consider that audio and video are interleaved in a same file. The way this

media presentation is constructed is described below in the figure 2. This media presentation has been temporally split into small independent and consecutive temporal segments 102, 102a and 103 (for example mp4 segments) meaning that the interleaved audio/video data of the media presentation is split into three consecutive temporal periods. Those temporal segments can be addressed and downloaded independently. The downloading addresses of the media content are HTTP addresses. (One HTTP address associated to each temporal segment of the audio/video media content.) They are set by the server 100 for each one of these temporal segments.

A manifest file 104 (or description file) is an XML document. It describes the content of the temporal media segments e.g. type of media (audio, video, audio-video, text...), coding format, time duration of the segment. Moreover it associates an URL to each media content segment that is described.

The manifest file 104 is sent to a client device 110 related to a client or a user. By reading the received manifest file 105, the client can know the association between temporal segments of the different media content and the HTTP addresses designating the temporal segments. Moreover, the manifest file 105 gives the information about the content (interleaved audio/video in this example) of the media presentation. For instance, the information may include resolution and/or bit-rate.

The client device 110 can therefore emit HTTP requests 106 for downloading the temporal segments that he wants, those temporal segments being described in the received manifest file 105.

As a response, the server 100 sends the requested temporal segments, 107. These temporal segments can be decoded 108 by the client device 110 for display 109.

25

Figure 1b illustrates more precisely the Media streaming over HTTP (particularly in DASH) according to the invention. It is considered here that the streamed video data includes a video track such that each frame of the video track is divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks.

30

First a client device receives a description file (or MPD in DASH) from a server, step 1008. This description file includes data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating the video sub-tracks.

The client chooses a Region of Interest (ROI) that he wants to display. For instance, he wants to zoom in on a specific zone as illustrated in figure 1c.

Figure 1c illustrates a frame 1100 which is here divided into eight tiles T1, T2, ..., T8. In this frame the client decided to zoom on a portion 1110 at the right bottom part of the image. As illustrated in the figure 1c, this chosen portion 1110 or ROI is encompassed by two tiles T6 and T8.

In figure 1b, the client chooses an ROI, step 1010, as illustrated in figure 1c.

The URLs corresponding to the tiles covered by the ROI chosen by the client (the URLs of T6 and T8 in the example of the figure 1c) are selected by the client device, step 1020.

The selection is also based on some compatibility criteria which are developed more in detail later.

Requested messages are sent from the client device to the server, step 1030. Each request message comprises the URL of one tile covered by the ROI chosen by the client. As explained more in detail below, the video sub-tracks corresponding to the tiles are organized into temporal segments. So, one URL designates the video sub-track corresponding to the tile, over a whole segment.

In response to the request messages, the server sends to the client device the video data (meaning the segments as detailed below), step 1040. If video sub-tracks/tiles are requested, the segments designated by the URLs in the request messages are sent to the client device.

Figure 2 illustrates the main steps for the generation of both a media presentation and a manifest file.

In parallel steps 200 and 201, audio and video data are acquired. Then, the audio data is compressed, step 202. For example, the MP3 standard can be used for this step. In parallel the video data is compressed, step 203. Video compression algorithms like MPEG4, AVC, HEVC or SVC can be used. Once the compression stage is conducted, audio and video elementary streams 204, 205 are available.

The elementary streams 204, 205 are encapsulated as a global media presentation, step 206.

A global media presentation 207 results from the encapsulation. For example, the ISO BMFF standard (or the extension of this ISO BMFF standard to AVC, SVC, HEVC...) can be used for describing as a global media presentation the content of the encoded audio and video elementary streams.

5 The encapsulated media presentation 207 is used for generating, step 208, an XML manifest file 209.

Figure 3 illustrates an example of the hierarchical content of a DASH manifest file. It describes the content of the media presentation available at the server and the association between each media component, also called media data, and the HTTP addresses.

For example, the media presentation may be temporally split into coarse-grained periods called *Period* (splicing of arbitrary content).

15 A “*Period*” at MPD level describes all media components that are available for a period of time (could be the complete duration of the media presentation if there is only one *Period*). Within this period, a media content component can be composed of several data segments corresponding to small period of time previously mentioned, to allow easy streaming/random accessing/switching.

20 The XML MPD will contain all the data related to each period. By receiving this information, the client will be aware of the content of each period of time. For example, a Media Presentation 300 is divided into several elements, each one corresponding to a *Period*. For example the second *Period* is comprised into 100s and 294s.

25 Each Media Presentation’s *Period* contains data that describes the available media content component for the corresponding period of time. One of the Media Presentation’s *Period* 301 is illustrated more in detail.

30 In addition several “adaptation set” elements are incorporated: one for video description and one for audio description. Each adaptation set is associated to a given track. In this example, the first group adaptation set is associated to the video track, and the second adaptation set is associated to the audio track corresponding to said video track for the considered time period.

35 An adaptation set structure 302 contains information about the different possible representations of the encoded video available at the server. In this example, the first representation is an encoded video of spatial resolution 640x480 encoded at the bit rate of 500 kbit/s. The second representation is the same video but encoded at

250 kbit/s. Each of this video can be downloaded by HTTP requests if the client knows the HTTP addresses related to the video. The association between content of each representation and HTTP addresses is done by using an additional temporal sub-layer.

As illustrated by the reference 303, the video representation 302 is split into
5 temporal segments (of 10 seconds in this example).

The first representation 302 gets a bandwidth of 500 kbits/s, a width of 640 pixels and a height of 480 pixels. More parameters are given by the field "Segment Info" 303.

The second representation gets a bandwidth of 250 kbits/s, a width of 640
10 pixels and a height of 480 pixels. This second representation may represent a decrease in quality compared to the first representation for instance. The client will be able to switch between those representations depending on the available bandwidth on the network.

Each temporal segment 303 is a content stored at the server that is
15 accessible through an HTTP address. In addition, an initialization segment is available. This initialization segment contains MP4 initialization information (if the video has been encapsulated by using the ISO BMFF or extensions) describing the MP4 content of the encapsulated video. For example, it helps the client to instantiate the decoding algorithms related to the video. The HTTP addresses of the initialization segment and
20 the media segments are given in the MPD (or description) file, which is illustrated more in detail below.

Figure 4 gives an example of known manifest file for a given media presentation. This manifest is a DASH manifest (also called MPD). For more clarity
25 only the main characteristics of the MPD are described here.

In this MPD, two media are described. The first one is an English audio stream and the second one is a video stream. The English audio stream is introduced through the 'adaptation set' banner. Two representations are related to this audio stream:

30 • The first one (with an id equal to "1") is an MP4 encapsulated elementary stream with a bit-rate of 64000 bit/s. The codec for handle this elementary stream (once disencapsulated) is defined in the standard by the attribute 'mp4a.0x40'. It is accessible by a request at the relative address: *7657412348.mp4*.

35 • The second one (with an id equal to "2") is an MP4 encapsulated elementary stream with a bit-rate of 32000 bit/s.

The adaptation set related to the video contains six representations whose Representation_ids are "6", "7", "8", "9", "A", and "B". These representations contain videos at different spatial resolutions (320x240, 640x480, 1280x720) and at different bit rates (from 256000 to 2048000 bits per second). For each of these representations, a different URL is associated. The client can therefore choose between these representations of the same video according to different criteria like estimated bandwidth or screen resolution for instance.

Now, the following figures focus more particularly on embodiments of the invention.

As previously described, the adaptation set of the manifest file carries (through the representation banner) the information for a same video encoded at different spatial resolutions and at different bit-rates.

The invention allows representations to describe sub-parts of the video. Indeed, in the DASH standard known in the prior art, no attribute for describing sub-parts of the same video is defined. In other words, by using the DASH standard, it is not possible to send directly the absolute or relative localization information for different sub-parts of a video.

In this embodiment (through the following figures), it is shown how this possibility can be added.

Figure 5 describes the notion of video tiling and how this notion is applied to a video. A video 500 is symbolized through three frames. Each frame 501 is divided into eight rectangles called T_n (with n varying from 1 to 8). Of course, the number and the shape of the tiles can be different. For example, the tiles of the video can have different dimensions.

However, in this example we consider that the tiling will be the same whatever the index of the video frame 501. We also consider that the tiles have the same horizontal and vertical size.

The result 502 of this tiling is given at the bottom of the figure 5. Eight independent video sub-tracks are obtained. These video sub-tracks are partitions of the whole global video. According to a preferred embodiment, these video sub-tracks are considered as independent video and are compressed independently.

It is noticed that the invention could easily apply to a scalable video with one base layer and at least one enhancement layer. In a first embodiment, only the

enhancement layer(s) is (are) divided into tiles. Consequently, when tiles are requested, the corresponding base layer is also requested by the client and consequently sent by the server to the client.

5 In another embodiment, the base layer and the enhancement layers are both divided into tiles. In this case, the URLs of corresponding tiles in each layer can be sent to the server, and in response the server sends to the client device the corresponding tiles in each layer.

Figure 6 shows the encapsulation stage. Before being streamed, the data
10 corresponding to each tile must be processed for being encapsulated in a standard format.

Data corresponding to the eight tiles are acquired, step 600 for being the input of the encoding step 601. The data corresponding to each tile is independently compressed and encoded, step 601. Any video compression algorithm can be used.
15 For example, H264, HEVC, MPEG-2 can be used. Once the data corresponding to the tiles is encoded, step 601, the resulting elementary streams have to be encapsulated in a file format. The ISO BMFF (or the extension of this media file) can be used (as proposed in the standard DASH).

In following those eight video tracks containing the eight sub-part of the
20 video will be referred as “video sub-tracks”. As data corresponding to eight video sub-tracks have been encoded, eight video sub-tracks will be defined in the ISO BMFF file. The whole eight video sub-tracks can be viewed as different tracks of a same media presentation. Of course, additional tracks like audio or text tracks could be used. However, for more clarity, we will not describe the insertion of other kind of media in
25 this figure.

First, during an encapsulation process 602, a media presentation 602a is generated. A piece of location information is set in an initialization segment 603. This initialization segment contains the initialization data associated to the corresponding video sub-tracks. Among these data, the location of each video sub-track is preferably
30 specified (as described more in detail in the next figure).

In addition to the initialization segment 603, the encapsulation process 602 generates a set of segment files 604, 605 (media segments that can could be accessed through an URL when the MPD will be generated) that correspond to small periods of time. In the example of this figure, two small periods of time are defined. It
35 means that each video sub-track is temporally split into two small periods of time. A

different set of segment files is attributed to each video sub-track for a given period of time. By using such a process, the client could request any of the proposed video sub-tracks for any proposed period of time.

5 The first set of media segments 604 correspond to the different tracks (sub-video) for a first period of time. The second set of media segments 605 are related to the second and following period of time for the same video tracks. Of course, the invention is not limited to two periods of time. The number of periods of time is not limited. It is noticed that the box 604 and 605 are represented with dotted lines, given that they are not existing containers.

10 An URL is associated to each segment file so that a client can request the tiles covered by a selected ROI as described below.

It is noticed that in the figure 3, two temporal decompositions are described:

- In the block 300, the splicing of arbitrary content, and
- 15 • In the blocks 302/303, the generation of small periods of time.

In the figure 6, we have considered that the splicing of arbitrary content generates only one global period and data corresponding to each video sub-track is encapsulated into two media segments corresponding to two small periods of time.

20 **Figure 7** shows how the initialization segment referenced 603 in the figure 6 has to be constructed for carrying the location of each video sub-track. It is recalled that the video sub-tracks are video tracks in the syntax of the file format. The initialization segment is an ISO file 700.

25 As defined in the ISO BMFF standard, this file contains several boxes. The known boxes are not described for more clarity. As eight video sub-tracks (meaning eight video tracks) are defined in this example, a 'moov' box of the encapsulated media presentation shall contain eight "trak" boxes 701.

30 An example of this "trak" box is referenced 702. It is associated with the first video sub-track. This 'trak' box also contains several boxes. A first box "tkhd" 703 is used for carrying the location of the video sub-track. This box contains several attributes. An attribute used in particular in this invention is a matrix 704. This matrix contains the width and height of the video sub-track and a deformation matrix that enables to display the corresponding track at the right position.

35 The parameters of this matrix given in the figure 7 are just example. These parameters must be tuned according to the shape of the different video sub-tracks: this

matrix is fulfilled so that the simultaneous display of the video sub-tracks covers the area of the initial video referenced 500 in the figure 5.

Figure 8 illustrates a description file (or MPD in the DASH standard). In the DASH standard, the syntax of the manifest (the MPD syntax) does not allow to take into account the notion of tiles.

The figure 8 shows the elements that may be included in the manifest/description file (the DASH MPD) for notifying the client about the presence and the locations of the different video sub-tracks. A partial view of a MPD is given in the figure 8.

This partial view 801 describes an adaptation set that contains information about a video sub-track. Only data related to one video sub-track is displayed in this figure for more clarity. So, the other sub-videos are not described. However, the description of the other sub-videos is similar (it used the same syntax but with other URLs).

The adaptation set ("*AdaptationSet*") 801 is used to describe one video sub-track which is a tile of the whole initial video. This adaptation set contains one representation of one video sub-track, this representation being defined by criteria like resolution but also frame rate or bandwidth for instance. Those criteria allow the client device to select or not several representations of video sub-tracks together or successively. Indeed, in an embodiment, a video sub-track with a first value of resolution or frame rate cannot be selected with another sub-track having a second value of resolution or frame rate.

In the adaptation set 801, an additional element (compared to the prior art) is proposed for signaling that this adaptation set represents a video sub-track in the media presentation. This additional element is a new scheme 802 that signals both the presence and the location of the tile corresponding to a video sub-track.

In particular, according to the invention, a new scheme for the 'Role' descriptor of the DASH standard is proposed. This new scheme of the "Role" descriptor is defined through the "schemeldUri" attribute. A new type called "tiling" is defined for the "schemeldUri" attribute. In addition, the new type of the schemeldUri is completed by additional attributes, which are used to indicate which tile amongst the existing tiles is represented.

In other words, if N tiles are available, the role scheme attribute "schemeldUri" of the role descriptor is equal to "urn:mpeg:dash:tiling:2012". It signals

the tiles that can be put together and the location of each of these tiles. A preferred syntax of this new scheme in the role descriptor is the following one:

<Role schemeIdUri="urn:mpeg:DASH:tiling:2012" Id='T' value ="x:y"/>.

5 The attribute "Id" is by an identifier attribute indicating the possible or forbidden associations.

The value 'T' identifies a set of tiles that can be merged together. A same 'Id=T' value means that the tiles are issued from the same initial video, meaning with the same resolution. As a consequence, they can be streamed together for being assembled by the client. The value 'Id=T' is optional. By default, if not present, all
10 defined tiles can be composed together (they are issued of the same initial video). 'T' is an integer value.

The integer values 'x' and 'y' signal the horizontal and vertical location of the current tile among the set of tiles from left to right and up to bottom. The values 'x' and 'y' are strictly positive. For example, if the initial video has been split into two
15 horizontal lines of tiles and if each horizontal line is split into four columns of tiles (eight tiles are generated), a value= "3:2" means that the tile is on the third column and on the second line. If the 'x' and 'y' values are set to "0", it means that the video associated to the scheme is a non-tiled version of the initial video. By default if the tiling role is not present, a video is a non-tiled video. It may be useful when there is a risk of confusion
20 in MPD interpretation.

Optionally, the proposed scheme can also be used for media components (or media data) that are not video (but for instance audio or text) when it is necessary to clarify the grouping of non-video media components with tiled video components. In such a case, only the Id value has to be used. A same Id for different media
25 components enables to make the association between them (the different media components can be played simultaneously).

In this preferred embodiment, the "value" attribute is composed of two integer values. However, other variants could exist. For example, the syntax of the value attribute could be:

30 • value="x:X:y:Y"

with the following signification:

- 'x' signals the horizontal location of the tile (index of the tile) amongst the whole set of columns;
- 'X' signals the number of columns;

- 'y' signals the vertical location of the tile (index of the tile) amongst the whole set of lines; and

- 'Y' signals the number of lines.

For example, in reference to the figure 5, the signaling of the tile T6 will be:

5 • `<Role schemeldUri="urn:mpeg:DASH:tiling:2012" Id='1' value
 ="2:4:2:2"/>`.

In the example, the initial video is split into tiles of same size. However, this is not restrictive. Tiles could have different sizes. For example, tiles could be generated from a quadtree partition. In such a case, the syntax of the @schemeldURI equal to
10 "urn:mpeg:dash:tiling:2012" should take into account the nature of the tile partition. The new syntax could be:

`<Role schemeldUri="urn:mpeg:DASH:tiling:2012" Id='T' value
 ="coordinates" coordinate_system="C"/>`.

The "coordinates" would be a value (or a set of values) that could be
15 identified from the identifier of the coordinate system ('the value "C" in this example). An example of coordinate system could be to define absolute location of the tile in pixels. Coordinates would be the location (x, y) in pixels of the top-left corner of the tile. Size of the tile would be defined by the standard attributes width and height of the representation.

20

Figure 9 is a complete example that illustrates the usage of the new scheme defined in the invention. This example takes the DASH standard (MPD) as reference. In this figure, a media presentation (video and audio media) is described. Two subsets are described:

- 25 • the first one contains the adaptation sets with Id: '0', '1', '2' and '3', and
 • the second one contains the adaptation sets tag Id: '4', '5' and '6'.

As mentioned above, the usage of subsets enables to specify that some adaptation sets cannot be streamed together. Adaptation sets of the second subset cannot be streamed with the adaptation sets of the first subset. In the first subset,
30 audio and video representations (with and without the new scheme) are available. Such representations give to the client the possibility of streaming media data even if the scheme 'tiling' is not supported (the MPD syntax without the scheme is always understood).

In the first subset, the adaptation set that contains the first video
35 representation is described by using a line 900:

- *<Role schemeldUri="urn:mpeg:DASH:tiling:2012" Id="1" value="0:0"/>*.

This line indicates that the representations associated to this adaptation set are non-tiled versions of the video (value="0:0").

5 A line with the scheme proposed in this invention is associated to the adaptation set that contains the audio media, 910:

- *<Role schemeldUri="urn:mpeg:DASH:tiling:2012" Id="1"/>*.

This line indicates that the audio media included in this adaptation set is related to the non-tiled version of the video. The optional field 'value="0:0"' could be also added but it is useless in this example.

10 In the second subset (adaptation set with Id= "4", "5" and "6"), two video sub-tracks are described through the new scheme. The representation element related to the first tile is contained in the adaptation set with 'Id' equal to '4'. A line 920 that specifies the first video sub-track is:

- *<Role schemeldUri="urn:mpeg:DASH:tiling:2012" Id="1" value="1:1"/>*.

15 A line 930 that specifies the second video sub-track is:

- *<Role schemeldUri="urn:mpeg:DASH:tiling:2012" Id="1" value="1:2"/>*.

This line specifies that the representations that are included in the adaptation set contain the URL related to the first tile of the second line of tile.

20 A line 940 with the scheme proposed in the invention is associated to the adaptation set (of the second subset) that contains the audio media:

- *<Role schemeldUri="urn:mpeg:DASH:tiling:2012" Id="1"/>*.

This line indicates that the audio media included in this adaptation set is related to one of the tiled version of the video sub-tracks.

25 **Figure 10** is a schematic block diagram of a computing device 1000 for implementation of one or more embodiments of the invention. The computing device 1000 may be a device such as a micro-computer, a workstation or a light portable device. The computing device 1000 comprises a communication bus connected to:

- a central processing unit 1001, such as a microprocessor, denoted CPU;
- 30 -a random access memory 1002, denoted RAM, for storing the executable code of the method of embodiments of the invention as well as the registers adapted to record variables and parameters necessary for implementing the method for reading and writing the manifests and/or for encoding the video and/or for reading or generating the Data under a given file format, the memory capacity thereof can be expanded by an
- 35 optional RAM connected to an expansion port for example;

-a read only memory 1003, denoted ROM, for storing computer programs for implementing embodiments of the invention;

-a network interface 1004 is typically connected to a communication network over which digital data to be processed are transmitted or received. The network interface 1004 can be a single network interface, or composed of a set of different network interfaces (for instance wired and wireless interfaces, or different kinds of wired or wireless interfaces). Data are written to the network interface for transmission or are read from the network interface for reception under the control of the software application running in the CPU 1001;

- a user interface 1005 for receiving inputs from a user or to display information to a user;

- a hard disk 1006 denoted HD;

- an I/O module 1007 for receiving/sending data from/to external devices such as a video source or display.

The executable code may be stored either in read only memory 1003, on the hard disk 1006 or on a removable digital medium such as for example a disk. According to a variant, the executable code of the programs can be received by means of a communication network, via the network interface 1004, in order to be stored in one of the storage means of the communication device 1000, such as the hard disk 1006, before being executed.

The central processing unit 1001 is adapted to control and direct the execution of the instructions or portions of software code of the program or programs according to embodiments of the invention, which instructions are stored in one of the aforementioned storage means. After powering on, the CPU 1001 is capable of executing instructions from main RAM memory 1002 relating to a software application after those instructions have been loaded from the program ROM 1003 or the hard-disc (HD) 1006 for example. Such a software application, when executed by the CPU 1001, causes the steps of the flowcharts shown in the previous figures to be performed.

In this embodiment, the apparatus is a programmable apparatus which uses software to implement the invention. However, alternatively, the present invention may be implemented in hardware (for example, in the form of an Application Specific Integrated Circuit or ASIC).

Although the present invention has been described hereinabove with reference to specific embodiments, the present invention is not limited to the specific embodiments, and modifications will be apparent to a person skilled in the art which lie within the scope of the present invention.

5

Many further modifications and variations will suggest themselves to those versed in the art upon making reference to the foregoing illustrative embodiments, which are given by way of example only and which are not intended to limit the scope of the invention, that scope being determined solely by the appended claims. In particular the different features from different embodiments may be interchanged, where appropriate.

10

CLAIMS

1. A method for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, the method comprising:

 - transmitting, by a server, a description file to a client device, said description file including data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating each video sub-track,
 - selecting by the client device one or more URLs according to one Region Of Interest chosen by the client device,
 - receiving from the client device, by the server, one or more request messages for requesting the video sub-tracks, each request message comprising one of the URLs selected by the client device, and
 - transmitting to the client device, by the server, video data corresponding to the requested video sub-tracks, in response to the request messages.
2. A method according to claim 1, wherein the description file further comprises a URL designating a track corresponding to the full given video, and if the client device does not select any URL according to one Region Of Interest, the server receives from the client device a request message comprising the URL of the full video track and transmits, to the client device, video data corresponding to the full video track in response to the request message.
3. A method according to claim 1 or 2, wherein the given video is a scalable video comprising a base layer and at least one enhancement layer, said description file further comprising the URL of the base layer track, and if the client device selects at least one URL according to one Region Of Interest, it also selects the URL of the base layer, and the server further receives from the client device one request message for requesting the base layer track, said request message including the URL of the base layer track, and the server further transmits, to the client device, video data corresponding to the requested base layer track, in response to the request message.
4. A method according to any preceding claim, wherein each URL designates a segment of tracks for a pre-defined period of time.

5. A method according to any one of claims 1 to 4, wherein each spatial tile is a rectangular region.
- 5 6. A method according to claim 5, wherein each spatial tile comprises p lines and q rows, p and q being integers.
7. A method according to any one of claims 5 or 6, wherein each spatial tile is referenced by an index value.
- 10 8. A method according to any one of claims 5 or 6, wherein each spatial tile is referenced by using Cartesian coordinates.
9. A method according to any one of claims 1 to 8, wherein the video data corresponds to m videos representing the same content, m being an integer, each of the m videos having a different resolution, and each frame of each video being divided into n spatial tiles, in order to create m*n independent video sub-tracks.
- 15 10. A method according to any one of claims 1 to 9, wherein the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.
- 20 11. A method according to claim 2, or any one of claims 3 to 10 when claims 3 to 10 depend upon claim 2, wherein the parameters further include data about:
- a. the type of the track: video track or video sub-track, and/or
 - b. the spatial position of each video sub-track relative to the other video sub-tracks, said parameters being described by a Role element if the data are streamed according to the DASH standard.
- 25 30 12. A method according to any one of claims 4 to 11, wherein the method further comprises:
- acquiring the data corresponding to the given video,
 - 35 - compressing the acquired data,

- encapsulating the compressed data, said encapsulating comprising:

- generating a given number of video segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
 - generating an initialization segment associated to the media files segments,
- 5 which comprises initialization data about the video track and the video sub-tracks, and
- generating the description file from the encapsulated data.

13. A method according to claim 12, wherein the description file further comprises a URL associated to the initialization segment.

10

14. A method according to claim 8 or any one of claims 9 to 13 when claims 9 to 13 depend upon claim 8, wherein the initialization data comprises values indicating the width and the height of each video sub-track.

15 15. A method according to claim 14, wherein the initialization data further comprises a transformation matrix which enables the display of each video sub-track at the right position.

16. A method according to any one of claims 1 to 15, wherein the data are streamed
20 according to the DASH standard, said description file being a Media Presentation Description file.

17. A method for providing data by a server device to a client device, said data corresponding to a given video, each frame of the video being divided into n spatial
25 tiles, n being an integer, in order to create n independent video sub-tracks, the method comprising:

- generating a description file, said description file including data about the spatial organization of the n video sub-tracks, and at least n URLs respectively designating each video sub-track,
- 30 • transmitting said description file to the client device, and
- transmitting video data corresponding to the video sub-tracks based on one or more client device requests, each request comprising one of the URLs.

18. A method according to claim 17, wherein the description file further comprises a
35 URL designating a track corresponding to the full given video, and the server transmits,

to the client device, video data corresponding to the full video track based on a client device requests comprising the URL of the full video track.

5 19. A method according to claim 17 or 18, wherein the given video is a scalable video comprising a base layer and at least one enhancement layer, said description file further comprising the URL of the base layer track, and the server further transmits, to the client device, video data corresponding to the base layer track based on a client device requests comprising the URL of the base layer track.

10 20. A method according to any one of claims 17 to 19, wherein each URL designates a segment of tracks for a pre-defined period of time.

21. A method according to any one of claims 17 to 20, further comprising preliminarily to the step of generating a description file:

- 15 - acquiring data corresponding to the given video,
 - compressing the acquired data,
 - encapsulating the compressed data, said encapsulating comprising:
- generating a given number of media segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
 - 20 • generating an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks.

22. A method according to any one of claims 17 to 21, wherein each spatial tile is a rectangular region.

25

23. A method according to claim 22, wherein each spatial tile comprises p lines and q rows, p and q being integers.

24. A method according to any one of claims 22 to 23, wherein each spatial tile is
 30 referenced by an index value.

25. A method according to any one of claims 22 to 23, wherein each spatial tile is referenced by using Cartesian coordinates.

26. A method according to any one of claims 17 to 23, wherein the video data includes m video tracks representing the same content, m being an integer, each of the m video tracks having a given resolution, and each frame of each video track being divided into n spatial tiles, in order to create m*n independent video sub-tracks.

5

27. A method according to any one of claims 17 to 26, wherein the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

10

28. A method according to claim 18, or any one of claims 19 to 27 when claims 19 to 27 depend upon claim 18, wherein the parameters further include data about:

15

- a. the type of the track: video track or video sub-track, and/or
 - b. and the spatial position of each video sub-track relative to the other video sub-tracks,
- said parameters being described by a Role element if the data are streamed according to the DASH standard.

20

29. A method for obtaining data corresponding to a given video by a client device, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, the method comprising:

25

- receiving a description file including data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating each video sub-track,
 - selecting at least one Region Of Interest in the video,
 - obtaining one or more URLs according to the chosen Region Of Interest, based on the description file, and
- 30 - sending one or more request messages for requesting the video sub-tracks, each request message comprising one of the URLs selected by the client device,
- receiving video data corresponding to the requested video sub-tracks, in response to the request messages.

30. A method according to claim 29, wherein the description file further comprises a URL designating a track corresponding to the full given video, and if the client device does not select any Region Of Interest, the method further comprises sending a request message for requesting the full video track and receiving video data
5 corresponding to the requested full video track, in response to the request message.

31. A method according to claim 29 or 30, wherein the given video is a scalable video comprising a base layer and at least one enhancement layer, said description file further comprising the URL of the base layer track, and if the client device chooses one
10 Region Of Interest, and the method further comprises:

- obtaining by the client device the URL of the base layer,
- sending request message which includes the URL of the base layer track, and
- receiving video data corresponding to the requested base layer track, in response to the request message.

15

32. A method according to any one of claims 29 to 31, wherein each URL designates a segment of tracks for a pre-defined period of time.

33. A method according to any one of claims 29 to 32, wherein each spatial tile is a
20 rectangular region.

34. A method according to any of claims 29 to 33, wherein each spatial tile comprises p lines and q rows, p and q being integers.

25 35. A method according to any one of claims 33 to 34, wherein each spatial tile is referenced by an index value.

36. A method according to any one of claims 33 to 34, wherein each spatial tile is referenced by using Cartesian coordinates.

30

37. A method according to any one of claims 29 to 36, wherein the video data corresponds to m videos representing the same content, m being an integer, each of the m videos having a different resolution, and each frame of each video being divided into n spatial tiles, in order to create m*n independent video sub-tracks.

35

38. A method according to any one of claims 29 to 37, wherein the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed
 5 according to the DASH standard.

39. A method according to claim 30 or any one of claims 31 to 38 when claims 31 to 38 depend upon claim 30, wherein the parameters further include at least data about:
 10 a. the type of the track: video track or video sub-track, and/or
 b. the spatial position of each video sub-track relative to the other video sub-tracks,
 said parameters being described by a Role element if the data are streamed according to the DASH standard.

15

40. A method according to any one of claims 32 to 39, wherein the received video data comprises:
 - a given number of video segment files, each one comprising the data
 20 associated to the video and the n video sub-tracks for a given period of time, and
 - an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks.

41. A method according to claim 40, wherein the description file further comprises a
 25 URL associated to the initialization segment.

42. A method according to claim 36, or any one of claims 37 to 41, when claims 37 to 39 depends upon claim 36, wherein the initialization data comprises values indicating the width and the height of each video sub-track.

30

43. A method according to claim 42, wherein the initialization data further comprises a transformation matrix which enables the display of each video sub-track at the right position.

44. A computer program product for a programmable apparatus, the computer program product comprising a sequence of instructions for implementing a method according to any one of claims 1 to 43 when loaded into and executed by the programmable apparatus.

5

45. A computer-readable storage medium storing instructions of a computer program for implementing a method according to any one of claims 1 to 43.

46. A device for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said device having means for implementing a method according to any one of claims 1 to 16.

47. A server device for providing data to a client device, said data corresponding to a given video each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said server device having means for implementing a method according to any one of claim 17 to 28.

48. A client device for obtaining data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said client device having means for implementing a method according any one of claims 29 to 43.

49. A method for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, substantially as hereinbefore described with reference to, and as shown in, Figures 1b and 5 to 10.

ABSTRACT

METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

The present invention provides a method (and a device for performing the method) for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks. The method comprises:

- transmitting, by a server, a description file to a client device, said description file including data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating each video sub-tracks,
- selecting by the client device one or more URLs according to one Region Of Interest chosen by the client device,
- receiving from the client device, by the server, one or more request messages for requesting the video sub-tracks, each request message comprising one of the URLs selected by the client device, and
- transmitting to the client device, by the server, video data corresponding to the requested video sub-tracks, in response to the request messages.

(Figure 1b)

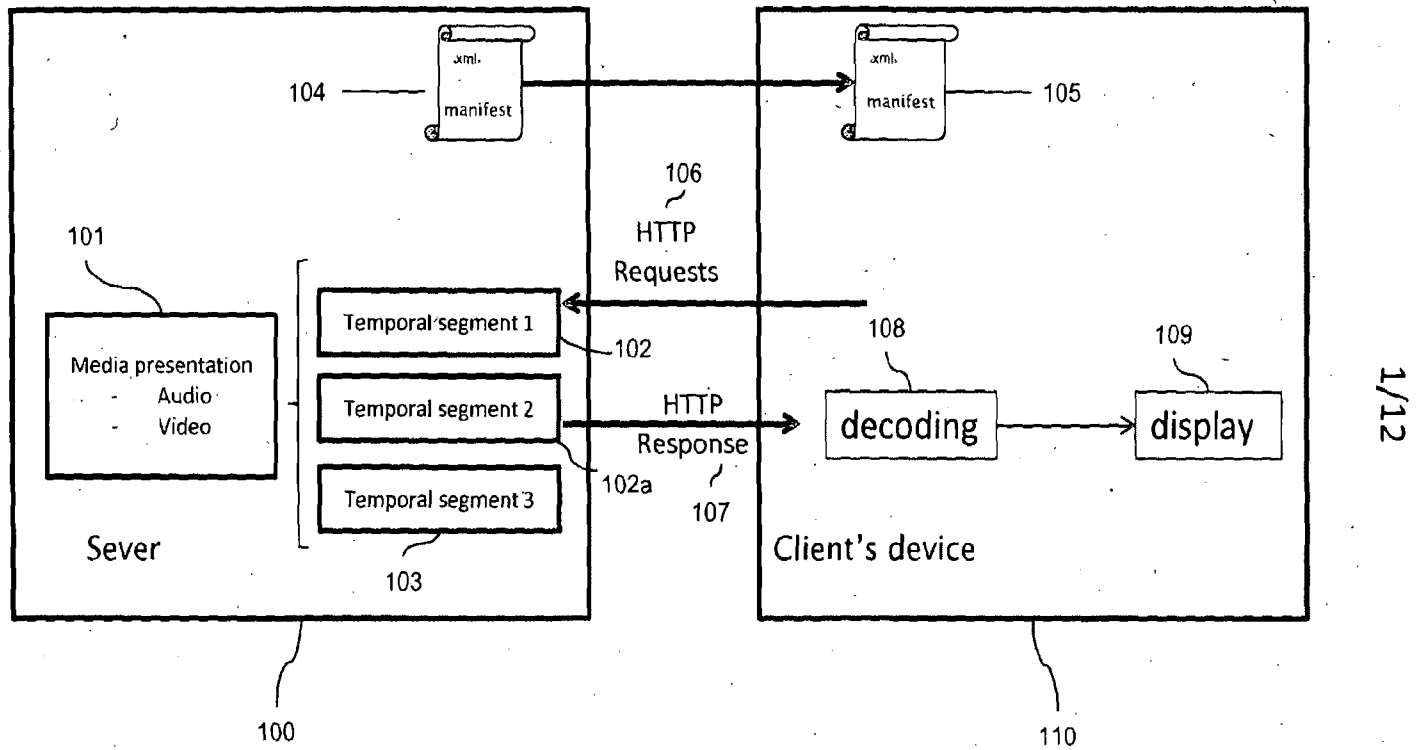
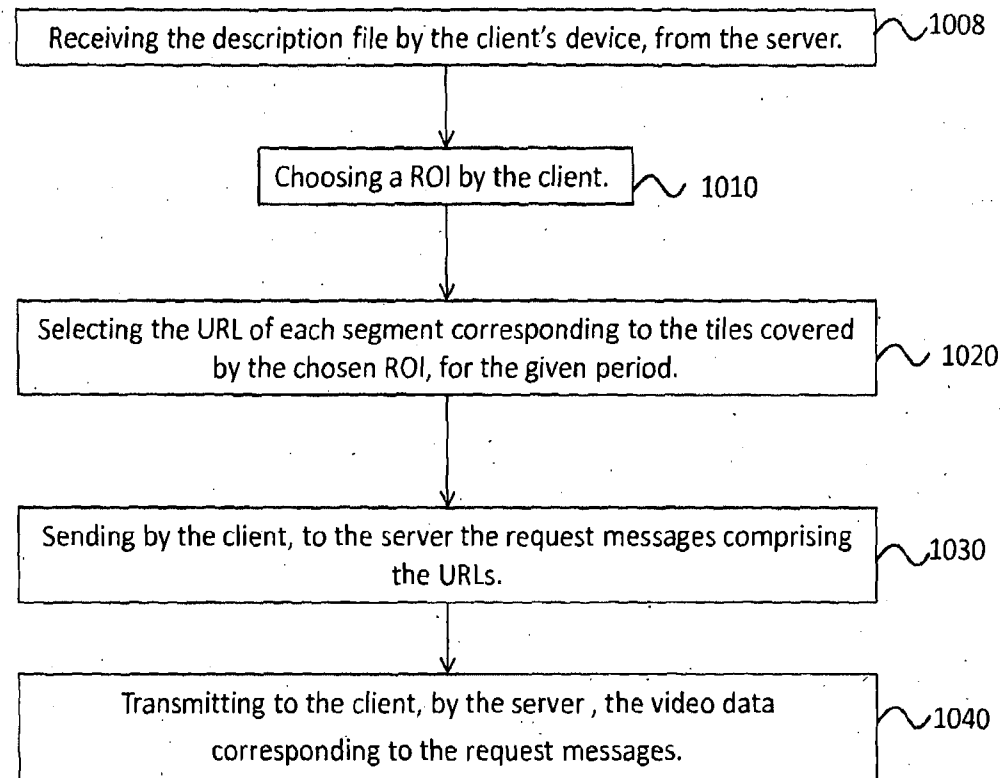
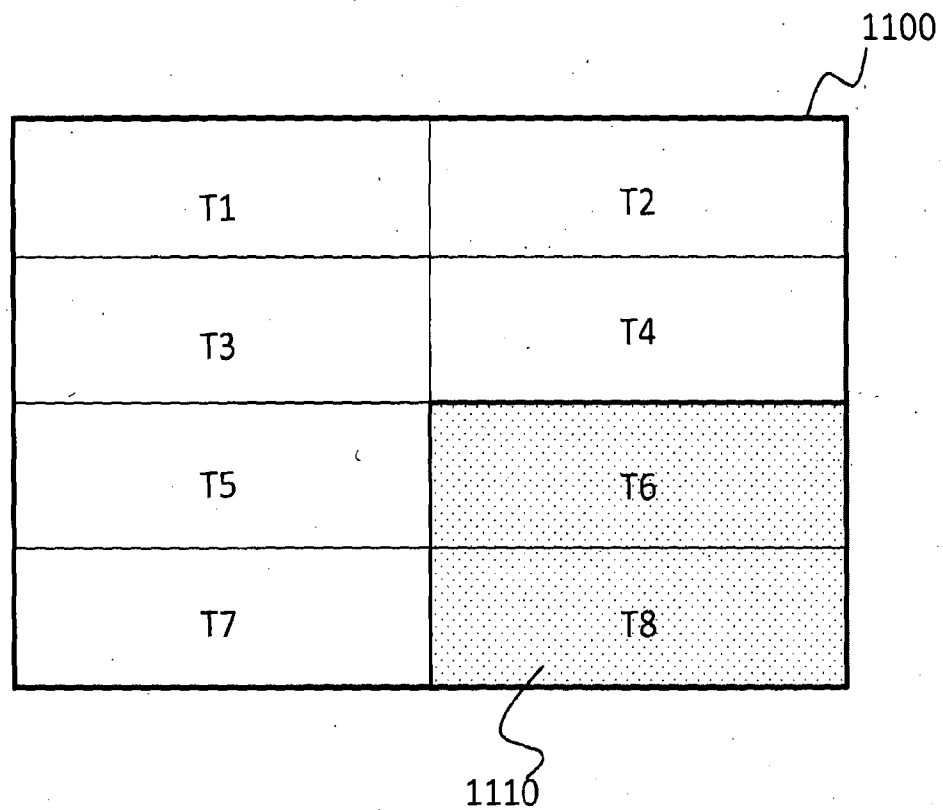


Figure 1a



2/12

Figure 1b



3/12

Figure 1c

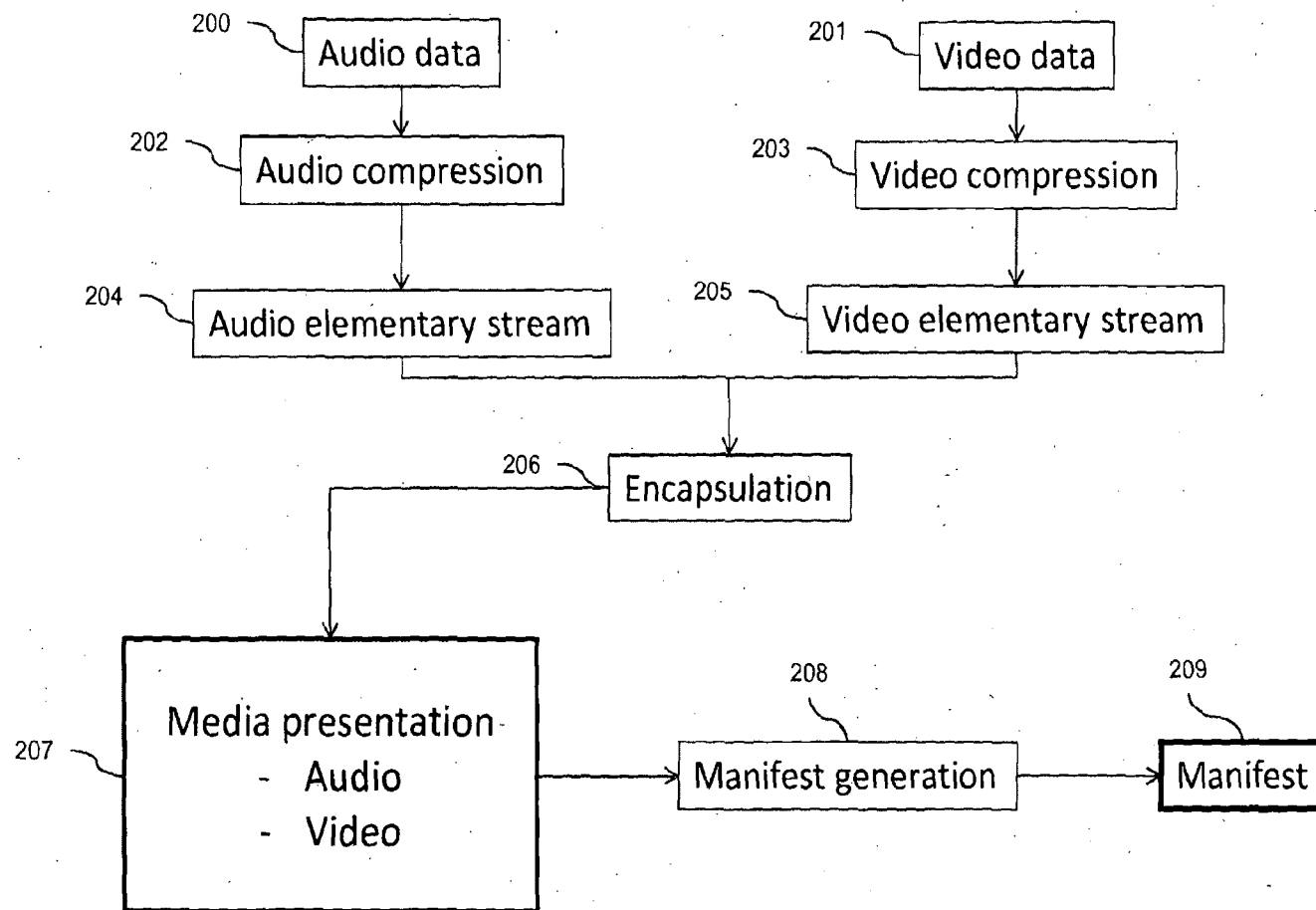


Figure 2

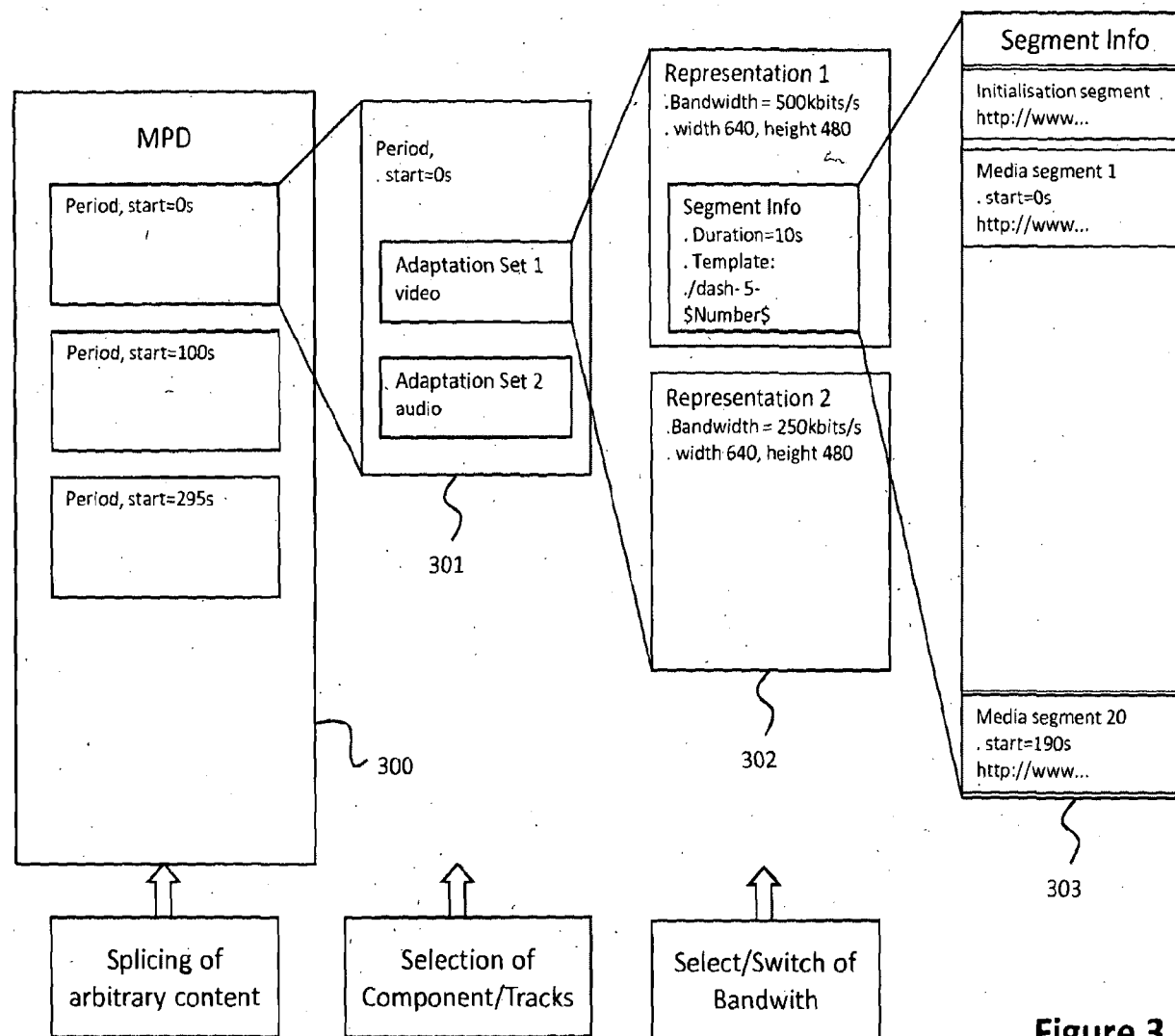


Figure 3

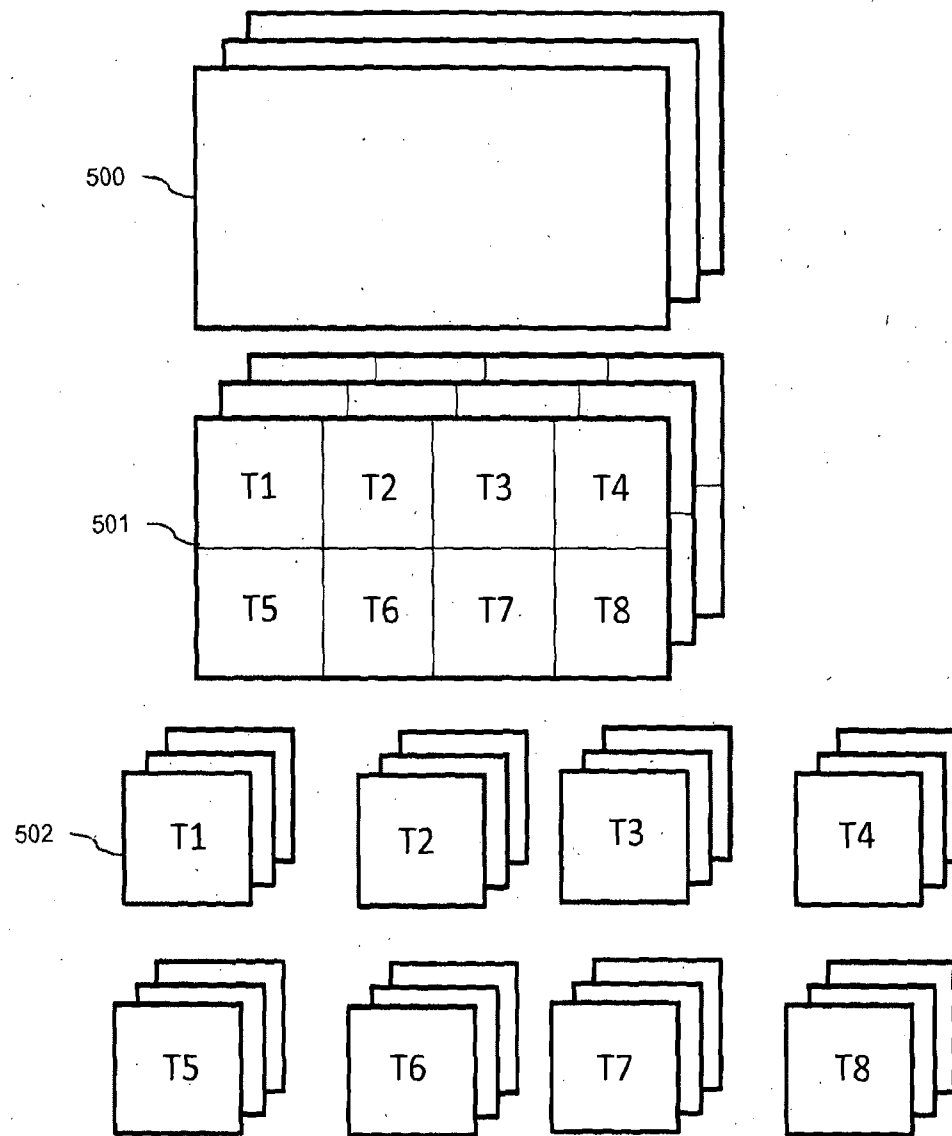
5/12

```

<?xml version="1.0"?>
  <MPD xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns="urn:mpeg-DASH:schema:MPD:2011"
    xsi:schemaLocation="urn:mpeg-DASH:schema:MPD:2011 DASH-MPD.xsd"
    type="static"
    mediaPresentationDuration="PT3.25S"
    minBufferTime="PT1.25"
    profiles="urn:mpeg-dash:profile:isoff-on-demand:2011">
    <BaseURL>http://cdn1.example.com/</BaseURL>
    <BaseURL>http://cdn2.example.com/</BaseURL>
    <Period>
      <!-- English Audio -->
      <AdaptationSet mimeType="audio/mp4" codecs="mp4a.0x40" lang="en"
        subsegmentAlignment="true" subsegmentStartsWithSAP="1">
        <ContentProtection schemeIdUri="urn:uuid:706D6953-556C-5244-4D48-
          655164657221"/>
        <Representation id="1" bandwidth="64000">
          <BaseURL>7657412348.mp4</BaseURL>
        </Representation>
        <Representation id="2" bandwidth="32000">
          <BaseURL>3463645345.mp4</BaseURL>
        </Representation>
      <!-- Video -->
      <AdaptationSet mimeType="video/mp4" codecs="avc1.4d0228"
        subsegmentAlignment="true" subsegmentStartsWithSAP="2">
        <ContentProtection schemeIdUri="urn:uuid:706D6953-556C-5244-4D48-
          655164657221"/>
        <Representation id="6" bandwidth="256000" width="320" height="240">
          <BaseURL>8563456473.mp4</BaseURL>
        </Representation>
        <Representation id="7" bandwidth="512000" width="320" height="240">
          <BaseURL>56363634.mp4</BaseURL>
        </Representation>
        <Representation id="8" bandwidth="1024000" width="640" height="480">
          <BaseURL>562455736.mp4</BaseURL>
        </Representation>
        <Representation id="9" bandwidth="1384000" width="640" height="480">
          <BaseURL>41325646.mp4</BaseURL>
        </Representation>
        <Representation id="A" bandwidth="1535000" width="1280" height="720">
          <BaseURL>89045625.mp4</BaseURL>
        </Representation>
        <Representation id="B" bandwidth="2048000" width="1280" height="720">
          <BaseURL>23536745734.mp4</BaseURL>
        </Representation>
      </AdaptationSet>
    </Period>
  </MPD>

```

Figure 4



7/12

Figure 5

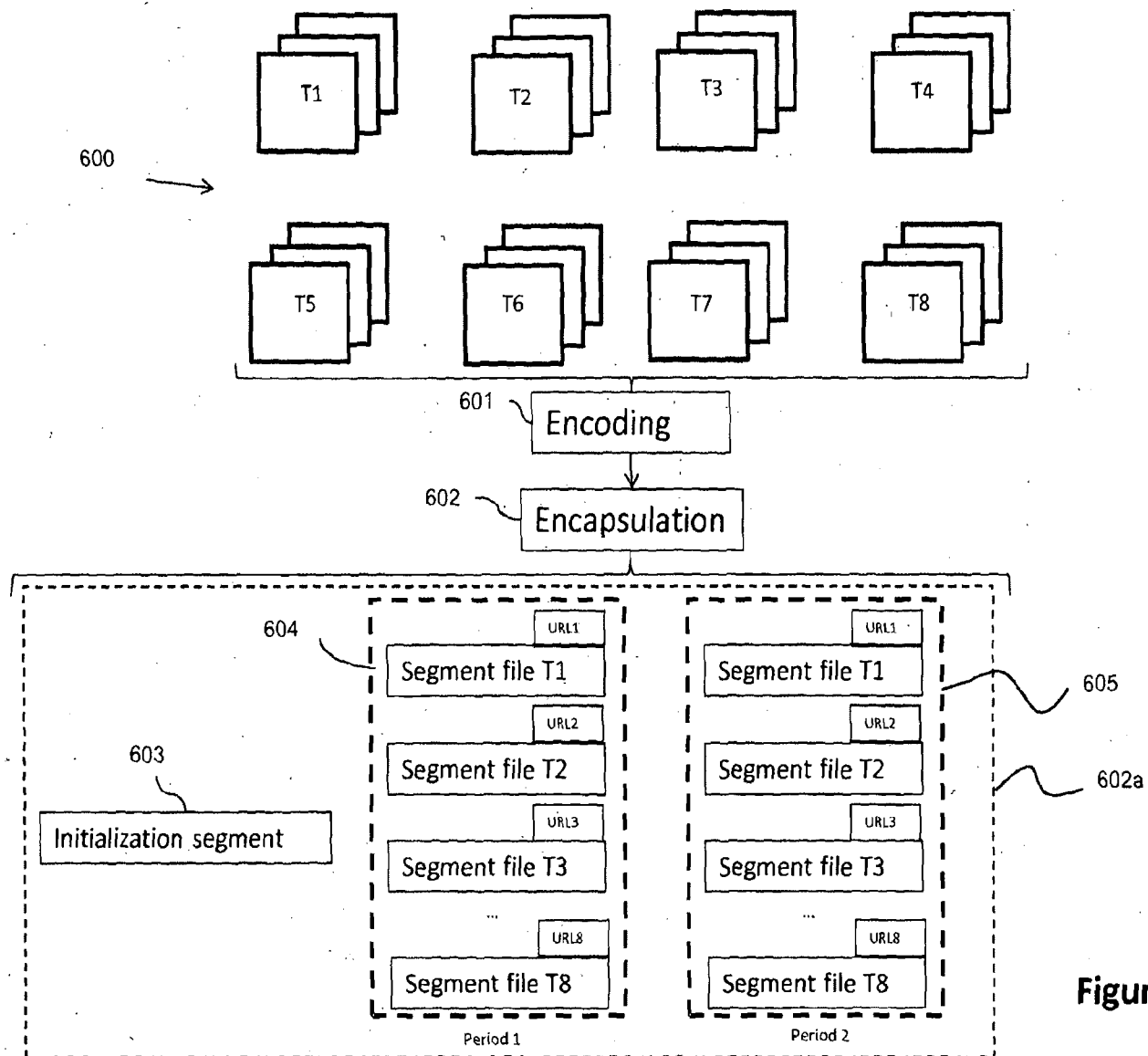
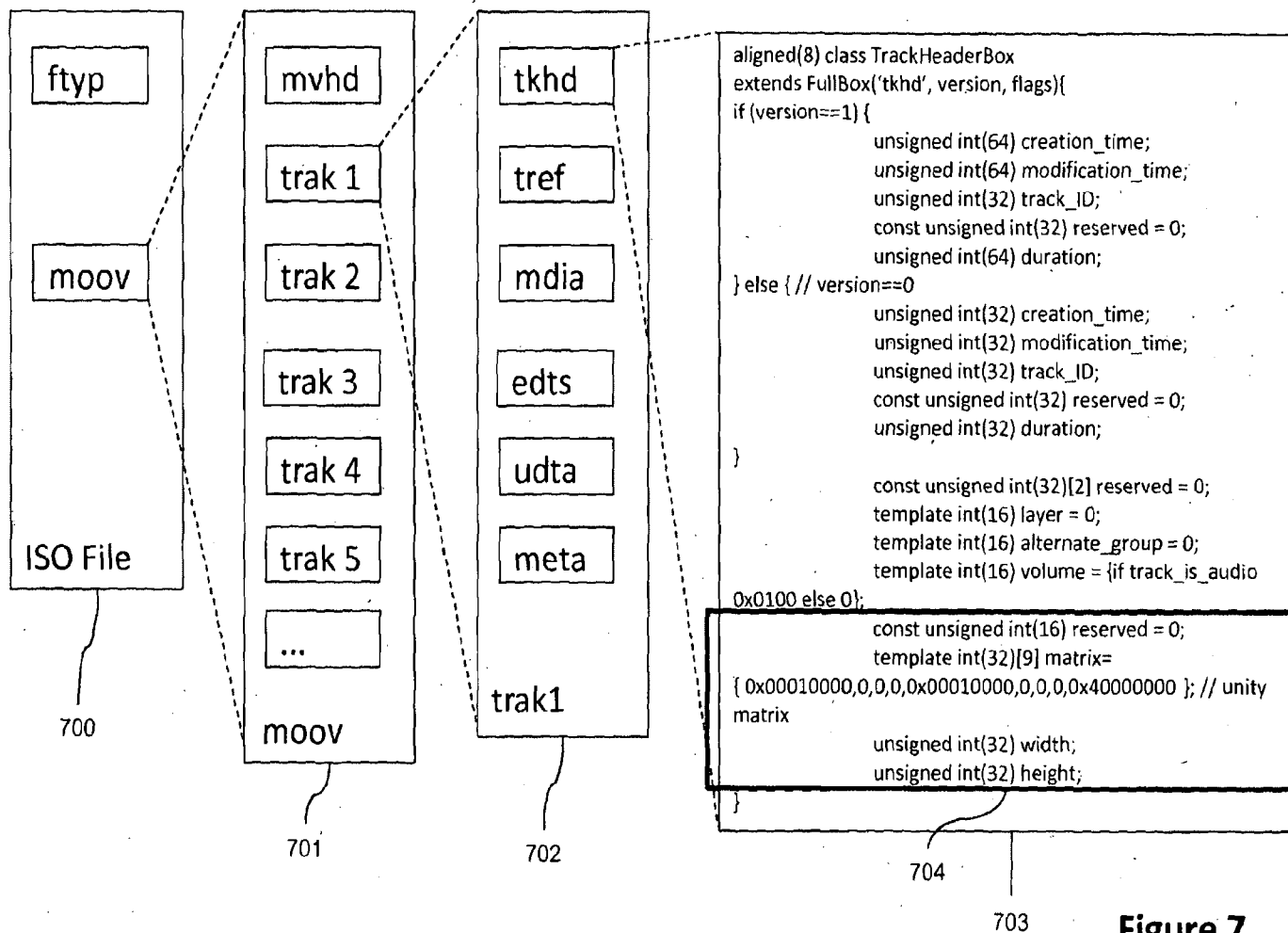


Figure 6

8/12



9/12

Figure 7

801

```

<AdaptationSet group='1' id='1'>
  <Role schemeIdUri="urn:mpeg:DASH:role:2011" value="main"/>
  <Role schemeIdUri="urn:mpeg:DASH:tiling:2012" id='T0' value="1:2"/>
  <Representation mimeType='video/mp4' codecs='avc1.644028, svc1' width='320' height='240'
    frameRate='15' id='tag1' bandwidth='128000'>
    <SegmentList duration='10'>
      <Initialization sourceURL='seg-init.mp4'/>
      <SegmentURL media='seg-128k-1.mp4'/>
    </SegmentList>
  </Representation>
</AdaptationSet>

```

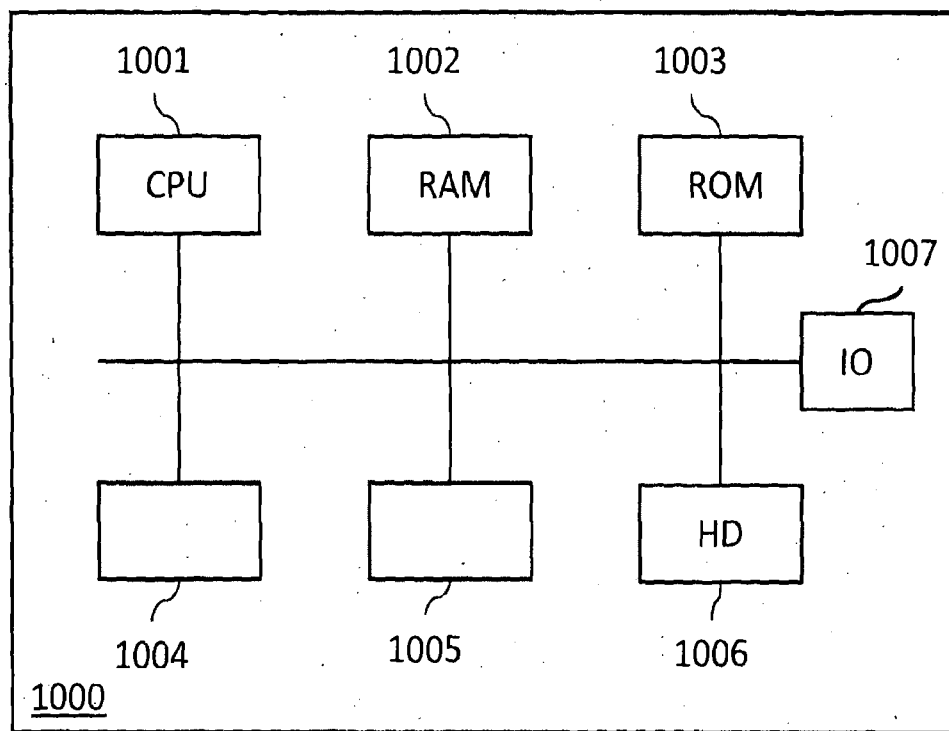
802

10/12

Figure 8

Figure 9

Figure 9



12/12

Figure 10

CERTIFICATE OF AVAILABILITY OF A CERTIFIED PATENT DOCUMENT IN A DIGITAL LIBRARY

The International Bureau certifies that a copy of the patent application indicated below has been available to the WIPO Digital Access Service since the date of availability indicated, and that the patent application has been available to the indicated Office(s) as of the date specified following the relevant Office code:

Document details: Country/Office: GB

Filing date: 16 Apr 2013 (16.04.2013)

Application number: 1306897.8

Date of availability of document: 29 May 2013 (29.05.2013)

The following Offices can retrieve this document by using the access code:

JP, US, SE, NZ, KR, EA, BR, GB, AU, ES, IB, EE, CN, MA, FI

Date of issue of this certificate: 02 Feb 2018 (02.02.2018)

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

Certified Office Copy

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with patent application GB 1306897.8 filed on 16 April 2013, and as stored electronically on the Patents Electronic Case file System.

The Patents Electronic Case-file System is compliant with British Standard BS10008 - Evidential weight and legal admissibility of information stored electronically and ISO15801 - Electronic imaging – information stored electronically, recommendations for trustworthiness and reliability.

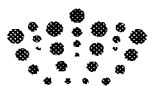
In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed A HAYES

Dated 18 April 2013



Patents Form 1

Patents Act 1977 (Rule 12)

Request for grant of a patent

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

Application number **GB 1306897.8**

1. Your reference	CRF-01437-GB		
2. Full name, address and postcode of the applicant or of each applicant	CANON KABUSHIKI KAISHA 30-2 SHIMOMARUKO 3-CHOME OHTA-KU 146-8501 Tokyo Japan		
Patents ADP number (if you know it)			
3. Title of the invention	Method and corresponding device for streaming video data		
4. Name of your agent (if you have one) "Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) (including the postcode)	Canon Europe Ltd Canon Europe Ltd 3 The Square Stockley Park Uxbridge UB11 1ET Middlesex United Kingdom		
Patents ADP number (if you know it)			
5. Priority declaration: Are you claiming priority from one or more earlier-filed patent applications? If so, please give details of the application(s)			
	Country	Application number	Date of filing
			PDAS Access Code
6. Divisionals etc: Is this application a divisional application, or being made following resolution of an entitlement dispute about an earlier application. If so, please give the application number and filing date of the earlier application		Number of earlier UK application	Date of filing (day / month / year)
7. Inventorship: (Inventors must be individuals not companies)			
Are all the applicants named above also inventors?	No		
8. Are you paying the application fee with this form?	Yes		

Patents Form 1

9. Accompanying documents: please enter the number of pages of each item accompanying this form.

Continuation sheets of this form

Description: **35**

Claim(s): **12**

Abstract: **1**

Drawing(s): **18**

If you are not filing a description, please give details of the previous application you are going to rely upon

Country	Application number	Date of filing	PDAS Access Code

10. If you are also filing any of the following, state how many against each item.

Priority documents: **0**

Statement of inventorship and right to grant of a patent
(Patents Form 7): **1**

Request for search (Patents Form 9A): **1**

Request for a substantive examination (Patents Form 10): **1**

Any other documents (please specify): **PDAS Registration Form**

11. I/We request the grant of a patent on the basis of this application.

Signature: **Subject: GB, Canon Europe Ltd, D.
Northway 27265; Issuer: European Patent
Office, European Patent Office CA**

Date: **16 Apr 2013**

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant

**NORTHWAY, Mr. Daniel Robert
Email: Daniel.Northway@canon-europe.com
Telephone: +(0)20 8588 8173
Fax: +(0)20 8588 8017**

Warning

After an application for a patent has been filed, the Comptroller will consider whether publication or communication of the invention should be prohibited or restricted under section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you are resident in the United Kingdom and your application contains information which relates to military technology, or would be prejudicial to national security or the safety of the public, section 23 of the Patents Act 1977 prohibits you from applying for a patent abroad without first getting written permission from the Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked. Until such time or until the revocation of any direction, for any such application the address for service referred to at part 4 above must be in the United Kingdom.

Although you may have an address for service in the Channel Islands, any agent instructed to act for you must reside or have a place of business in the European Economic Area or Isle of Man.

METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

FIELD OF THE INVENTION

5 The invention relates to a method and a device for transmitting media data, and more particularly Web-accessed compressed videos. Preferably, the streaming of media data is made over IP networks (like the Internet) by using the protocol HTTP.

10 **BACKGROUND OF THE INVENTION**

 A media presentation is usually composed of several media contents such as audio, video or text. They can be sent from a server to a client for being jointly played by the client device. Those media contents are downloaded by the client from a
15 server.

 In this context, a new standard called DASH (for "Dynamic Adaptive Streaming over HTTP") has recently emerged (see "ISO/IEC 23009-1, Dynamic adaptive streaming over HTTP (DASH), Part1: Media presentation description and segment formats"). This standard enables to create an association between a compact
20 description of the content(s) of a media presentation and the HTTP addresses. Usually, this association is described in a file called a manifest file or description file. In the context of DASH, this manifest file is a file also called the MPD file (for Media Presentation Description).

 When the MPD file is sent to the client device, the description of each
25 media content can be easily known by the client. By reading the manifest file, the client is aware of the kind of media contents proposed in the media presentation and is aware of the HTTP addresses for downloading the associated media contents. Therefore, it can decide which media content to download (via HTTP requests) and to play (decoding and play after reception of the media data segments).

30 In addition to this association, the DASH standard proposes to split each media content into small periods of time. The time decomposition is added in the MPD file. Thus it describes the association between HTTP addresses (or URLs) and the compact description of each media content over a small period of time.

35

The invention focuses on a video description in a manifest file (by taking the DASH MPD as reference). Even if the other elements of the media representation (e.g. audio, text,...) are not directly taken into account, they can easily be incorporated in a more global media description as will be explained below.

5

The spatial resolution of the video becomes more and more important. In this perspective, 4K2K videos begin to emerge on the market. However, mobile applications cannot display such a resolution with a high quality.

A solution proposes to split the video into tiles. If the user of a mobile application wants to display or focus on sub-parts of the video, only the tiles corresponding to the sub-part are transmitted. This process allows keeping a video portion with a good quality.

In the context of DASH, the known standard "ISO BMFF" ("Base Media File Format") is used to encapsulate media contents into media data segments in order to form the media presentation.

Classically, by using DASH, each track would be described in the manifest as independent media content, even if the track corresponds to a sub-part of the video. There is no way in the manifest to signal that each track is a sub-part of the same video. Indeed current MPD definition doesn't allow describing tiled video. In practice, the user would have to download a first initialization segment (in addition to the manifest) for knowing that each video described in the MPD is a sub-part of a tiled video. Then they would have to download, as a minimum, the beginning of each first media data segment of each video content to retrieve the association between tile locations and video content. The downloading of this initialization information conducts to delays and additional and useless HTTP requests.

In another prior art which is not compatible with the use of DASH, the article "*In packet video 2010, An Interactive Region Of Interest Video Streaming System for Online Lecture Viewing*", A. Mavlankar, P. Agrawal, D. Pang, D. Halawa, N. Cheung, B. Girod, proposes a specific manifest ("proprietary manifest") describing tiles for a scalable video. The specific manifest provides an identifier and a piece of location information for each tile. From a URL associated to a base layer, and tiles information provided by the proprietary manifest, an HTTP query is built to access a particular tile, this query being associated to a tile index. This type of HTTP query requires

processing at server-side to retrieve, from the HTTP query, the byte-range and consequently the tile to be sent to the client device to fulfill its request. This can be done only by a very specific server.

5 SUMMARY OF THE INVENTION

The present invention has been devised to address one or more of the foregoing concerns.

10 According to a first aspect of the invention, there is proposed a method for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks.

The method comprises:

- transmitting, by a server, a description file to a client device, said description file
15 including data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating each video sub-track,
- selecting by the client device one or more URLs according to one Region Of Interest chosen by the client device or a client device's user,
- receiving from the client device, by the server, one or more request messages
20 for requesting a resulting number of video sub-tracks, each request message comprising one of the URLs selected by the client device, and
- transmitting to the client device, by the server, video data corresponding to the requested video sub-tracks, in response to the request messages.

25 It is specified that spatial tiles are composed of rows and columns of pixels.

In other words, the first aspect of the invention proposes to include directly the URLs of video sub-tracks in a description file (meaning an MPD in DASH) so that the client is aware of the division of the frames into tiles and is able to directly send URL
30 request messages to the server.

The first aspect of the invention allows the limiting of the number of requests for the streaming of the data between the server and the client device. Moreover, when it receives the description file, the client is already aware of the presence and the spatial organization of the tiles, and consequently, it knows how to display the corresponding
35 video sub-tracks.

5 In an embodiment, the description file further comprises a URL designating a track corresponding to the full given video, and if the client device does not select any URL according to one Region Of Interest, the server receives from the client device a request message comprising the URL of the full video track and transmits, to the client device, video data corresponding to the full video track in response to the request message.

10 In an embodiment, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and said video further comprising a base layer video track, said description file further comprising the URL of the base layer track, and if the client device selects at least one URL according to one Region Of Interest, it also selects the
15 URL of the base layer, and the server further receives from the client device one request message for requesting the base layer track, said request message including the URL of the base layer track, and the server further transmits, to the client device, video data corresponding to the requested base layer track, in response to the request message.

20 According to a variant, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and each frame of the base layer also being divided into n spatial tiles, each tile of the base layer corresponding to a tile in the enhancement layer, in
25 order to create n independent base layer sub-tracks, and if the client device selects at least one URL according to one Region Of Interest, it also selects the URLs of the corresponding base layer sub-tracks, and the server further receives from the client device one request message for requesting the base layer sub-tracks, said request message including the URLs of the base layer sub-tracks, and the server further transmits, to the client device, video data corresponding
30 to the requested base layer sub-tracks, in response to the request message.

In an embodiment, the configuration of the n spatial tiles is defined in the description file by a grid subdivided into a given number of rows and columns, each one having a pre-determined height and width.

- 5 In an embodiment, the configuration of the n spatial tiles defines spatial tiles having a uniform or a non-uniform area.

In an embodiment, each spatial tile is a rectangular region.

- 10 In an embodiment, if the spatial tiles have a uniform area, the grid is specified by its number of boundaries in both horizontal and vertical dimensions.

- In an embodiment, if the spatial tiles have a non-uniform area the grid is specified by its number of rows and columns and the positions of the borders of the rows and the
15 columns.

In an embodiment, the data are streamed according to the DASH standard, said description file being a Media Presentation Description file.

- 20 In an embodiment, each URL designates a segment of track or video sub-track for a pre-defined period of time.

- In an embodiment, the configuration of the n spatial tiles being defined for each period of time by using a syntax element relative to an entire period of time.
25

- In an embodiment, the description file comprising a set of parameters defined for each video sub-track for every period of time,
the set of parameters including a descriptor which incorporates data about:
a. the type of the track: video track or video sub-track, and/or
30 b. if the track is a video sub-track, the position of the spatial tile and the configuration of the n spatial tiles.

In an embodiment, the description file comprising for every period of time, a set of parameters being defined for each tile and,

the set of parameters including a descriptor called a Role element which incorporates data about:

the type of the track: video track or video sub-track, and/or

b. if the track is a video sub-track, a reference to the configuration of the n spatial tiles.

5

In an embodiment, if the track is a video sub-track, the descriptor further comprise a scheme to specify the position of the considered tile relative to the configuration of the n spatial tiles.

10 In an embodiment, the position of the spatial tile being indicated by referring to the indexes of the rows and the columns of the grid.

In an embodiment, the position of the spatial tile being indicated by referring to the position in pixels of the top-left corner of the tile and the width and height of the tile.

15

In an embodiment, the position of the spatial tile being indicated by positions in a specified coordinates system.

20 In an embodiment, the position of the spatial tile being expressed as a spatial Media Fragments.

In an embodiment, the video data corresponds to m videos representing the same content, m being an integer, each of the m videos having a different resolution, and each frame of each video being divided into n spatial tiles, in order to create $m \cdot n$ independent video sub-tracks.

25

30 In an embodiment, the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

This enables the client-side selection of any subset of sub-tracks with guarantee for correct display without the need, in the specific case of tile, of upsampling or downsampling the received data.

35

In an embodiment, the method further comprises:

- acquiring the data corresponding to the given video,
- compressing the acquired data,
- encapsulating the compressed data, said encapsulating comprising:

- 5 • generating a given number of video segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
- generating an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks, and
- generating the description file from the encapsulated data.

10

In an embodiment, the description file further comprises a URL associated to the initialization segment.

In an embodiment, the initialization data comprises values indicating the width and the height of each video sub-track.

15

In an embodiment, the initialization data further comprises a transformation matrix which enables the display of each video sub-track at the right position.

- 20 According to another aspect of the invention, it is proposed a method for providing data by a server device to a client device, said data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks.

The method comprises:

- 25 • generating a description file, said description file including data about the spatial organization of the n video sub-tracks, and at least n URLs respectively designating each video sub-track,
 - transmitting said description file to the client device, and
 - transmitting video data corresponding to a given number of video sub-tracks
- 30 based on one or more client device or client device user's requests, each request comprising one of the URLs.

In an embodiment, the description file further comprises a URL designating a track corresponding to the full given video, and the server transmits, to the client device,

video data corresponding to the full video track based on a client device requests comprising the URL of the full video track.

5 In an embodiment, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and said video further comprising a base layer track, said description file further comprising the URL of the base layer track, and the server further transmits, to the client device, video data corresponding to the base layer track based on a client device requests comprising the URL of the base layer track.

10

According to a variant, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and each frame of the base layer also being divided into n spatial tiles, each tile of the base layer corresponding to a tile in the enhancement layer, in order to create n independent base layer sub-tracks, said description file further comprising the URL of the base layer sub-tracks, and the server further transmits, to the client device, video data corresponding to the base layer sub-tracks based on a client device requests comprising the URL of the base layer sub-tracks.

20

In an embodiment, the configuration of the n spatial tiles is defined in the description file by a grid subdivided into a given number of rows and columns, each one having a pre-determined height and width.

25 In an embodiment, the configuration of the n spatial tiles defines spatial tiles having a uniform or a non-uniform area.

In an embodiment, each spatial tile is a rectangular region.

30 In an embodiment, if the spatial tiles have a uniform area, the grid is specified by its number of boundaries in both horizontal and vertical dimensions.

In an embodiment, if the spatial tiles have a non-uniform area the grid is specified by its number of rows and columns and the positions of the borders of the rows and the columns.

35

In an embodiment, the data are transmitted according to the DASH standard, said description file being a Media Presentation Description file.

- 5 In an embodiment, each URL designates a segment of track or sub-track for a pre-defined period of time.

In an embodiment, the configuration of the n spatial tiles being defined for each period of time by using a syntax element relative to an entire period of time.

10

In an embodiment, the description file comprising a set of parameters defined for each video sub-track for every period of time,

the set of parameters including a descriptor which incorporates data about:

- a. the type of the track: video track or video sub-track, and/or
 15 b. if the track is a video sub-track, the position of the spatial tile and the configuration of the n spatial tiles.

In an embodiment, the description file comprises for every period of time, a set of parameters being defined for each tile,

- 20 the set of parameters including a descriptor called a Role element which incorporates data about:

the type of the track: video track or video sub-track, and/or

b. if the track is a video sub-track, a reference to the configuration of the n spatial tiles.

- 25 In an embodiment, if the track is a video sub-track, the descriptor further comprise a scheme to specify the position of the considered tile relative to the configuration of the n tile.

- 30 In an embodiment, the position of the spatial tile being indicated by referring to the indexes of the rows and the columns of the grid.

In an embodiment, the position of the spatial tile being indicated by referring to the position in pixels of the top-left corner of the tile and the width and height of the tile.

In an embodiment, the position of the spatial tile being indicated by positions in a specified coordinates system.

5 In an embodiment, the position of the spatial tile being expressed as a spatial Media Fragments.

In an embodiment, the method further comprises preliminarily to the step of generating a description file:

- 10 - acquiring data corresponding to the given video,
- compressing the acquired data,
- encapsulating the compressed data, said encapsulating comprising:
 - generating a given number of media segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
 - generating an initialization segment associated to the media files segments,
- 15 which comprises initialization data about the video track and the video sub-tracks.

20 In an embodiment, the video data includes m video tracks representing the same content, m being an integer, each of the m video tracks having a given resolution, and each frame of each video track being divided into n spatial tiles, in order to create m*n independent video sub-tracks.

25 In an embodiment, the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

30 According to another aspect of the invention, it is proposed a method for obtaining data corresponding to a given video by a client device, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks. The method comprises:

- receiving a description file including data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating each video sub-track,

- selecting by the client device or client device's user at least one Region Of Interest in the video,
 - obtaining one or more URLs according to the chosen Region Of Interest, based on the description file, and
 - 5 - sending one or more request messages for requesting the video sub-tracks, each request message comprising one of the URLs selected by the client device,
 - receiving video data corresponding to the requested video sub-tracks, in response to the request messages.
- 10 In an embodiment, the description file further comprises a URL designating a track corresponding to the full given video, and if the client device does not select any Region Of Interest, the method further comprises sending a request message for requesting the full video track and receiving video data corresponding to the requested full video track, in response to the request message.
- 15 In an embodiment, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and said video further comprising a base layer video sub-track, said description file further comprising the URL of the base layer track, and if the client
- 20 device chooses one Region Of Interest, and the method further comprises:
- obtaining by the client device the URL of the base layer,
 - sending request message which includes the URL of the base layer track, and
 - receiving video data corresponding to the requested base layer track, in response to the request message.
- 25 According to a variant, the given video is a scalable video comprises a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and each frame of the base layer also being divided into n spatial tiles, each tile of the base layer corresponding to a tile in the enhancement layer, in
- 30 order to create n independent base layer sub-tracks,
- said description file further comprising the URLs of the base layer sub-tracks, and if the client device chooses one Region Of Interest, and the method further comprises:
- obtaining by the client device the URLs of the base layer sub-tracks,
 - sending request message which includes the URLs of the base layer sub-tracks, and

- receiving video data corresponding to the requested base layer sub-tracks, in response to the request message.

5 In an embodiment, the configuration of the n spatial tiles is defined in the description file by a grid subdivided into a given number of rows and columns, each one having a pre-determined height and width.

10 In an embodiment, the configuration of the n spatial tiles defines spatial tiles having a uniform or a non-uniform area.

In an embodiment, each spatial tile is a rectangular region.

15 In an embodiment, if the spatial tiles have a uniform area, the grid is specified by its number of boundaries in both horizontal and vertical dimensions.

In an embodiment, if the spatial tiles have a non-uniform area the grid is specified by its number of rows and columns and the positions of the borders of the rows and the columns.

20 In an embodiment, the data are defined according to the DASH standard, said description file being a Media Presentation Description file.

25 In an embodiment, each URL designates a segment of track or sub-track for a pre-defined period of time.

In an embodiment, the configuration of the n spatial tiles being defined for each period of time by using a syntax element relative to an entire period of time.

30 In an embodiment, the description file comprising a set of parameters defined for each video sub-track for every period of time,
the set of parameters including a descriptor which incorporates data about:
a. the type of the track: video track or video sub-track, and/or
b. if the track is a video sub-track, the position of the spatial tile and the configuration of the n spatial tiles.
35

In an embodiment, the description file comprising for every period of time, a set of parameters being defined for each tile and,
the set of parameters including a descriptor called a Role element which incorporates data about:

- 5 the type of the track: video track or video sub-track, and/or
- b. if the track is a video sub-track, a reference to the configuration of the n spatial tiles.

In an embodiment, if the track is a video sub-track, the descriptor further comprise a scheme to specify the position of the considered tile relative to the configuration of the
10 n tile.

In an embodiment, the position of the spatial tile being indicated by referring to the indexes of the rows and the columns of the grid.

- 15 In an embodiment, the position of the spatial tile being indicated by referring to the position in pixels of the top-left corner of the tile and the width and height of the tile.

In an embodiment, the position of the spatial tile being indicated by positions in a specified coordinates system.

- 20 In an embodiment, the position of the spatial tile being expressed as a spatial Media Fragments.

- 25 In an embodiment, the video data corresponds to m videos representing the same content, m being an integer, each of the m videos having a different resolution, and each frame of each video being divided into n spatial tiles, in order to create $m \cdot n$ independent video sub-tracks.

- 30 In an embodiment, the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

69. A method according to any one of claims 48 to 68, wherein the received video data comprises:

- a given number of video segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
- an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks.

5

In an embodiment, the description file further comprises a URL associated to the initialization segment.

10 In an embodiment, the initialization data comprises values indicating the width and the height of each video sub-track.

In an embodiment, the initialization data further comprises a transformation matrix which enables the display of each video sub-track at the right position.

15 According to another aspect of the invention, it is proposed a computer program product for a programmable apparatus, the computer program product comprising a sequence of instructions for implementing a method as detailed above when loaded into and executed by the programmable apparatus.

20 According to another aspect of the invention, it is proposed a computer-readable storage medium storing instructions of a computer program for implementing a method as detailed above.

25 According to another aspect of the invention, it is proposed a device for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said device having means for implementing a method for streaming data as detailed above.

30 According to another aspect of the invention, it is proposed a server device for providing data to a client device, said data corresponding to a given video each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said server device having means for implementing a method for providing data as detailed above.

According to another aspect of the invention, it is proposed a client device for obtaining data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, said client device having means for implementing a method for obtaining data as detailed
5 above.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Other particularities and advantages of the invention will also emerge from the following description, the invention being described purely by way of example and being illustrated by the accompanying drawings, in which:

15

Figure 1a illustrates a block diagram about an example of the general principle of the Media streaming over HTTP;

20

Figure 1b is a flow chart, explaining more in detail the media streaming over HTTP according to an embodiment of the invention, in particular when a frame is divided into tiles;

Figure 1c schematically represents a frame divided into tiles and a Region Of Interest, according to an embodiment of the invention;

25

Figure 1d schematically represents a frame from spatially scalable video divided into tiles and a Region Of Interest, according to an embodiment of the invention;

Figure 2 is a block diagram illustrating an example of the general principle of generating a media presentation and a manifest file;

Figure 3 schematically represents the classical organization of a Media presentation for being streamed using DASH;

30

Figure 4 illustrates a description file/manifest where no sub-track is involved;

Figure 5 schematically describes an embodiment for pre-processing an initial video into video sub-tracks according to the invention;

35

Figure 5a schematically describes the division into slice and slice segment of a tiled video frames;

Figure 6 schematically describes an embodiment for encoding and encapsulating video sub-tracks into a file format, according to the invention;

Figure 7 schematically describes an embodiment of the boxes of the file format that can be used for carrying the location of each video sub-track, according to the invention;

Figure 8, 8a and 8b describe different syntaxes of a manifest/description file according to the invention;

Figure 9 gives a complete example of manifest/description file for a media presentation with video sub-tracks, according to the invention;

Figure 10 is a schematic block diagram of a computing device for implementation of one or more embodiments of the invention,

Figure 11 illustrates another example of manifest/description file for a media presentation with video sub-tracks, according to the invention, and

Figure 12 illustrates another syntax used in a manifest/description file for a media presentation with video sub-tracks, according to the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Figure 1a describes the general principle of the Media streaming over HTTP, like DASH in particular. Most of the new protocols and standards for Media streaming over HTTP are based on this principle.

A media server 100 contains different media presentations. An example of media presentation 101 is illustrated. It contains here audio and video data. It is considered here that the video is integral, meaning it is not divided into tiles. In this example, we consider that audio and video are interleaved in a same file. The way this media presentation is constructed is described below in the figure 2. This media presentation has been temporally split into small independent and consecutive temporal segments 102, 102a and 103 (for example mp4 segments) meaning that the interleaved audio/video data of the media presentation is split into three consecutive temporal periods. Those temporal segments can be addressed and downloaded independently. The downloading addresses of the media content are HTTP addresses. (One HTTP address associated to each temporal segment of the audio/video media content.) They are set by the server 100 for each one of these temporal segments.

A manifest file 104 (or description file) is an XML document. It describes the content of the temporal media segments e.g. type of media (audio, video, audio-video, text...), coding format, time duration of the segment. Moreover it associates an URL to each media content segment that is described.

5 The manifest file 104 is sent to a client device 110 related to a client or a user. By reading the received manifest file 105, the client can know the association between temporal segments of the different media content and the HTTP addresses designating the temporal segments. Moreover, the manifest file 105 gives the information about the content (interleaved audio/video in this example) of the media
10 presentation. For instance, the information may include resolution and/or bit-rate.

The client device 110 can therefore emit HTTP requests 106 for downloading the temporal segments that he wants, those temporal segments being described in the received manifest file 105.

As a response, the server 100 sends the requested temporal segments,
15 107. These temporal segments can be decoded 108 by the client device 110 for display 109.

Figure 1b illustrates more precisely the Media streaming over HTTP (particularly in DASH) according to the invention. It is considered here that the
20 streamed video data includes a video track such that each frame of the video track is divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks.

First a client device receives a description file (or MPD in DASH) from a server, step 1008. This description file includes data about the spatial organization of
25 the n video sub-tracks and at least n URLs respectively designating the video sub-tracks.

The client chooses a Region of Interest (ROI) that he wants to display. For instance, he wants to zoom in on a specific zone as illustrated in figure 1c.

30 **Figure 1c** illustrates a frame 1100 which is here divided into eight tiles T1, T2, ..., T8. In this frame the client decided to zoom on a portion 1110 at the right bottom part of the image. As illustrated in the figure 1c, this chosen portion 1110 or ROI is encompassed by two tiles T6 and T8.

Figure 1d illustrates a frame 1120 which is encoded as a scalable video with a base layer 1121 and a spatial enhancement layer 1122 here divided into eight tiles T1, T2, ..., T8. The base layer frame 1121 is not tiled, as such each tile in the enhancement layer 1222 depends on the whole base layer. In this frame, when the user decides to zoom on a portion 1123 at the right bottom part of the image 1122, he needs the two selected tiles but also the base layer.

As illustrated in the figure 1d, this chosen portion 1123 or ROI is encompassed by two tiles T6 and T8 plus the base layer 1121. The right part of the figure 1d represents a frame 1130 which is encoded as a tiled base layer 1131 and a tiled spatial enhancement layer 1132 with spatial dependencies that are tiled-based: one tile at enhancement layer 1132 depends only on the tiles at the same position in the base layer 1131. In this configuration, when the user selects the ROI 1133, he needs the two selected tiles 1133 plus the two reference tiles T06 and T08 in the base layer 1131.

15

In figure 1b, the client chooses an ROI, step 1010, as illustrated in figure 1c or 1d, depending on the video configuration in terms of scalability and tiling.

The URLs corresponding to the tiles covered by the ROI chosen by the client (the URLs of T6 and T8 in the example of the figure 1c) are selected by the client device, step 1020.

The selection is also based on some compatibility criteria which are developed more in detail later.

Requested messages are sent from the client device to the server, step 1030. Each request message comprises the URL of one tile covered by the ROI chosen by the client. As explained more in detail below, the video sub-tracks corresponding to the tiles are organized into temporal segments. So, one URL designates the video sub-track corresponding to the tile, over a whole segment.

In response to the request messages, the server sends to the client device the video data (meaning the segments as detailed below), step 1040. If video sub-tracks/tiles are requested, the segments designated by the URLs in the request messages are sent to the client device.

Figure 2 illustrates the main steps for the generation of both a media presentation and a manifest file.

In parallel steps 200 and 201, audio and video data are acquired. Then, the audio data is compressed, step 202. For example, the MP3 standard can be used for this step. In parallel the video data is compressed, step 203. Video compression algorithms like MPEG4, AVC, HEVC or SVC can be used. Once the compression stage is conducted, audio and video elementary streams 204, 205 are available.

The elementary streams 204, 205 are encapsulated as a global media presentation, step 206.

A global media presentation 207 results from the encapsulation. For example, the ISO BMFF standard (or the extension of this ISO BMFF standard to AVC, SVC, HEVC...) can be used for describing as a global media presentation the content of the encoded audio and video elementary streams.

The encapsulated media presentation 207 is used for generating, step 208, an XML manifest file 209.

Figure 3 illustrates an example of the hierarchical content of a DASH manifest file. It describes the content of the media presentation available at the server and the association between each media component, also called media data, and the HTTP addresses.

For example, the media presentation may be temporally split into coarse-grained periods called *Period* (splicing of arbitrary content).

A “*Period*” at MPD level describes all media components that are available for a period of time (could be the complete duration of the media presentation if there is only one Period). Within this period, a media content component can be composed of several data segments corresponding to small period of time previously mentioned, to allow easy streaming/random accessing/switching.

The XML MPD will contain all the data related to each period. By receiving this information, the client will be aware of the content of each period of time. For example, a Media Presentation 300 is divided into several elements, each one corresponding to a Period. For example the second Period is comprised into 100s and 294s.

Each Media Presentation’s Period contains data that describes the available media content component for the corresponding period of time. One of the Media Presentation’s Period 301 is illustrated more in detail.

In addition several “adaptation set” elements are incorporated: one for video description and one for audio description. Each adaptation set is associated to a

given track. In this example, the first group adaptation set is associated to the video track, and the second adaptation set is associated to the audio track corresponding to said video track for the considered time period.

An adaptation set structure 302 contains information about the different possible representations of the encoded video available at the server. In this example, the first representation is an encoded video of spatial resolution 640x480 encoded at the bit rate of 500 kbit/s. The second representation is the same video but encoded at 250 kbit/s. Each of this video can be downloaded by HTTP requests if the client knows the HTTP addresses related to the video. The association between content of each representation and HTTP addresses is done by using an additional temporal sub-layer.

As illustrated by the reference 303, the video representation 302 is split into temporal segments (of 10 seconds in this example).

The first representation 302 gets a bandwidth of 500 kbits/s, a width of 640 pixels and a height of 480 pixels. More parameters are given by the field "Segment Info" 303.

The second representation gets a bandwidth of 250 kbits/s, a width of 640 pixels and a height of 480 pixels. This second representation may represent a decrease in quality compared to the first representation for instance. The client will be able to switch between those representations depending on the available bandwidth on the network.

Each temporal segment 303 is a content stored at the server that is accessible through an HTTP address. In addition, an initialization segment is available. This initialization segment contains MP4 initialization information (if the video has been encapsulated by using the ISO BMFF or extensions) describing the MP4 content of the encapsulated video. For example, it helps the client to instantiate the decoding algorithms related to the video. The HTTP addresses of the initialization segment and the media segments are given in the MPD (or description) file, which is illustrated more in detail below.

Figure 4 gives an example of known manifest file for a given media presentation. This manifest is a DASH manifest (also called MPD). For more clarity only the main characteristics of the MPD are described here.

In this MPD, two media are described. The first one is an English audio stream and the second one is a video stream. The English audio stream is introduced

through the 'adaptation set' banner. Two representations are related to this audio stream:

- The first one (with an id equal to "1") is an MP4 encapsulated elementary stream with a bit-rate of 64000 bit/s. The codec for handle this elementary stream (once parsed by an mp4 parser) is defined in the standard by the attribute 'mp4a.0x40'. It is accessible by a request at the relative address: *7657412348.mp4*.
- The second one (with an id equal to "2") is an MP4 encapsulated elementary stream with a bit-rate of 32000 bit/s.

The adaptation set related to the video contains six representations whose Representation_ids are "6", "7", "8", "9", "A", and "B". These representations contain videos at different spatial resolutions (320x240, 640x480, 1280x720) and at different bit rates (from 256000 to 2048000 bits per second). For each of these representations, a different URL is associated. The client can therefore choose between these representations of the same video according to different criteria like estimated bandwidth or screen resolution for instance.

Now, the following figures focus more particularly on embodiments of the invention.

As previously described, the adaptation set of the manifest file carries (through the representation banner) the information for a same video encoded at different spatial resolutions and at different bit-rates.

The invention allows representations to describe sub-parts of the video. Indeed, in the DASH standard known in the prior art, no attribute for describing sub-parts of the same video is defined. In other words, by using the DASH standard, it is not possible to send directly the absolute or relative localization information for different sub-parts of a video.

In this embodiment (through the following figures), it is shown how this possibility can be added.

Figure 5 describes the notion of video tiling and how this notion is applied to a video. A video 500 is symbolized through three frames. Each frame 501 is divided into eight rectangles called T_n (with n varying from 1 to 8). Of course, the number and the shape of the tiles can be different. For example, the tiles of the video can have different dimensions.

However, in this example we consider that the tiling will be the same whatever the index of the video frame 501. We also consider that the tiles have the same horizontal and vertical size.

The result 502 of this tiling is given at the bottom of the figure 5. Eight
5 independent video sub-tracks are obtained. These video sub-tracks are partitions of the whole global video. According to a preferred embodiment, these video sub-tracks are considered as independent video and are compressed independently.

It is noticed that the invention could easily apply to a scalable video with one base layer and at least one enhancement layer. In a first embodiment, only the
10 enhancement layer(s) is (are) divided into tiles. Consequently, when tiles are requested, the corresponding base layer is also requested by the client and consequently sent by the server to the client.

In another embodiment, the base layer and the enhancement layers are both divided into tiles. In this case, the URLs of corresponding tiles in each layer can
15 be sent to the server, and in response the server sends to the client device the corresponding tiles in each layer.

Figure 5a describes the specific tiles and slices organization in the HEVC format. HEVC standard defines different spatial subdivision of pictures: tiles, slices and
20 slice segments. These different partitions have been introduced for different purposes: the slices are related to streaming issues while the tiles and the slice segments have been defined for being able to do parallel processing.

A tile defines a rectangular region of a picture that contains an integer number of Coding Tree Units (CTU) 553 originally called LCU (Largest Coding Unit) by
25 the man skilled in the art. The tiling is only defined by row and column boundaries 551, 552 as depicted on figure 5a. This makes the tiles good candidates for regions of interest description in terms of position and sizes. However, the HEVC bitstream organization in terms of syntax and its encapsulation into Network Abstract Layer (NAL) units is rather based on slices (as in Advanced Video Coding).

A slice in HEVC is a set of slice segments, with at least the first slice
30 segment being an independent slice segment, the others, if any, being dependent slice segments. A slice segment contains an integer number of consecutive (in raster scan order) CTUs. It has not necessarily a rectangular shape (thus less appropriate than tiles for ROI representation). A slice segment is encoded in the HEVC bitstream as two
35 parts: a slice_segment_header followed by slice_segment_data.

Independent slice segments and dependent slice segments differ by their header: the dependent slice segment has a shorter header because reusing information from the independent slice segment's header. Both independent and dependent slice segments contain a list of entry points in the bitstream: either to tiles or to entropy decoding synchronization points. An entry point defines a position in a HEVC bitstream. It is identifiable by using a particular code or by being referenced in a table. It corresponds to a particular syntax element: the beginning of a NAL unit or a slice segment for instance.

To better understand the relationships between slice, slice segments and tiles, we illustrate different configurations in 560 and 570, on figure 5a. These configurations differ from a first configuration 550. The configuration 550 would correspond to a case where one tile has one slice (containing only one independent slice segment). On the second configuration 560, the picture is partitioned in two vertical tiles 561, 562 separated by a bold dashed line and one slice (with five slice segments).

On the right part of the figure, the picture 570 is split in two tiles 571, 572 illustrated by the bold dashed line. The left tile 571 has two slices (each with two slice segments, one dependent and one independent slice segments) delimited by a bold plain line and the right tile 572 has one slice (with two slice segments, one dependent and one independent slice segment). The HEVC standard defines organization rules between tiles and slice segments that can be summarized as follows (one or both conditions have to be met):

- All CTUs in a slice segment belong to the same tile.
- All CTUs in a tile belong to the same slice segment.

In order to match the Region Of Interest's support and transport, we preferably consider the configuration 550 of figure 5a where one tile contains one slice with one independent segment. However the encapsulation solution would work with the other configurations 560 or 570.

The tiles are signaled in HEVC bitstream in Picture Parameter Set 590 as shown on figure 5a. If a regular tiling is used, the parameter "uniform_spacing_flag" takes the value "1" and only the number of tiles columns 551 and rows 552 is required. Otherwise, it is set to "0" and each column and line position is coded in number of coding tree units (typically of size 64x64 pixels).

Figure 6 shows the encapsulation stage. Before being streamed, the data corresponding to each tile must be processed for being encapsulated in a standard format.

Data corresponding to the eight tiles are acquired, step 600 for being the input of the encoding step 601. The data corresponding to each tile is independently compressed and encoded, step 601. Any video compression algorithm can be used. For example, H264, HEVC, MPEG-2 can be used. Once the data corresponding to the tiles is encoded, step 601, the resulting elementary streams have to be encapsulated in a file format. The ISO BMFF (or the extension of this media file) can be used (as proposed in the standard DASH).

In following those eight video tracks containing the eight sub-part of the video will be referred as “video sub-tracks”. As data corresponding to eight video sub-tracks have been encoded, eight video sub-tracks will be defined in the ISO BMFF file. The whole eight video sub-tracks can be viewed as different tracks of a same media presentation. Of course, additional tracks like audio or text tracks could be used. However, for more clarity, we will not describe the insertion of other kind of media in this figure.

First, during an encapsulation process 602, a media presentation 602a is generated. A piece of location information is set in an initialization segment 603. This initialization segment contains the initialization data associated to the corresponding video sub-tracks. Among these data, the location of each video sub-track is preferably specified (as described more in detail in the next figure).

In addition to the initialization segment 603, the encapsulation process 602 generates a set of segment files 604, 605 (media segments that can be accessed through an URL when the MPD will be generated) that correspond to small periods of time. In the example of this figure, two small periods of time are defined. It means that each video sub-track is temporally split into two small periods of time. A different set of segment files is attributed to each video sub-track for a given period of time. By using such a process, the client could request any of the proposed video sub-tracks for any proposed period of time.

The first set of media segments 604 correspond to the different tracks (sub-video) for a first period of time. The second set of media segments 605 are related to the second and following period of time for the same video tracks. Of course, the invention is not limited to two periods of time. The number of periods of time is not

limited. It is noticed that the box 604 and 605 are represented with dotted lines, given that they are not existing containers.

An URL is associated to each segment file so that a client can request the tiles covered by a selected ROI as described below.

5

It is noticed that in the figure 3, two temporal decompositions are described:

- In the block 300, the splicing of arbitrary content, and
- In the blocks 302/303, the generation of small periods of time.

10 In the figure 6, we have considered that the splicing of arbitrary content generates only one global period and data corresponding to each video sub-track is encapsulated into two media segments corresponding to two small periods of time.

15 **Figure 7** shows how the initialization segment referenced 603 in the figure 6 has to be constructed for carrying the location of each video sub-track. It is recalled that the video sub-tracks are video tracks in the syntax of the file format. The initialization segment is an ISO file 700.

20 As defined in the ISO BMFF standard, this file contains several boxes. The known boxes are not described for more clarity. As eight video sub-tracks (meaning eight video tracks) are defined in this example, a 'moov' box of the encapsulated media presentation shall contain eight "trak" boxes 701.

25 An example of this "trak" box is referenced 702. It is associated with the first video sub-track. This 'trak' box also contains several boxes. A first box "tkhd" 703 is used for carrying the location of the video sub-track. This box contains several attributes. An attribute used in particular in this invention is a matrix 704. This matrix contains the width and height of the video sub-track and a deformation matrix that enables to display the corresponding track at the right position.

30 The parameters of this matrix given in the figure 7 are just example. These parameters must be tuned according to the shape of the different video sub-tracks: this matrix is fulfilled so that the simultaneous display of the video sub-tracks covers the area of the initial video referenced 500 in the figure 5.

Figure 8 illustrates a description file (or MPD in the DASH standard). In the DASH standard, the syntax of the manifest (the MPD syntax) does not allow to take into account the notion of tiles.

The figure 8 shows the elements that may be included in the manifest/description file (the DASH MPD) for notifying the client about the presence and the locations of the different video sub-tracks. A partial view of a MPD is given in the figure 8.

5 An example of a tiled video frame 800 is represented on the left part of the MPD in order to link a tile to its representation in the MPD. In this example, the tiled video frame comprises four tiles 1:1, 1:2; 2:1 and 2:2, their width and height being indicated on the left and top side of the tiled video frame 800.

10 A partial view 801 describes an adaptation set that contains information about a video sub-track. Only data related to one video sub-track is displayed in this figure for more clarity. So, the other sub-videos are not described. However, the description of the other sub-videos is similar (it used the same syntax but with other URLs).

15 The adaptation set ("*AdaptationSet*") 801 is used to describe one video sub-track which is a tile of the whole initial video. This adaptation set contains one representation of one video sub-track, this representation being defined by criteria like resolution but also frame rate or bandwidth for instance. Those criteria allow the client device to select or not several representations of video sub-tracks together or successively. Indeed, in an embodiment, a video sub-track with a first value of resolution or frame rate cannot be selected with another sub-track having a second value of resolution or frame rate.

25 In the adaptation set 801, an additional element (compared to the prior art) is proposed for signaling that this adaptation set represents a video sub-track in the media presentation. This additional element is a new scheme 802 that signals both the presence and the location of the tile corresponding to a video sub-track.

30 In particular, according to the invention, a new scheme for the 'Role' descriptor of the DASH standard is proposed. This new scheme of the "Role" descriptor is defined through the "schemeldUri" attribute. A new type called "tiling" is defined for the "schemeldUri" attribute. In addition, the new type of the schemeldUri is completed by additional attributes, which are used to indicate which tile amongst the existing tiles is represented.

In other words, if N tiles are available, the attribute "schemeldUri" of the Role descriptor is equal for example to "urn:mpeg:dash:tiling:2013" (any value provided that is unique in the context of DASH). Then the Role descriptor signals via its

attributes the tiles that can be put together and the location of each of these tiles. A preferred syntax of this new scheme in the role descriptor is the following one:

<Role schemeIdUri="urn:mpeg:DASH:tiling:2013" Id='T' value ="x:y"/>.

5 The attribute "Id" is an identifier attribute indicating the possible or forbidden associations.

The variable 'T' identifies a set of tiles that can be merged together. A same 'Id=T' variable means that the tiles are issued from the same initial video, meaning with the same resolution. As a consequence, they can be streamed together for being assembled by the client. The variable 'Id=T' is optional. By default, if not present, all
10 defined tiles can be composed together (they are issued of the same initial video). 'T' is an integer.

The attribute "value" allows identifying the position of the tile(s). The integer 'x' and 'y' signal the horizontal and vertical location of the current tile among the set of tiles from left to right and up to bottom. The integers 'x' and 'y' are strictly positive. For
15 example, if the initial video has been split into two horizontal lines of tiles and if each horizontal line is split into four columns of tiles (eight tiles are generated), a value="3:2" means that the tile is on the third column and on the second line. If the 'x' and 'y' values are set to "0", it means that the video associated to the scheme is a non-tiled version of the initial video, i.e. it is the full-frame video. By default if the tiling role is not
20 present, a video is a non-tiled video. It may be useful when there is a risk of confusion in MPD interpretation.

In this example, the value of the scheme 802 designates the video associated to the tile "1:2".

25 Optionally, the proposed scheme can also be used for media components (or media data) that are not video (but for instance audio or text) when it is necessary to clarify the grouping of non-video media components with tiled video components. In such a case, only the Id value has to be used. A same Id for different media components enables to make the association between them (the different media components can be played simultaneously).

30 In this preferred embodiment, the "value" attribute is composed of two integer values. However, other variants could exist. For example, the syntax of the value attribute could be:

- value="x:X;y:Y" or coma separated: value="x:X,y:Y" or whatever separator character between horizontal and vertical positions as on example 812,
35 with the following signification:

- 'x' signals the horizontal location of the tile (index of the tile) amongst the whole set of columns;

- 'X' signals the number of columns;

- 'y' signals the vertical location of the tile (index of the tile) amongst the whole set of lines; and

- 'Y' signals the number of lines.

For example, in reference to the figure 5, the signaling of the tile T6 will be:

- `<Role schemeldUri="urn:mpeg:DASH:tiling:2013" Id='1' value="2:4:2:2"/>` or coma separated: `schemeldUri="urn:mpeg:DASH:tiling:2013" Id='1' value="2:4,2:2"/>` or whatever separator character between horizontal and vertical positions. The value of the scheme 812 designates the video associated to the tile "1:2" and provides the information that the tiling is a 2x2" grid.

In the example illustrated by the video frame 800, the initial video is split into tiles of same size as it is explained below in figure 8a. However, this is not restrictive. Tiles could have different sizes. For example, tiles could be generated from a quadtree partition. In such a case, the syntax of the @schemeldURI equal to "urn:mpeg:dash:tiling:2013" should take into account the nature of the tile partition. The new syntax could be:

- `<Role schemeldUri="urn:mpeg:DASH:tiling:2013" Id='T' value="coordinates" coordinate_system="C"/>`.

The "coordinates" would be a value (or a set of values) that could be identified from the optional identifier of the coordinate system ('the value "C" in this example). An example of coordinate system could be to define absolute location of the tile in pixels, actually the default case. Coordinates would be the location (x, y) in pixels of the top-left corner of the tile. When no "coordinate_system" attribute is specified, it is assumed that coordinates given in the attribute "value" are expressed into pixel positions, unless a ':' character is present in the value that indicates positions in the tiling grid. Size of the tile would be defined by the standard attributes width and height of the representation. For example, in a code portion referenced 821 in the figure 8, the tile position is signaled using pixel coordinate system using syntax `value="x, y"`. In a line referenced 822, the tile with top-left corner at position column=0, row=240 is described. All code portion examples 801, 811, 821 provide tile position with or without tiling information. The tile size has to be parsed from the associated "Representation" element.

Figure 8a provides alternative signaling of tiles positions and sizes in the particular context of HEVC tiles. In the right part of this figure 8a, three examples 860, 870 and 875 of a tiled video frame are provided. Each one corresponds to a specific configuration as detailed below.

5 As explained in reference to figure 5a, HEVC tiles are signaled in the bitstream via tile rows and columns borders positions (for instance, back to the figure 5a, the tiled video frame referenced 550 shows two rows 551 and two columns 552 borders, leading to a 3x3 tiling configuration). As such, it is proposed to put in the “*Role*” element 862 describing a tile, the tiling organization as in the example 861 in the
10 figure 8a. In this example, an attribute “*grid*” is used to indicate as first value whether the tiling is regular or not. This directly translates in MPD the *uniform_space_flag* from the HEVC bitstream defined in the HEVC standard.

 When the tiling is regular as in the tiled video frame 860, the other values in the *grid* attribute provide the number of tile columns minus 1 and the number of tile
15 rows minus 1 (as encoded in the HEVC bitstream). This number of tiles in the horizontal dimension is directly computed from the HEVC bitstream parameter *num_tiles_columns_minus1* and the number of tiles in the vertical dimension is directly computed from the HEVC bitstream parameter *num_tiles_rows_minus1* (defined in the HEVC Standard), as in the line referenced 862 for the tiled video frame 860. This
20 notation enables to directly translate HEVC Picture Parameter Sets’ values in the MPD (*num_tiles_columns_minus1* and *num_tiles_rows_minus1*). In addition to the *grid* attribute, the sizes of the full-frame video are required to be able to compute the tiles sizes and positions (see the line referenced 862).

 In case the tiling is not uniform, as represented on the tiled video frames
25 871 or 873, the *grid* attribute with first value being equal to 0 implies that the “*Role*” element must allow retrieving the list of positions for each column and the list of positions for each row, given in pixels. In such case, the number of tile borders defining the rows and columns is contained in the subsequent values of the “*grid*” attribute. The tiled video frame 872 provides possible names for the attributes to indicate the row and
30 column borders positions (it could be different names however without affecting the invention at both generation and parsing times). Row and column border positions are specified into pixels (see the line 872) with the width and height of the full-frame video.

 As another embodiment (not represented), for regular tiling, the *grid* and *width* and *height* attributes can be simplified into one single attribute like for example,
35 grid=“w, h, W, H” where w and h respectively provides the size (width and height in

pixels) of a tile and W, H the size in pixels of the full-frame video. Applied to the examples 861, 862, this leads to *grid*="320, 240, 640, 480". It has the advantage to makes an easier to parse syntax for DASH clients (one attribute providing all the 4 values instead of three different attributes in 862).

5 Another embodiment for the tiling configuration signalization is to have the tiling information at a highest level of signalization. Thus, it can be described once and used from all the fields "*Representation*" associated to a tile. This reduces the description cost and the size of the manifest potentially reducing the download time of the manifest and reducing the startup delay of the streaming application.

10

In figure 8b, portions of code 881 and 886 illustrate as example, such element to describe the tiling configuration. These portions of code 881 and 886 are related to two tiled video frames 880 and 885 schematically illustrated in the right part of the figure 8b.

15 Any tile representation coming from this tiling configuration can refer to it via the "*id*" attribute of the tiling "*Role*" element previously mentioned. The *uniform* attribute indicates whether the tiling is regular or not, direct translation of the *uniform_spacing_flag* HEVC flag. When set to 1, the following attributes *cols* (for columns) and *rows* indicate the number of tiles columns minus 1 and the number of
20 tiles rows minus 1.

In the example referenced 880, there is only one tile row boundary and 1 tile column boundary. The two last attributes provide the dimensions width and height of the full-frame video. When the tiling is not uniform as on the tiled video frame 885, then the "*tiling*" element contains children elements that provide the positions in pixels
25 of the tiles columns and rows (one element per dimension, as shown in a line 887). In case the tiling configuration changes along time, a new period of time (<Period>) is created. This new period contains the new tiling configuration.

In case the manifest describes via the "*tiling*" element multiple tiling configurations, the tiling applied to a given tile can be referenced via its "*id*" attribute by
30 adding a new attribute in the *Role* describing the tile. For example: <*Role schemeIdUri*="urn:mpeg:DASH:tiling:2013" *Id*=' **tiling_1**' *value*="0,0" />. Then, there are two alternatives to inform streaming clients about the tiling configuration. This information is useful, for example to inform the user about the addressable spatial areas in the videos. The approach with attributes duplicates information for each tile.
35 Consequently, it is less compact, but it has the benefit to keep all the tile related

information in the same element. This offers robustness in case of transformations applied to the manifest by any intermediate node in content distribution networks.

Considering the robustness aspect and self-description of a tile via the “*Role*” element, it is also interesting to put in the “*value*” attribute the size information in addition to position information. In this embodiment, the “*value*” attribute specifies a coma-separated list of four integers, in the following order: the x and y position of the top-left corner and the width and height of a tile. For example: *value*=“x, y, w, h” as in the figure 12 described later. The coordinate system used to express the position of a tile is a 2D coordinate system, where the origin is arbitrary but shall be the same for all representations sharing the same id for the tiling role. Additionally, the x-axis is assumed to be oriented towards the right of the screen and the y-axis oriented towards the bottom. The width and height may be used by a viewer to render multiple tiles and align them spatially.

Another embodiment proposes to indicate the positions and sizes of the tile by using the syntax for spatial fragments defined in the W3C MediaFragments URI 1.0. This leads to a “*value*” attribute like: *value*=“#xywh=0,0,320,240” to describe the first tile in the picture 860 (see the figure 8a). This provides the advantage for streaming clients that also support the Media Fragments URI specification. Indeed, if for example, a Media Fragments URI is used to link to a video to display, the client with Media Fragments URI support will automatically match the “*Representation*” with the correct spatial fragment thus making easier the choice of the adaptation logic. Moreover, when the server also supports Media Fragment URIs, the streaming client can use the *BaseURL* in the MPD and put the value of the *value* attribute into a HTTP Range header as specified by the Media Fragments URI specification to directly request the corresponding tile. Another advantage of using Media Fragments URI syntax is that the so-formed URL can be bookmarked and distributed by the client so that any other Media Fragments URI client can access the same tile.

When each tile is described separately in its own “*AdaptationSet*” it is difficult for a client to identify to which full-frame video “*Representation*” it is related to. It was proposed earlier to use the special *value*=“0:0” in the “*Role*” element describing the tile, i.e. the “tiling Role”. However, the full-frame video can be described in the same way. The “*Representation*” of the tiles is annotated, i.e. using a “tiling” *Role* (not represented). In such case, the “tiling” *Role* associated to the “*Representation*” of the full-frame video has its “*id*” attribute set to the same value as the “*id*” attributes of the “tiling” *Roles* of the tiles composing this full-frame video. By default, when a tiling “*Role*”

is associated to a video "*Representation*" without any *value* attribute, this "*Representation*" has to be considered as the full-frame video. To be more explicit this "*Representation*" can carry a *value* attribute. In such case, the x and y fields take 0, 0 as value for the top-left corner while w and h take the values of the width and height of the full-frame video. In case a "*tiling*" element is declared, the tiling Role for the full-frame video "*Representation*" can of course refer to this tiling via its "*id*" so that the relation from tile to full-frame video is explicit for the streaming clients. Any of the above description for full-frame video signaling has the advantage of avoiding ambiguities for the clients using the manifest. However, to remain as close as possible to the standard, we can also use the classical Role element with standard "*alternate*" and "*main*" fields respectively assigned to the adaptation set containing the tiles "*Representation*" and to the adaptation set containing the full-frame video "*Representation*". When all these Representations are declared in the same AdaptationSet, one ContentComponent element per Representation can be used to describe the respective Role of each Representation.

This is described more in detail in the figure 11. This example describes a HD video (Representation 'R0' in 1106) that is composed of four spatial tiles of 960x540 (Representations 1101, 1102, 1103, 1104). Each tile has its own "*AdaptationSet*" and associated "*Representation*" plus a "*tiling*" Role. There are only one set of four tiles which can be associated, identified by "TS1".

Two subsets 1105 are defined to indicate the alternative between the full-frame video in the first subset and any tile or composition of tiles from the second subset. It can be easily extrapolated from example of the figure 11, that when several "*Representations*" schemes are available for a given tile, for example in terms of bandwidth, the dynamic switching mechanism provided by DASH is not broken.

Figure 9 is a complete example that illustrates the usage of the new scheme defined in the invention. This example takes the DASH standard (MPD) as reference. In this figure, a media presentation (video and audio media) is described. Two subsets are described:

- the first one contains the adaptation sets with Id: '0', '1', '2' and '3', and
- the second one contains the adaptation sets tag Id: '4', '5' and '6'.

As mentioned above, the usage of subsets enables to specify that some adaptation sets cannot be streamed together. Adaptation sets of the second subset cannot be streamed with the adaptation sets of the first subset. In the first subset, audio and video representations (with and without the new scheme) are available.

Such representations give to the client the possibility of streaming media data even if the scheme 'tiling' is not supported (the MPD syntax without the scheme is always understood).

5 In the first subset, the adaptation set that contains the first video representation is described by using a line 900:

- *<Role schemeldUri="urn:mpeg:DASH:tiling:2013" Id="1" value="0:0"/>*.

This line indicates that the representations associated to this adaptation set are non-tiled versions of the video (value="0:0").

10 A line with the scheme proposed in this invention is associated to the adaptation set that contains the audio media, 910:

- *<Role schemeldUri="urn:mpeg:DASH:tiling:2013" Id="1"/>*.

This line indicates that the audio media included in this adaptation set is related to the non-tiled version of the video. The optional field 'value="0:0"' could be also added but it is useless in this example.

15 In the second subset (adaptation set with Id= "4", "5" and "6"), two video sub-tracks are described through the new scheme. The representation element related to the first tile is contained in the adaptation set with 'Id' equal to '4'. A line 920 that specifies the first video sub-track is:

- *<Role schemeldUri="urn:mpeg:DASH:tiling:2013" Id="1" value="1:1"/>*.

20 A line 930 that specifies the second video sub-track is:

- *<Role schemeldUri="urn:mpeg:DASH:tiling:2013" Id="1" value="1:2"/>*.

This line specifies that the representations that are included in the adaptation set contain the URL related to the first tile of the second line of tile.

25 A line 940 with the scheme proposed in the invention is associated to the adaptation set (of the second subset) that contains the audio media:

- *<Role schemeldUri="urn:mpeg:DASH:tiling:2013" Id="1"/>*.

This line indicates that the audio media included in this adaptation set is related to one of the tiled version of the video sub-tracks.

30 **Figure 10** is a schematic block diagram of a computing device 1000 for implementation of one or more embodiments of the invention. The computing device 1000 may be a device such as a micro-computer, a workstation or a light portable device. The computing device 1000 comprises a communication bus connected to:

- a central processing unit 1001, such as a microprocessor, denoted CPU;

-a random access memory 1002, denoted RAM, for storing the executable code of the method of embodiments of the invention as well as the registers adapted to record variables and parameters necessary for implementing the method for reading and writing the manifests and/or for encoding the video and/or for reading or generating the Data under a given file format, the memory capacity thereof can be expanded by an optional RAM connected to an expansion port for example;

-a read only memory 1003, denoted ROM, for storing computer programs for implementing embodiments of the invention;

-a network interface 1004 is typically connected to a communication network over which digital data to be processed are transmitted or received. The network interface 1004 can be a single network interface, or composed of a set of different network interfaces (for instance wired and wireless interfaces, or different kinds of wired or wireless interfaces). Data are written to the network interface for transmission or are read from the network interface for reception under the control of the software application running in the CPU 1001;

- a user interface 1005 for receiving inputs from a user or to display information to a user;

- a hard disk 1006 denoted HD;

- an I/O module 1007 for receiving/sending data from/to external devices such as a video source or display.

The executable code may be stored either in read only memory 1003, on the hard disk 1006 or on a removable digital medium such as for example a disk. According to a variant, the executable code of the programs can be received by means of a communication network, via the network interface 1004, in order to be stored in one of the storage means of the communication device 1000, such as the hard disk 1006, before being executed.

The central processing unit 1001 is adapted to control and direct the execution of the instructions or portions of software code of the program or programs according to embodiments of the invention, which instructions are stored in one of the aforementioned storage means. After powering on, the CPU 1001 is capable of executing instructions from main RAM memory 1002 relating to a software application after those instructions have been loaded from the program ROM 1003 or the hard-disc (HD) 1006 for example. Such a software application, when executed by the CPU 1001, causes the steps of the flowcharts shown in the previous figures to be performed.

In this embodiment, the apparatus is a programmable apparatus which uses software to implement the invention. However, alternatively, the present invention may be implemented in hardware (for example, in the form of an Application Specific Integrated Circuit or ASIC).

5

Although the present invention has been described hereinabove with reference to specific embodiments, the present invention is not limited to the specific embodiments, and modifications will be apparent to a person skilled in the art which lie within the scope of the present invention.

10

For example, the present invention may be embedded in a device like a camera, a smartphone or a tablet that acts as a remote controller for a TV, for example to zoom in onto a particular region of interest. It can also be used from the same devices to have personalized browsing experience of the TV program by selecting specific areas of interest. Another usage from these devices and methods by a user is to share with other connected devices some selected sub-parts of his preferred videos. It can also be used in smartphone or tablet to monitor what happened in a specific area of a building put under surveillance provided that the surveillance camera supports the method for providing data according to the invention.

15

20

Many further modifications and variations will suggest themselves to those versed in the art upon making reference to the foregoing illustrative embodiments, which are given by way of example only and which are not intended to limit the scope of the invention, that scope being determined solely by the appended claims. In particular the different features from different embodiments may be interchanged, where appropriate.

25

CLAIMS

1. A method for streaming data corresponding to a given video, each frame of the video
 5 being divided into n spatial tiles, n being an integer, in order to create n independent
 video sub-tracks, the method comprising:
- transmitting, by a server, a description file to a client device, said description file
 including data about the spatial organization of the n video sub-tracks and at least n
 URLs respectively designating each video sub-track,
 - 10 • selecting by the client device one or more URLs according to one Region Of
 Interest chosen by the client device or a client device's user,
 - receiving from the client device, by the server, one or more request messages
 for requesting a resulting number of video sub-tracks, each request message
 comprising one of the URLs selected by the client device, and
 - 15 • transmitting to the client device, by the server, video data corresponding to the
 requested video sub-tracks, in response to the request messages.
2. A method according to claim 1, wherein the description file further comprises a URL
 20 designating a track corresponding to the full given video, and if the client device does
 not select any URL according to one Region Of Interest, the server receives from the
 client device a request message comprising the URL of the full video track and
 transmits, to the client device, video data corresponding to the full video track in
 response to the request message.
- 25 3. A method according to claim 1 or 2, wherein the given video is a scalable video
 comprising a base layer and at least one enhancement layer, said n video sub tracks
 corresponding to an enhancement layer, and said video further comprising a base layer
 video track, said description file further comprising the URL of the base layer track, and
 if the client device selects at least one URL according to one Region Of Interest, it also
 30 selects the URL of the base layer, and the server further receives from the client device
 one request message for requesting the base layer track, said request message
 including the URL of the base layer track, and the server further transmits, to the client
 device, video data corresponding to the requested base layer track, in response to the
 request message.
- 35

4. A method according to claim 1 or 2, wherein the given video is a scalable video comprising a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and each frame of the base layer also being divided into n spatial tiles, each tile of the base layer corresponding to a tile in the enhancement layer, in order to create n independent base layer sub-tracks,
5 and if the client device selects at least one URL according to one Region Of Interest, it also selects the URLs of the corresponding base layer sub-tracks, and the server further receives from the client device one request message for requesting the base layer sub-tracks, said request message including the URLs of the base layer sub-tracks, and the server further transmits, to the client device, video data corresponding
10 to the requested base layer sub-tracks, in response to the request message.
5. A method according to any preceding claims, wherein the configuration of the n spatial tiles is defined in the description file by a grid subdivided into a given number of rows and columns, each one having a pre-determined height and width.
15
6. A method according to claim 5, wherein the configuration of the n spatial tiles defines spatial tiles having a uniform or a non-uniform area.
- 20 7. A method according to any one of claims 5 or 6, wherein each spatial tile is a rectangular region.
8. A method according to claim 6 or 7, wherein if the spatial tiles have a uniform area, the grid is specified by its number of boundaries in both horizontal and vertical
25 dimensions.
9. A method according to claim 6 or 7, wherein if the spatial tiles have a non-uniform area the grid is specified by its number of rows and columns and the positions of the borders of the rows and the columns.
30
10. A method according to any preceding claims, wherein the data are streamed according to the DASH standard, said description file being a Media Presentation Description file.

11. A method according to claim 10, wherein each URL designates a segment of track or video sub-track for a pre-defined period of time.

12. A method according to claim 11, wherein the configuration of the n spatial tiles being defined for each period of time by using a syntax element relative to an entire period of time.

13. A method according to claim 11, the description file comprising a set of parameters defined for each video sub-track for every period of time,
the set of parameters including a descriptor which incorporates data about:
a. the type of the track: video track or video sub-track, and/or
b. if the track is a video sub-track, the position of the spatial tile and the configuration of the n spatial tiles.

14. A method according to claim 11, the description file comprising for every period of time, a set of parameters being defined for each tile and,
the set of parameters including a descriptor called a Role element which incorporates data about:
the type of the track: video track or video sub-track, and/or
b. if the track is a video sub-track, a reference to the configuration of the n spatial tiles.

15. A method according to any one of claims 12 to 14, wherein if the track is a video sub-track, the descriptor further comprise a scheme to specify the position of the considered tile relative to the configuration of the n spatial tiles.

16. A method according to claim 15, wherein the position of the spatial tile being indicated by referring to the indexes of the rows and the columns of the grid.

17. A method according to claim 15, wherein the position of the spatial tile being indicated by referring to the position in pixels of the top-left corner of the tile and the width and height of the tile.

18. A method according to claim 15, wherein the position of the spatial tile being indicated by positions in a specified coordinates system.

19. A method according to claim 15, wherein the position of the spatial tile being expressed as a spatial Media Fragments.
20. A method according to any one of claims 1 to 19, wherein the video data
5 corresponds to m videos representing the same content, m being an integer, each of the m videos having a different resolution, and each frame of each video being divided into n spatial tiles, in order to create m*n independent video sub-tracks.
21. A method according to any one of claims 10 to 20, wherein the description file
10 comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.
22. A method according to any one of the preceding claims, wherein the method further
15 comprises:
- acquiring the data corresponding to the given video,
 - compressing the acquired data,
 - encapsulating the compressed data, said encapsulating comprising:
- 20 • generating a given number of video segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
- generating an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks, and
- generating the description file from the encapsulated data.
- 25
23. A method according to claim 22, wherein the description file further comprises a URL associated to the initialization segment.
24. A method according to claim 22 or 23 , wherein the initialization data comprises
30 values indicating the width and the height of each video sub-track.
25. A method according to claim 24, wherein the initialization data further comprises a transformation matrix which enables the display of each video sub-track at the right position.

26. A method for providing data by a server device to a client device, said data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks, the method comprising:

- 5 • generating a description file, said description file including data about the spatial organization of the n video sub-tracks, and at least n URLs respectively designating each video sub-track,
- transmitting said description file to the client device, and
- transmitting video data corresponding to a given number of video sub-tracks
- 10 based on one or more client device or client device user's requests, each request comprising one of the URLs.

27. A method according to claim 26, wherein the description file further comprises a URL designating a track corresponding to the full given video, and the server transmits, 15 to the client device, video data corresponding to the full video track based on a client device requests comprising the URL of the full video track.

28. A method according to claim 26 or 27, wherein the given video is a scalable video comprising a base layer and at least one enhancement layer, said n video sub tracks 20 corresponding to an enhancement layer, and said video further comprising a base layer track, said description file further comprising the URL of the base layer track, and the server further transmits, to the client device, video data corresponding to the base layer track based on a client device requests comprising the URL of the base layer track.

25 29. A method according to claim 26 or 27, wherein the given video is a scalable video comprising a base layer and at least one enhancement layer, said n video sub tracks corresponding to an enhancement layer, and each frame of the base layer also being divided into n spatial tiles, each tile of the base layer corresponding to a tile in the enhancement layer, in order to create n independent base layer sub-tracks, said 30 description file further comprising the URL of the base layer sub-tracks, and the server further transmits, to the client device, video data corresponding to the base layer sub-tracks based on a client device requests comprising the URL of the base layer sub-tracks.

30. A method according to any one of claims 26 to 29, wherein the configuration of the n spatial tiles is defined in the description file by a grid subdivided into a given number of rows and columns, each one having a pre-determined height and width.
- 5 31. A method according to claim 30, wherein the configuration of the n spatial tiles defines spatial tiles having a uniform or a non-uniform area.
32. A method according to any one of claims 30 or 31, wherein each spatial tile is a rectangular region.
- 10 33. A method according to claim 30 or 31, wherein if the spatial tiles have a uniform area, the grid is specified by its number of boundaries in both horizontal and vertical dimensions.
- 15 34. A method according to claim 30 or 31, wherein if the spatial tiles have a non-uniform area the grid is specified by its number of rows and columns and the positions of the borders of the rows and the columns.
- 20 35. A method according to any one of claims 26 to 34, wherein the data are transmitted according to the DASH standard, said description file being a Media Presentation Description file.
36. A method according to claim 35, wherein each URL designates a segment of track or sub-track for a pre-defined period of time.
- 25 37. A method according to claim 36, wherein the configuration of the n spatial tiles being defined for each period of time by using a syntax element relative to an entire period of time.
- 30 38. A method according to claim 37, the description file comprising a set of parameters defined for each video sub-track for every period of time, the set of parameters including a descriptor which incorporates data about:
- a. the type of the track: video track or video sub-track, and/or
 - b. if the track is a video sub-track, the position of the spatial tile and the configuration of
- 35 the n spatial tiles.

39. A method according to claim 36, wherein the description file comprises for every period of time, a set of parameters being defined for each tile,
the set of parameters including a descriptor called a Role element which incorporates
5 data about:

the type of the track: video track or video sub-track, and/or

b. if the track is a video sub-track, a reference to the configuration of the n spatial tiles.

40. A method according to any one of claims 38 or 39, wherein if the track is a video
10 sub-track, the descriptor further comprise a scheme to specify the position of the considered tile relative to the configuration of the n tile.

41. A method according to claim 40, wherein the position of the spatial tile being indicated by referring to the indexes of the rows and the columns of the grid.
15

42. A method according to claim 40, wherein the position of the spatial tile being indicated by referring to the position in pixels of the top-left corner of the tile and the width and height of the tile.

20 43. A method according to claim 40, wherein the position of the spatial tile being indicated by positions in a specified coordinates system.

44. A method according to claim 40, wherein the position of the spatial tile being expressed as a spatial Media Fragments.
25

45. A method according to any one of claims 26 to 44, further comprising preliminarily to the step of generating a description file:

- acquiring data corresponding to the given video,

- compressing the acquired data,

30 - encapsulating the compressed data, said encapsulating comprising:

- generating a given number of media segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
- generating an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks.

35

46. A method according to any one of claims 26 to 45, wherein the video data includes
 m video tracks representing the same content, m being an integer, each of the m video
 tracks having a given resolution, and each frame of each video track being divided into
 5 n spatial tiles, in order to create m*n independent video sub-tracks.

47. A method according to any one of claims 26 to 46, wherein the description file
 comprises parameters for video sub-tracks, the parameters including data about the
 possible or forbidden associations of the different video sub-tracks, said possible or
 10 forbidden associations being indicated by an identifier attribute if the data are streamed
 according to the DASH standard.

48. A method for obtaining data corresponding to a given video by a client device, each
 frame of the video being divided into n spatial tiles, n being an integer, in order to
 15 create n independent video sub-tracks, the method comprising:

- receiving a description file including data about the spatial organization of the
 n video sub-tracks and at least n URLs respectively designating each video sub-track,
- selecting by the client device or client device's user at least one Region Of
 Interest in the video,
- 20 - obtaining one or more URLs according to the chosen Region Of Interest,
 based on the description file, and
- sending one or more request messages for requesting the video sub-tracks, each
 request message comprising one of the URLs selected by the client device,
- receiving video data corresponding to the requested video sub-tracks, in response to
 25 the request messages.

49. A method according to claim 48, wherein the description file further comprises a
 URL designating a track corresponding to the full given video, and if the client device
 does not select any Region Of Interest, the method further comprises sending a
 30 request message for requesting the full video track and receiving video data
 corresponding to the requested full video track, in response to the request message.

50. A method according to claim 48 or 49, wherein the given video is a scalable video
 comprising a base layer and at least one enhancement layer, said n video sub tracks
 35 corresponding to an enhancement layer, and said video further comprising a base layer

video track, said description file further comprising the URL of the base layer track, and if the client device chooses one Region Of Interest, and the method further comprises:

- obtaining by the client device the URL of the base layer,
- sending request message which includes the URL of the base layer track, and
- 5 - receiving video data corresponding to the requested base layer track, in response to the request message.

51. A method according to claim 48 or 49, wherein the given video is a scalable video comprising a base layer and at least one enhancement layer, said n video sub tracks
10 corresponding to an enhancement layer, and each frame of the base layer also being divided into n spatial tiles, each tile of the base layer corresponding to a tile in the enhancement layer, in order to create n independent base layer sub-tracks, said description file further comprising the URLs of the base layer sub-tracks, and if the client device chooses one Region Of Interest, and the method further comprises:

- 15 - obtaining by the client device the URLs of the base layer sub-tracks,
- sending request message which includes the URLs of the base layer sub-tracks, and
- receiving video data corresponding to the requested base layer sub-tracks, in response to the request message.

20 52. A method according to any one of claims 48 to 51, wherein the configuration of the n spatial tiles is defined in the description file by a grid subdivided into a given number of rows and columns, each one having a pre-determined height and width.

53. A method according to claim 52, wherein the configuration of the n spatial tiles
25 defines spatial tiles having a uniform or a non-uniform area.

54. A method according to any one of claims 52 or 53, wherein each spatial tile is a rectangular region.

30 55. A method according to claim 52 or 53, wherein if the spatial tiles have a uniform area, the grid is specified by its number of boundaries in both horizontal and vertical dimensions.

56. A method according to claim 52 or 53, wherein if the spatial tiles have a non-uniform area the grid is specified by its number of rows and columns and the positions of the borders of the rows and the columns.

5 57. A method according to any one of claims 48 to 56, wherein the data are defined according to the DASH standard, said description file being a Media Presentation Description file.

10 58. A method according to claim 57, wherein each URL designates a segment of track or sub-track for a pre-defined period of time.

59. A method according to claim 58, wherein the configuration of the n spatial tiles being defined for each period of time by using a syntax element relative to an entire period of time.

15

60. A method according to claim 59, the description file comprising a set of parameters defined for each video sub-track for every period of time, the set of parameters including a descriptor which incorporates data about:

20 a. the type of the track: video track or video sub-track, and/or
b. if the track is a video sub-track, the position of the spatial tile and the configuration of the n spatial tiles.

61. A method according to claim 58, wherein the description file comprising for every period of time, a set of parameters being defined for each tile and,

25 the set of parameters including a descriptor called a Role element which incorporates data about:

the type of the track: video track or video sub-track, and/or
b. if the track is a video sub-track, a reference to the configuration of the n spatial tiles.

30 62. A method according to any one of claims 60 or 61, wherein if the track is a video sub-track, the descriptor further comprise a scheme to specify the position of the considered tile relative to the configuration of the n tile.

35 63. A method according to claim 62, wherein the position of the spatial tile being indicated by referring to the indexes of the rows and the columns of the grid.

64. A method according to claim 62, wherein the position of the spatial tile being indicated by referring to the position in pixels of the top-left corner of the tile and the width and height of the tile.

5

65. A method according to claim 62, wherein the position of the spatial tile being indicated by positions in a specified coordinates system.

66. A method according to claim 62, wherein the position of the spatial tile being expressed as a spatial Media Fragments.

10

67. A method according to any one of claims 48 to 66, wherein the video data corresponds to m videos representing the same content, m being an integer, each of the m videos having a different resolution, and each frame of each video being divided into n spatial tiles, in order to create $m \times n$ independent video sub-tracks.

15

68. A method according to any one of claims 48 to 67, wherein the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

20

69. A method according to any one of claims 48 to 68, wherein the received video data comprises:

- a given number of video segment files, each one comprising the data associated to the video and the n video sub-tracks for a given period of time, and
- an initialization segment associated to the media files segments, which comprises initialization data about the video track and the video sub-tracks.

25

70. A method according to claim 69, wherein the description file further comprises a URL associated to the initialization segment.

30

71. A method according to claim 70 wherein the initialization data comprises values indicating the width and the height of each video sub-track.

72. A method according to claim 71, wherein the initialization data further comprises a transformation matrix which enables the display of each video sub-track at the right position.

5 73. A computer program product for a programmable apparatus, the computer program product comprising a sequence of instructions for implementing a method according to any one of claims 1 to 72 when loaded into and executed by the programmable apparatus.

10 74. A computer-readable storage medium storing instructions of a computer program for implementing a method according to any one of claims 1 to 72.

75. A device for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n
15 independent video sub-tracks, said device having means for implementing a method according to any one of claims 1 to 25.

76. A server device for providing data to a client device, said data corresponding to a given video each frame of the video being divided into n spatial tiles, n being an
20 integer, in order to create n independent video sub-tracks, said server device having means for implementing a method according to any one of claim 26 to 47.

77. A client device for obtaining data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n
25 independent video sub-tracks, said client device having means for implementing a method according any one of claims 48 to 72.

78. A method for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n
30 independent video sub-tracks, substantially as hereinbefore described with reference to, and as shown in, Figures 1b and 5 to 12.

ABSTRACT

METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

The present invention provides a method for streaming data corresponding to a given video, each frame of the video being divided into n spatial tiles, n being an integer, in order to create n independent video sub-tracks. The method comprises:

- transmitting, by a server, a description file to a client device, said description file including data about the spatial organization of the n video sub-tracks and at least n URLs respectively designating each video sub-track,
- selecting by the client device one or more URLs according to one Region Of Interest chosen by the client device or a client device's user,
- receiving from the client device, by the server, one or more request messages for requesting a resulting number of video sub-tracks, each request message comprising one of the URLs selected by the client device, and
- transmitting to the client device, by the server, video data corresponding to the requested video sub-tracks, in response to the request messages.

(Figure 1b)

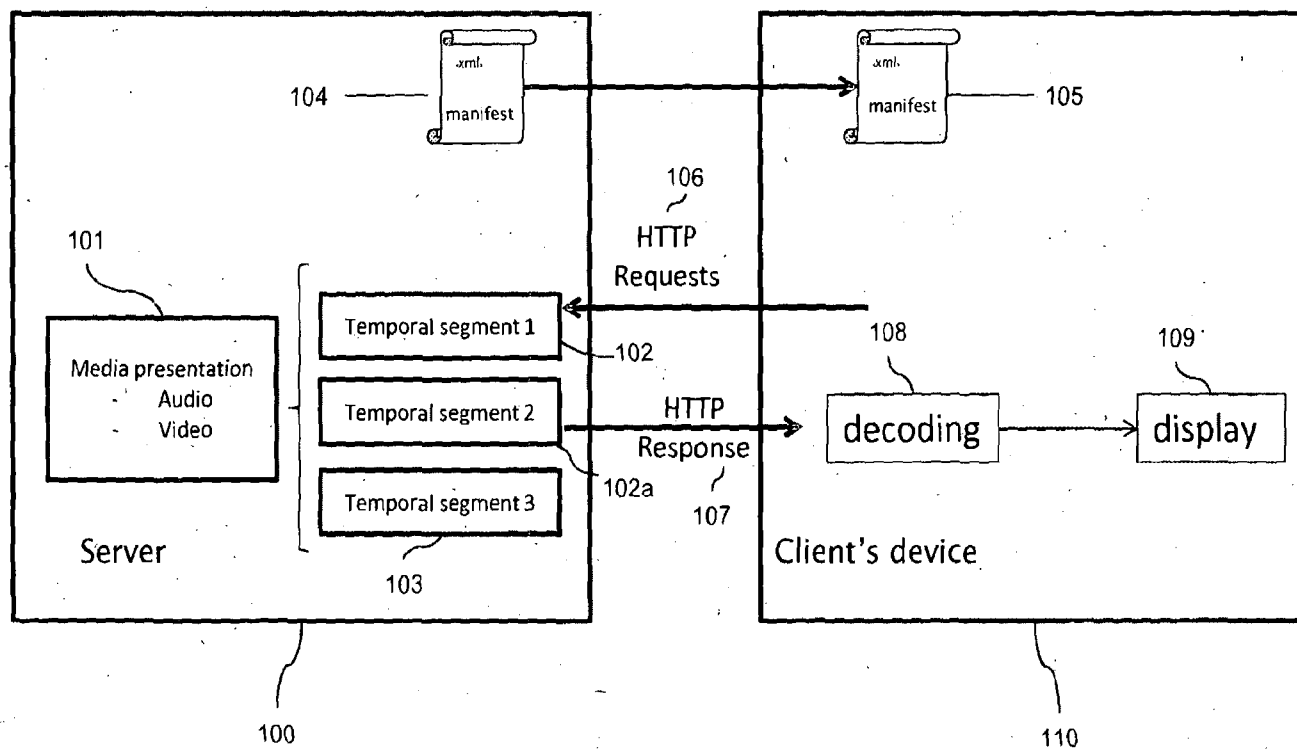
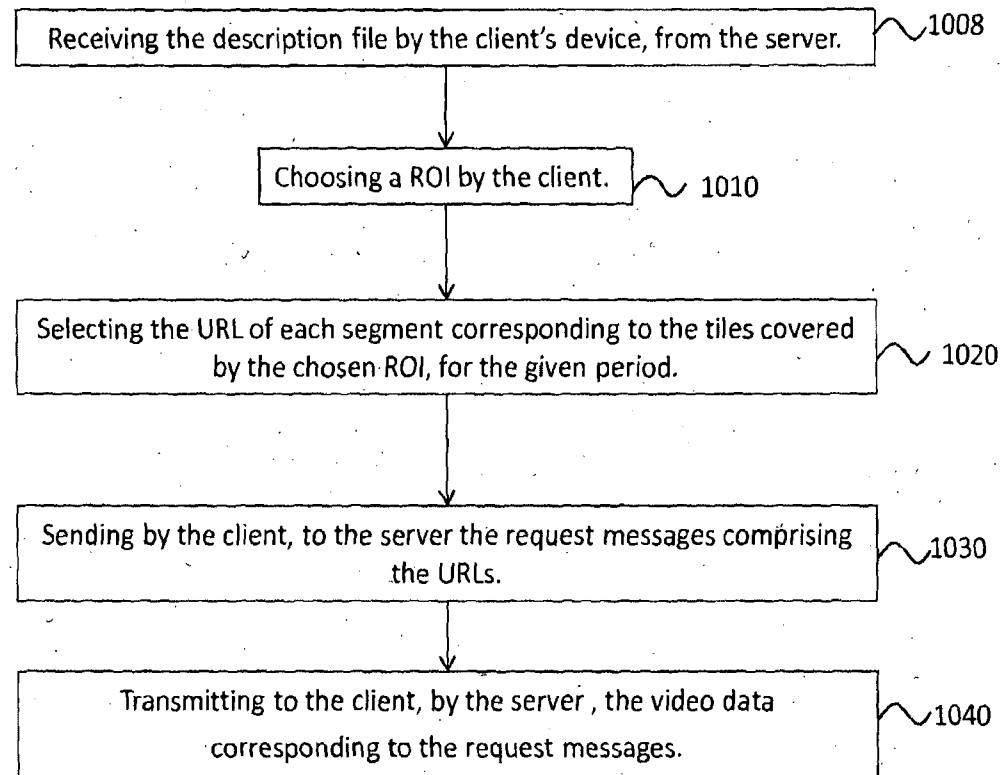
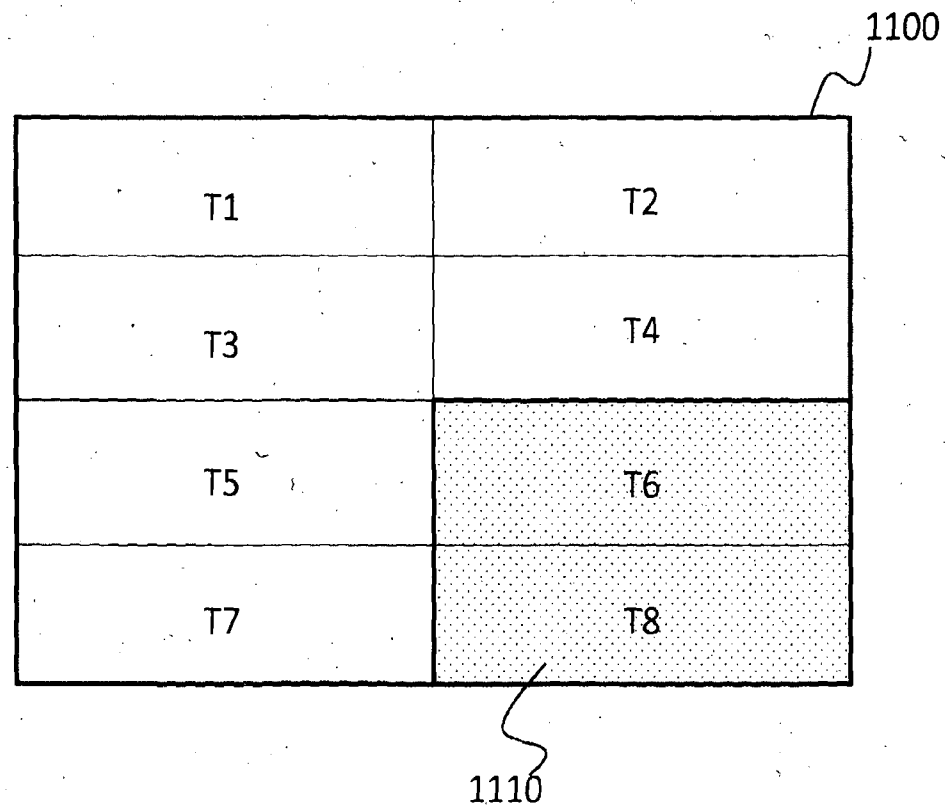


Figure 1a



2/18

Figure 1b



3/18

Figure 1c

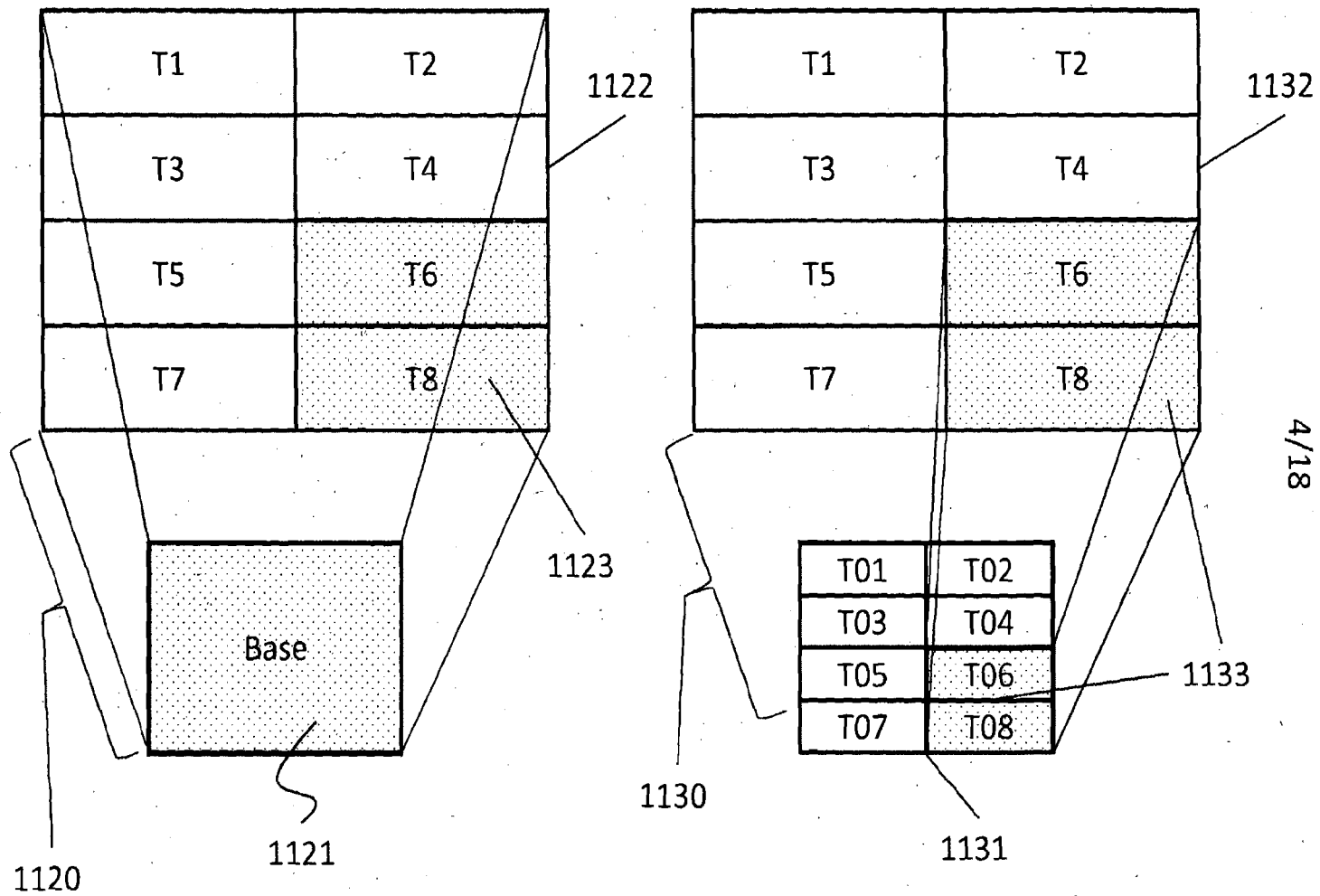
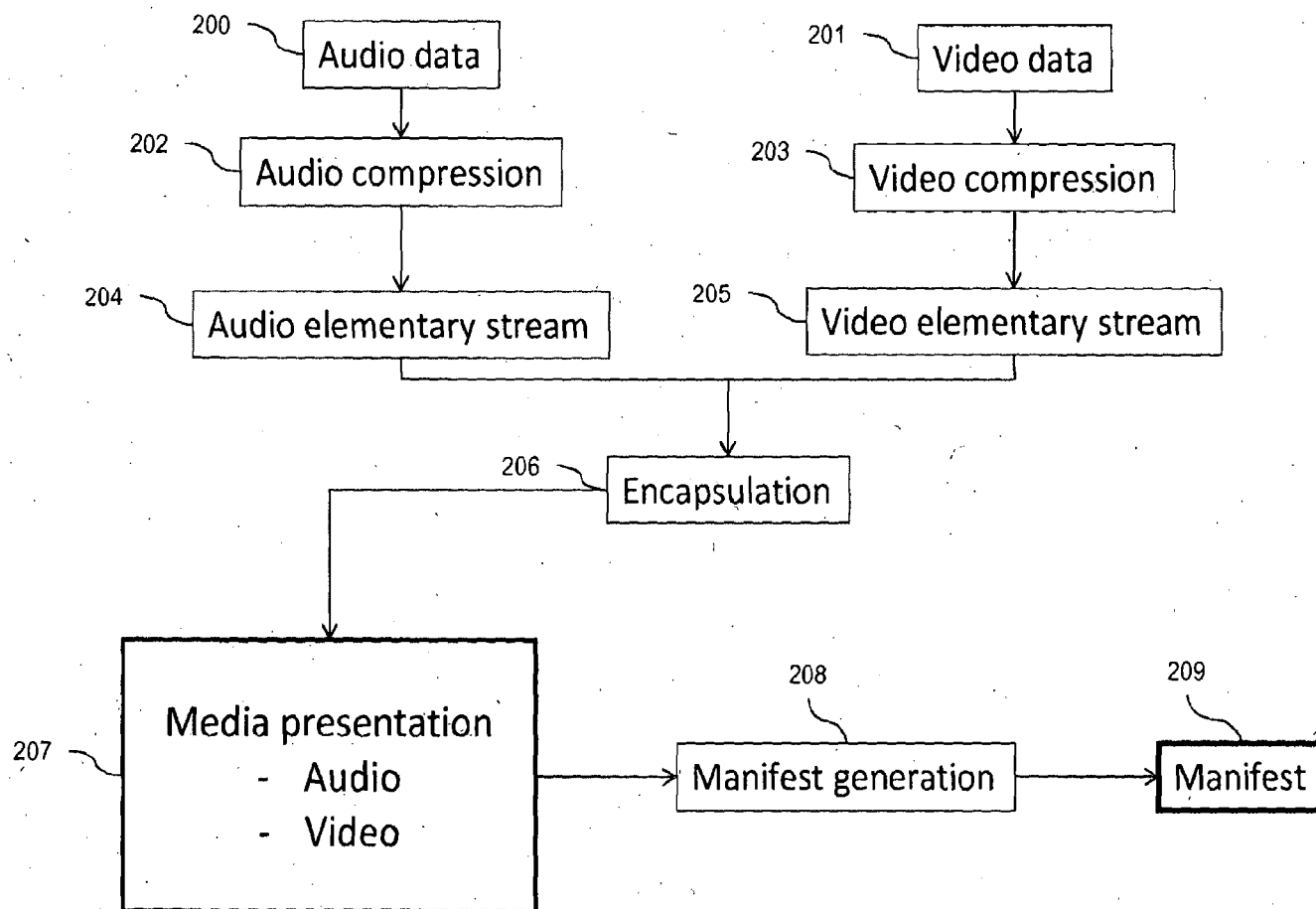


Figure 1d



5/18

Figure 2

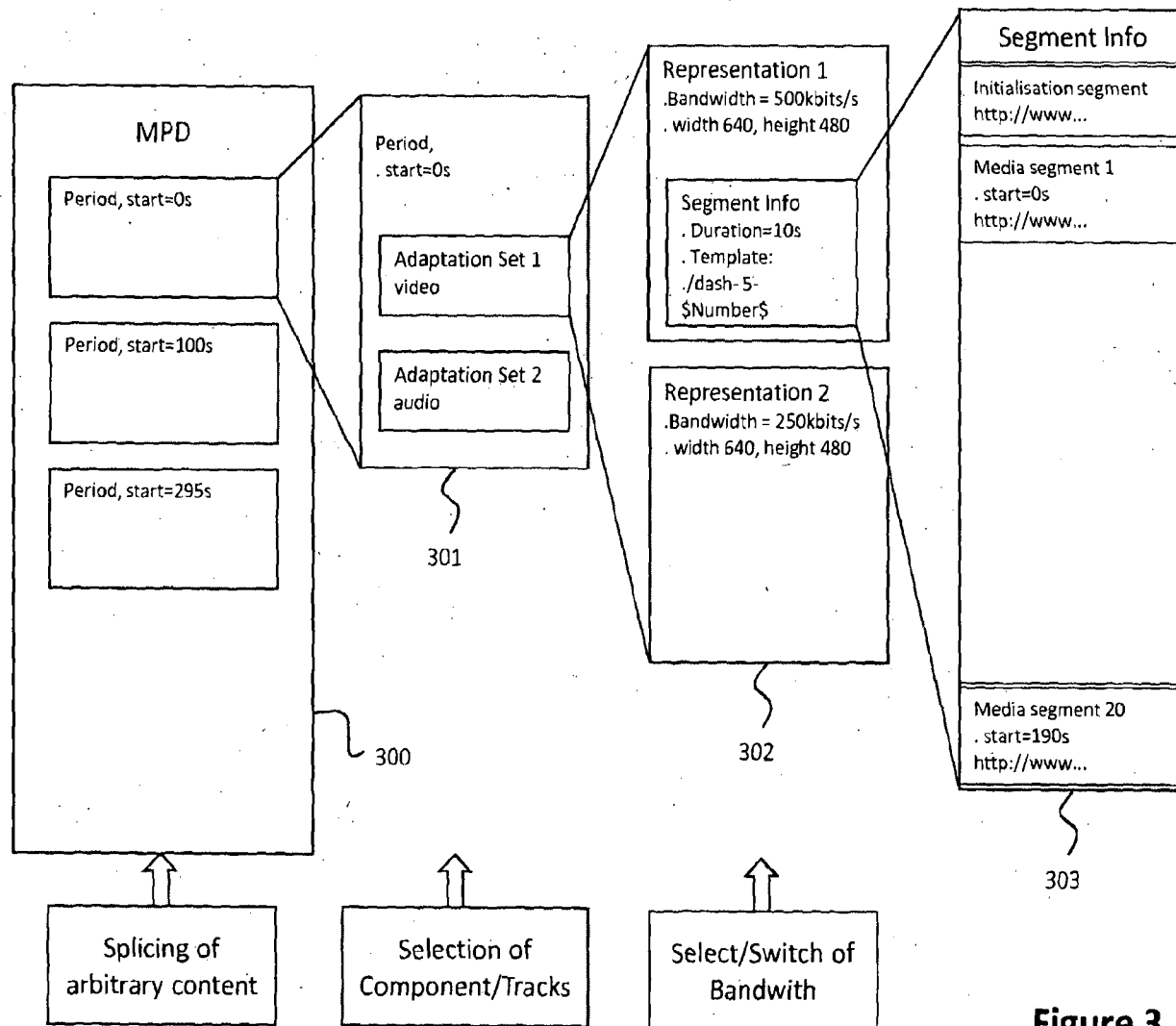


Figure 3


```

<?xml version="1.0"?>
<MPD xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="urn:mpeg-DASH:schema:MPD:2011"
  xsi:schemaLocation="urn:mpeg-DASH:schema:MPD:2011 DASH-MPD.xsd"
  type="static"
  mediaPresentationDuration="PT325S"
  minBufferTime="PT1.25"
  profiles="urn:mpeg-dash:profile:isoff-on-demand:2011">
  <BaseURL>http://cdn1.example.com/</BaseURL>
  <BaseURL>http://cdn2.example.com/</BaseURL>
  <Period>
    <i>English Audio</i>
    <AdaptationSet mimeType="audio/mp4" codecs="mp4a.0x40" lang="en"
      subsegmentAlignment="true" subsegmentStartsWithSAP="1">
      <ContentProtection schemeIdUri="urn:uuid:706D6953-656C-5244-4D48-
656164657221"/>
      <Representation id="1" bandwidth="64000">
        <BaseURL>7657412348.mp4</BaseURL>
      </Representation>
      <Representation id="2" bandwidth="32000">
        <BaseURL>3463646346.mp4</BaseURL>
      </Representation>
    </AdaptationSet>
    <i>Video</i>
    <AdaptationSet mimeType="video/mp4" codecs="avc1.400208"
      subsegmentAlignment="true" subsegmentStartsWithSAP="1">
      <ContentProtection schemeIdUri="urn:uuid:706D6953-656C-5244-4D48-
656164657221"/>
      <Representation id="6" bandwidth="256000" width="320" height="240">
        <BaseURL>8563456473.mp4</BaseURL>
      </Representation>
      <Representation id="7" bandwidth="512000" width="320" height="240">
        <BaseURL>56363634.mp4</BaseURL>
      </Representation>
      <Representation id="8" bandwidth="1024000" width="640" height="480">
        <BaseURL>562465736.mp4</BaseURL>
      </Representation>
      <Representation id="9" bandwidth="1384000" width="640" height="480">
        <BaseURL>41325645.mp4</BaseURL>
      </Representation>
      <Representation id="A" bandwidth="1536000" width="1280" height="720">
        <BaseURL>89045625.mp4</BaseURL>
      </Representation>
      <Representation id="B" bandwidth="2048000" width="1280" height="720">
        <BaseURL>23536745734.mp4</BaseURL>
      </Representation>
    </AdaptationSet>
  </Period>
</MPD>

```

7/18

Figure 4

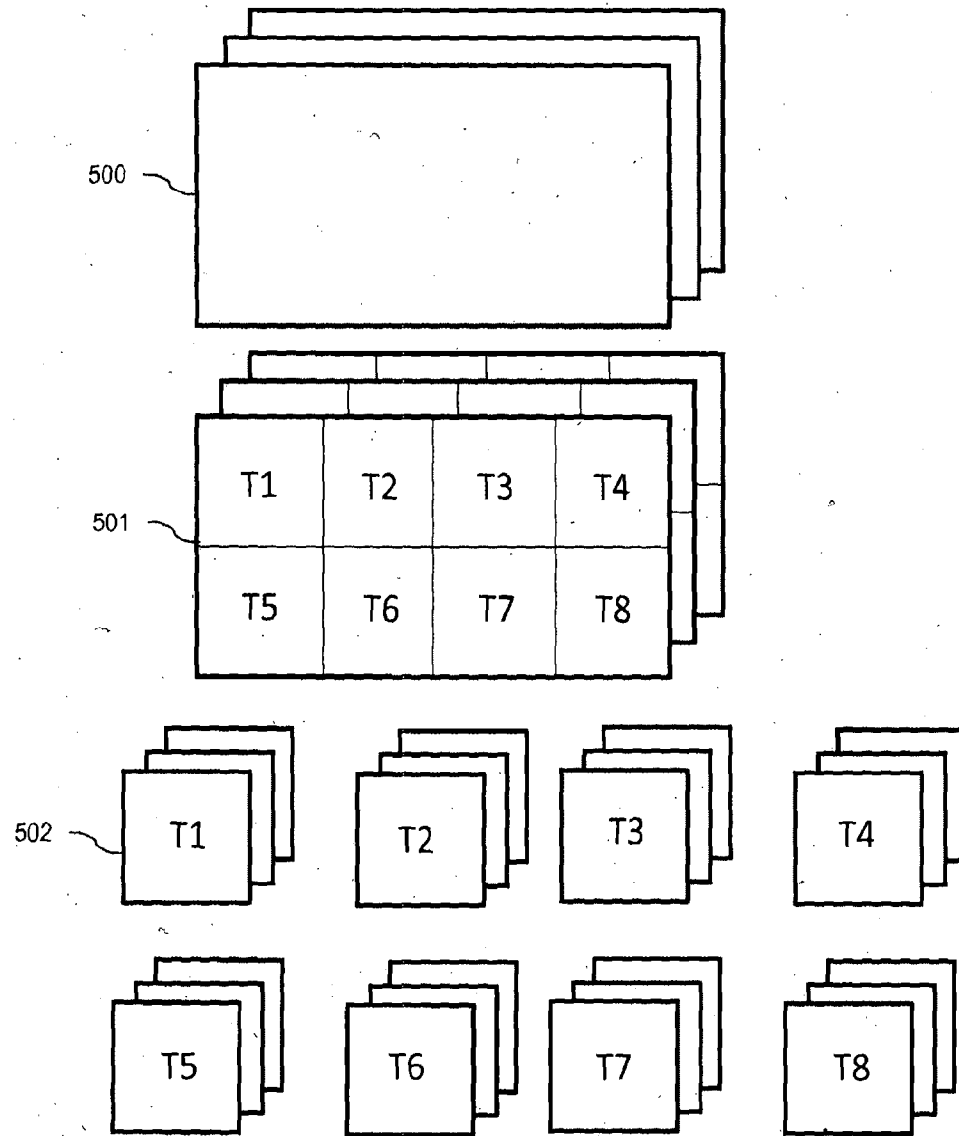
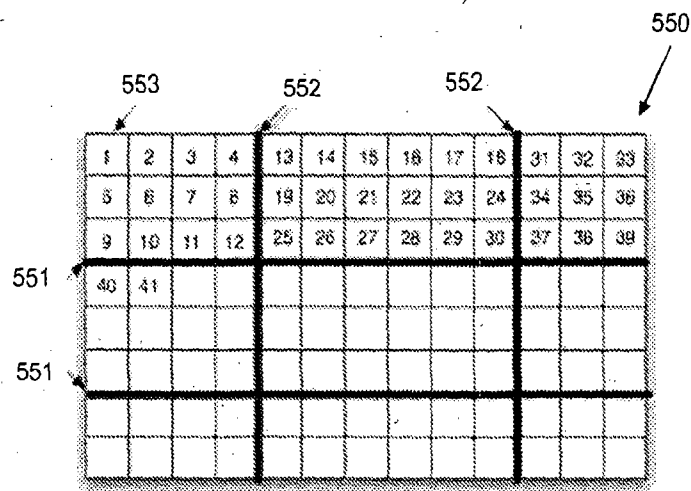


Figure 5



if(tiles_enabled_flag){	
num_tile_columns_minus1	ue(v)
num_tile_rows_minus1	ue(v)
uniform_spacing_flag	u(1)
if(!uniform_spacing_flag){	
for(i=0; i<num_tile_columns_minus1; i++)	
column_width_minus1[i]	ue(v)
for(i=0; i<num_tile_rows_minus1; i++)	
row_height_minus1[i]	ue(v)
}	
loop_filter_across_tiles_enabled_flag	u(1)
}	

9/18

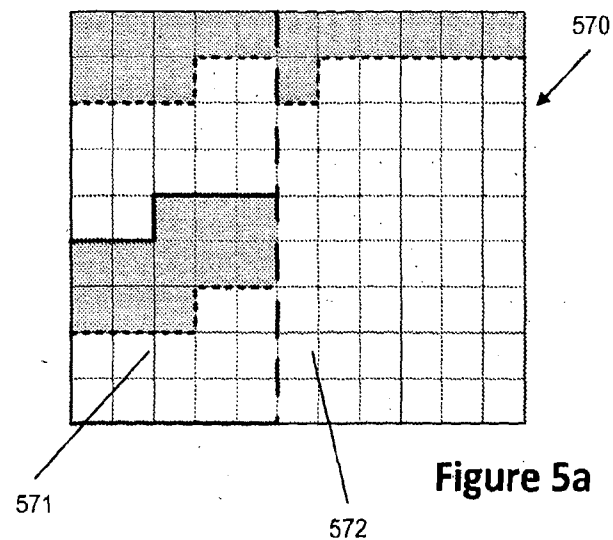
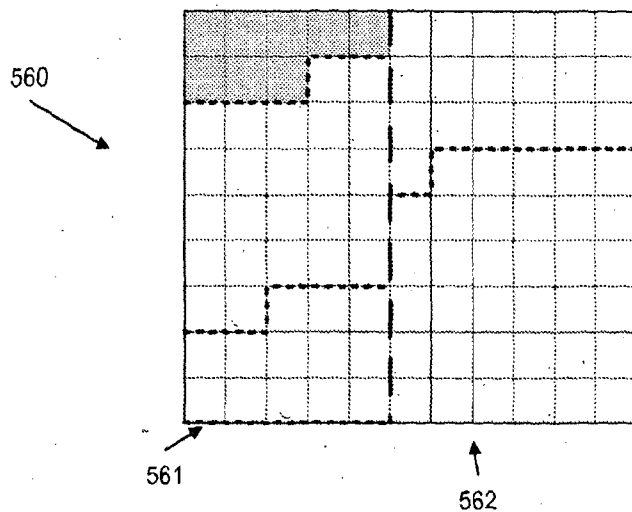


Figure 5a

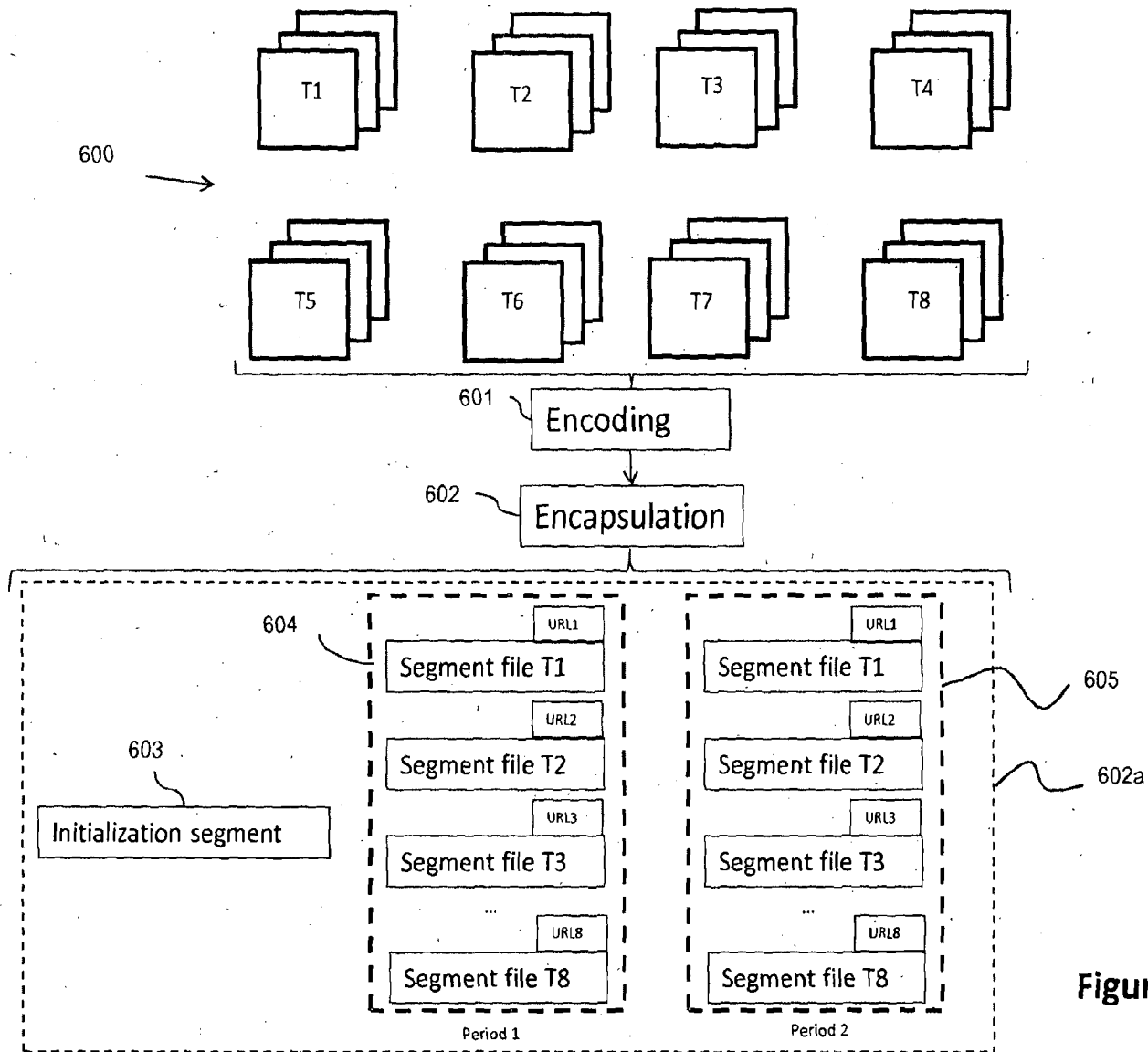
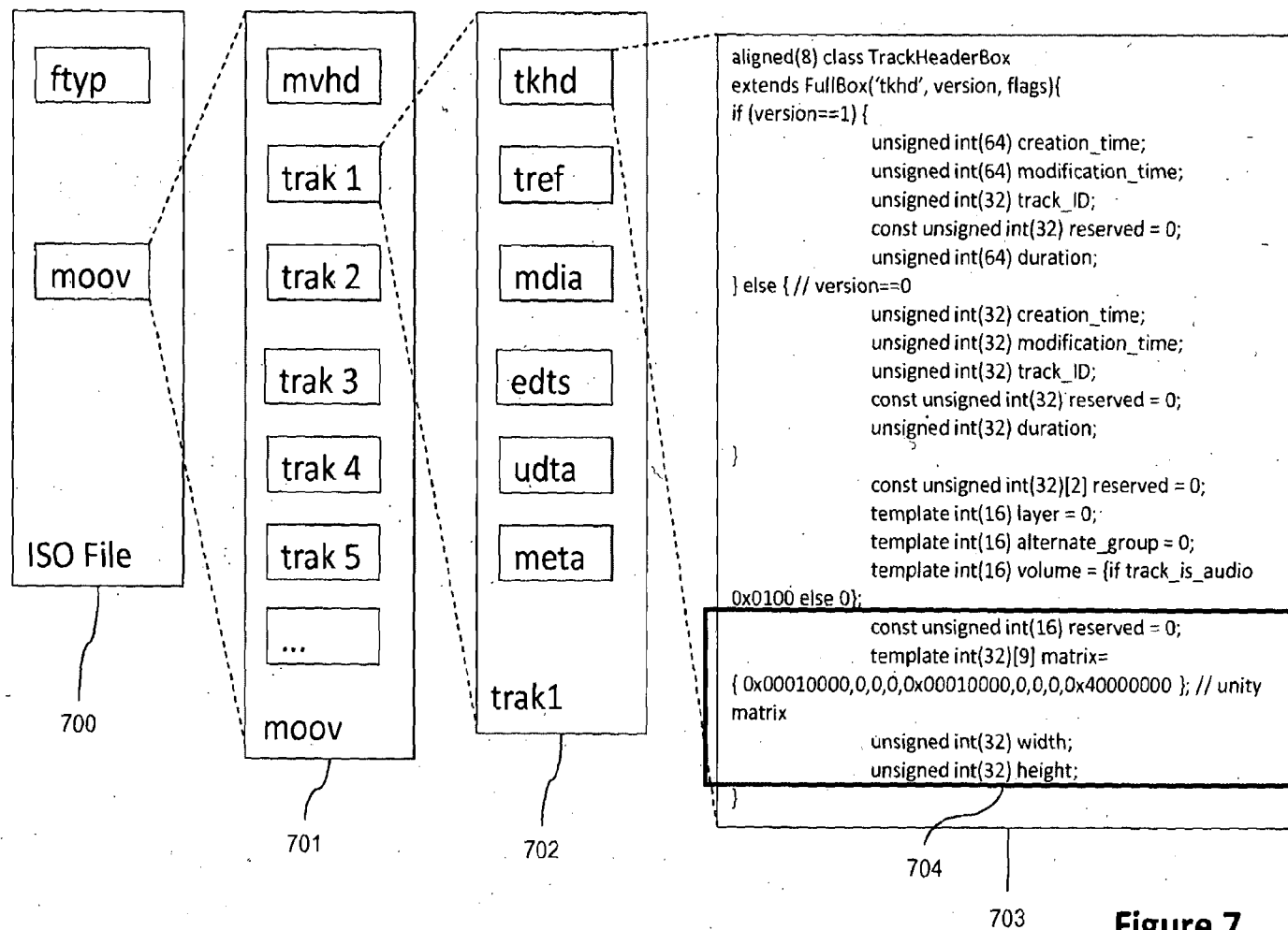


Figure 6



11/18

Figure 7

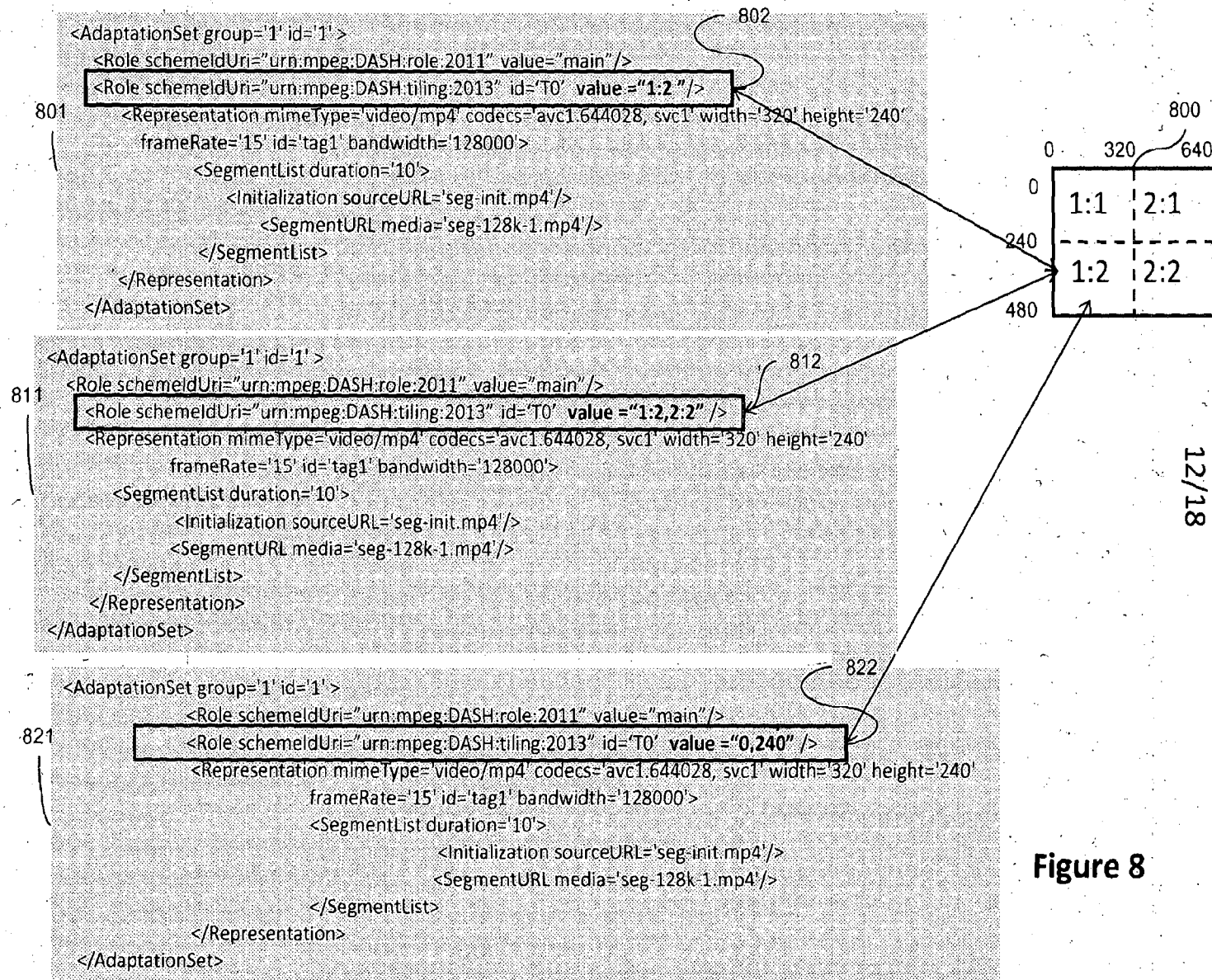
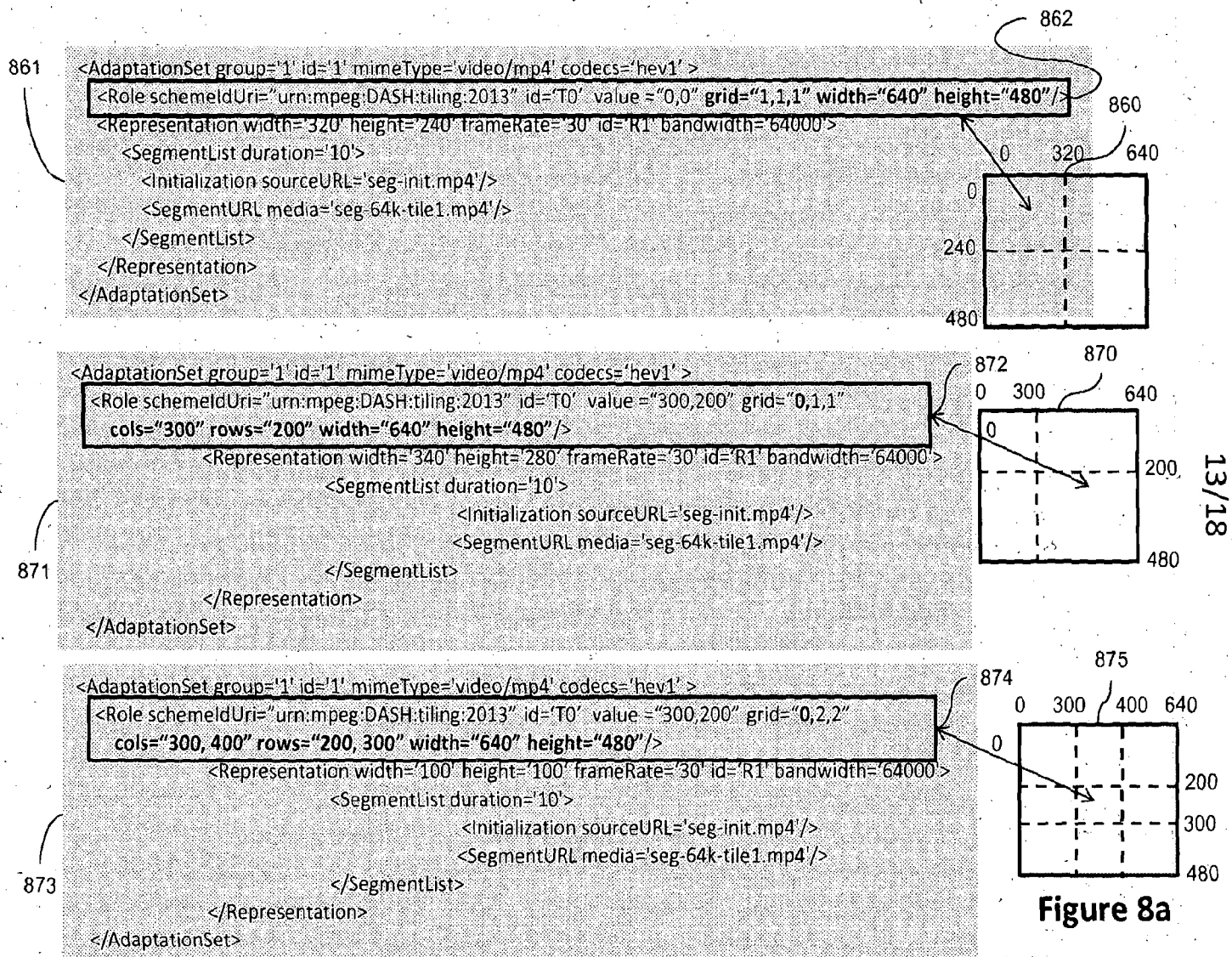


Figure 8



881

```

<Period...>
<Tiling id="tiling_1" uniform="1" cols="1" rows="1" width="640" height="480"/>
<AdaptationSet group="1" id="1" mimeType="video/mp4" codecs="hev1">
  <Role schemeIdUri="urn:mpeg:DASH:tiling:2013" id="tiling_1" value="0,0"/>
  <Representation width="320" height="240" frameRate="30" id="R1" bandwidth="64000">
    <SegmentList duration="10">
      <Initialization sourceURL="seg-init.mp4"/>
      <SegmentURL media="seg-64k-tile1.mp4"/>
    </SegmentList>
  </Representation>
</AdaptationSet>
</Period>

```

882

880

886

```

<Period...>
<Tiling id="tiling_1" uniform="0" cols="1" rows="1" width="640" height="480">
  <columns>200</columns> <rows>300</rows>
</Tiling>
<AdaptationSet group="1" id="1" mimeType="video/mp4" codecs="hev1">
  <Role schemeIdUri="urn:mpeg:DASH:tiling:2013" id="tiling_1" value="0,0"/>
  <Representation width="200" height="300" frameRate="30" id="R1" bandwidth="64000">
    <SegmentList duration="10">
      <Initialization sourceURL="seg-init.mp4"/>
      <SegmentURL media="seg-64k-tile1.mp4"/>
    </SegmentList>
  </Representation>
</AdaptationSet>
</Period>

```

887

885

Figure 8b

14/18


```

<?xml version='1.0' encoding='UTF-8'?>
<MPD
  xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
  xmlns='urn:mpeg:DASH:schema:MPD:2011'
  xmlns:xlink='http://www.w3.org/1999/xlink'
  xsi:schemaLocation='urn:mpeg:DASH:schema:MPD:2011
http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-DASH_schema_files/...
  .. DASH-MPD.xsd'
  minBufferTime='PT10.00S'
  mediaPresentationDuration='PT3256S'
  type='dynamic' availabilityStartTime='2001-12-17T09:40:57Z'
  profiles='urn:mpeg:dash:profile:full:2011'
  <Period start='PT0S'
    <subset contains='0 1 2 3'> </subset>
    <subset contains='4 5 6'> </subset>
    <AdaptationSet group='1' id='0'>
      <Representation mimeType='video/mp4' codecs='avc1.644028, ...
...svc1' width='640' height='480'
                                frameRate='15' id='tag0' bandwidth='128000'>
        <SegmentList duration='10'>
          <Initialization sourceURL='seg-init.mp4'>
          <SegmentURL media='seg-128k-1.mp4'>
        </SegmentList>
      </Representation>
    </AdaptationSet>
    <AdaptationSet group='1' id='1'>
      <Role schemeIdUri='urn:mpeg:DASH:role:2011' value='main'>
900 -----> <Role schemeIdUri='urn:mpeg:DASH:tiling:2013' id='1' value='0:0'>
      <Representation mimeType='video/mp4' codecs='avc1.644028, svc1' ...
... width='640' height='480' frameRate='15' id='tag1' bandwidth='128000'>
        <SegmentList duration='10'>
          <Initialization sourceURL='seg-init.mp4'>
          <SegmentURL media='seg-128k-1.mp4'>
        </SegmentList>
      </Representation>
    </AdaptationSet>
    <AdaptationSet group='2' id='2'>
      <Representation mimeType='audio/mp4' id='tag2' bandwidth='128000'...
... codecs='mp4a.0x40'>
        <SegmentList duration='10'>
          <Initialization sourceURL='seg-s-init.mp4'>
          <SegmentURL media='seg-s3-128k-1.mp4'>
        </SegmentList>
      </Representation>
    </AdaptationSet>

```

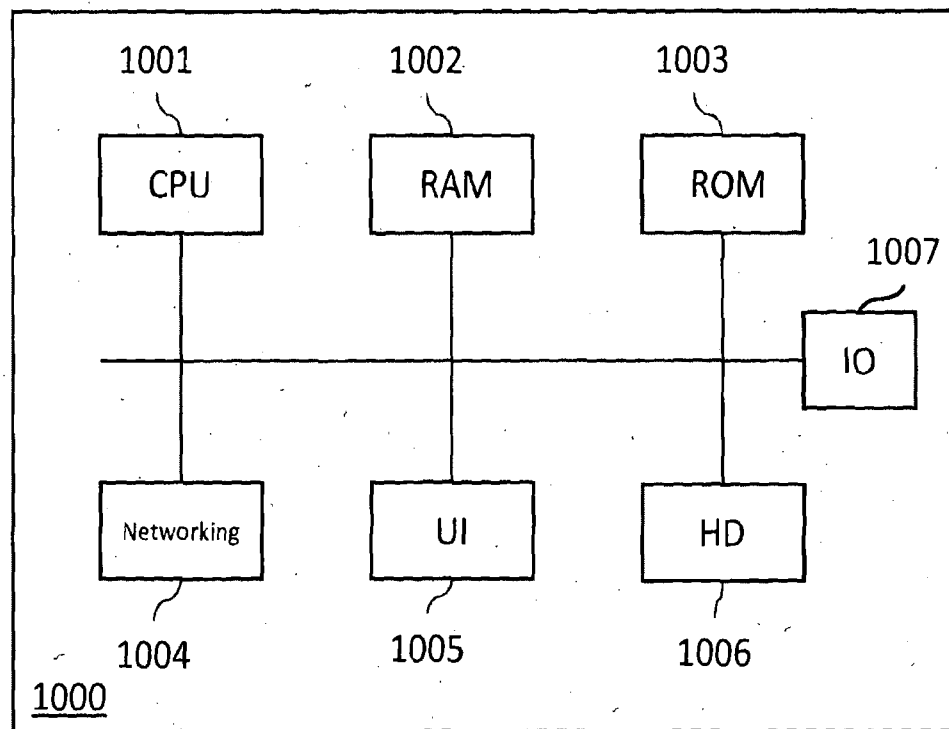
```

<AdaptationSet group='2' id='3'>
  <Role schemeIdUri='urn:mpeg:DASH:role:2011' value='main'>
910 → <Role schemeIdUri='urn:mpeg:DASH:tiling:2013' id='1' value='1'>
  <Representation mimeType='audio/mp4' id='tag3' bandwidth='128000'
codecs='mp4a.0x40'>
    <SegmentList duration='10'>
      <Initialization sourceURL='seg-s-init.mp4'>
      <SegmentURL media='seg-s3-128k-1.mp4'>
    </SegmentList>
  </Representation>
</AdaptationSet>
<AdaptationSet group='3' id='4'>
  <Role schemeIdUri='urn:mpeg:DASH:role:2011' value='main'>
920 → <Role schemeIdUri='urn:mpeg:DASH:tiling:2013' id='1' value='1:1'>
  <Representation mimeType='video/mp4' codecs='avc1.644028, svc1' ...
... width='320' height='240' frameRate='15' id='tag4' bandwidth='128000'>
    <SegmentList duration='10'>
      <Initialization sourceURL='seg-s-init.mp4'>
      <SegmentURL media='seg-s1-128k-1.mp4'>
    </SegmentList>
  </Representation>
</AdaptationSet>
<AdaptationSet group='4' id='5'>
  <Role schemeIdUri='urn:mpeg:DASH:role:2011' value='main'>
930 → <Role schemeIdUri='urn:mpeg:DASH:tiling:2013' id='1' value='1:2'>
  <Representation mimeType='video/mp4' codecs='avc1.644028, svc1' width='320'
... height='240' frameRate='15' id='tag5' bandwidth='128000'>
    <SegmentList duration='10'>
      <Initialization sourceURL='seg-s-init.mp4'>
      <SegmentURL media='seg-s2-128k-1.mp4'>
    </SegmentList>
  </Representation>
</AdaptationSet>
<AdaptationSet group='5' id='6'>
  <Role schemeIdUri='urn:mpeg:DASH:role:2011' value='main'>
940 → <Role schemeIdUri='urn:mpeg:DASH:tiling:2013' id='1' value='1'>
  <Representation mimeType='audio/mp4' id='tag6' bandwidth='128000' ...
... codecs='mp4a.0x40'>
    <SegmentList duration='10'>
      <Initialization sourceURL='seg-s-init.mp4'>
      <SegmentURL media='seg-s3-128k-1.mp4'>
    </SegmentList>
  </Representation>
</AdaptationSet>
</Period>
</MPD>

```

15/18

Figure 4



16/18

Figure 10

```

<?xml version="1.0"?>
<MPD
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="urn:mpeg:DASH:schema:MPD:2011"
  xsi:schemaLocation="urn:mpeg:DASH:schema:MPD:2011 DASH-MPD.xsd"
  profiles="urn:mpeg:dash:profile:full:2011"
  minBufferTime="PT5.0S"
  type="static"
  mediaPresentationDuration="PT32S6S">
  <BaseURL>http://www.example.com/server/Segments/</BaseURL>

1105 <Period start="PT0.00S" duration="PT32S6S">
  → <Subset contains="AS1"/>
    <Subset contains="AS2 AS3 AS4 AS5"/>
    <SegmentList duration="10">
      <Initialization sourceURL='seg-init.mp4'/>
    </SegmentList>

    <!-- Description of full-frame video -->
    <AdaptationSet id="AS1" mimeType='video/mp4' codecs='hev1'>
1100 <Role schemeIdUri="urn:mpeg:DASH:role:2011" value="main"/>
    → <Representation id="R0" width='1920' height='1080' frameRate='30' ...
      ...bandwidth='256000'>
        <SegmentList duration='10'>
          <SegmentURL media='seg-full-1.mp4'/>
        </SegmentList>
      </Representation>
    </AdaptationSet>

    <!-- Description of first tile -->
    <AdaptationSet id="AS2" mimeType='video/mp4' codecs='hev1'>
      <Role schemeIdUri="urn:mpeg:DASH:role:2011" value="alternate"/>
1101 <Role schemeIdUri="urn:mpeg:DASH:tiling:2013" id="TS1" value="0,0,960,540"/>
    → <Representation width='960' height='540' frameRate='30' bandwidth='64000'>
      <SegmentList duration='10'>
        <SegmentURL media='seg-tile1-1.mp4'/>
      </SegmentList>
    </Representation>
  </AdaptationSet>

  <!-- Description of second tile -->
  <AdaptationSet id="AS3" mimeType='video/mp4' codecs='hev1'>
    <Role schemeIdUri="urn:mpeg:DASH:role:2011"
      value="alternate"/>
    <Role schemeIdUri="urn:mpeg:DASH:tiling:2013" id="TS1" ...
      ...value="960,0,960,540"/>
1102 <Representation width='960' height='540' frameRate='30'
    → bandwidth='64000'>
      <SegmentList duration='10'>
        <SegmentURL media='seg-tile2-1.mp4'/>
      </SegmentList>
    </Representation>
  </AdaptationSet>

  <!-- Description of third tile -->
  <AdaptationSet id="AS4" mimeType='video/mp4' codecs='hev1'>
    <Role schemeIdUri="urn:mpeg:DASH:role:2011" ...
      ...value="alternate"/>
    <Role schemeIdUri="urn:mpeg:DASH:tiling:2013" id="TS1" value
      ="0,540,960,540"/>
1103 <Representation width='960' height='540' frameRate='30'
    → bandwidth='64000'>
      <SegmentList duration='10'>
        <SegmentURL media='seg-tile3-1.mp4'/>
      </SegmentList>
    </Representation>
  </AdaptationSet>

  <!-- Description of fourth tile -->
  <AdaptationSet id="AS5" mimeType='video/mp4' codecs='hev1'>
    <Role schemeIdUri="urn:mpeg:DASH:role:2011" ...
      ...value="alternate"/>
    <Role schemeIdUri="urn:mpeg:DASH:tiling:2013" id="TS1" value
      ="960,540,960,540"/>
1104 <Representation width='960' height='540' frameRate='30'
    → bandwidth='64000'>
      <SegmentList duration='10'>
        <SegmentURL media='seg-tile4-1.mp4'/>
      </SegmentList>
    </Representation>
  </AdaptationSet>
</Period>
</MPD>

```

17/18

Figure 11

1200

1201

```
<AdaptationSet id='AS1' mimeType='video/mp4' codecs='hev1'>
  <Role schemeIdUri="urn:mpeg:DASH:tiling:2013" id='TS1' value="0,0,960,540"/>
  <Representation width='960' height='540' frameRate='30' id='R1' bandwidth='64000'>
    <SegmentList duration='10'>
      <SegmentURL media='seg-tile1.mp4' />
      ...
    </SegmentList>
  </Representation>
</AdaptationSet>
```

18/18

Figure 12



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-cont-CINC

CONFIRMATION NO. 4207

PUBLICATION NOTICE

34904
CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION
15975 ALTON PARKWAY
IRVINE, CA 92618-3731



Title:METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

Publication No.US-2018-0041610-A1

Publication Date:02/08/2018

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publicly available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Search Notes 	Application/Control No. 15/783,999	Applicant(s)/Patent Under Reexamination DENOUAL et al.
	Examiner BENJAMIN M THIEU	Art Unit 2441

CPC - Searched*		
Symbol	Date	Examiner
H04N21/858, H04N21/63, H04N21/6332, H04N21/2343, H04N21/845, H04N21/4728, H04N21/8456, H04N21/6332, H04N21/8586, H04N21/4728, H04N21/234327, H04N21/631	02/27/2018	BT

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Performed Inventor Search	02/27/2018	BT
Searched EAST (US-PGPUB, USPAT, EPO, JPO, DERWENT, IBM_TDB)	02/27/2018	BT

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/BENJAMIN M THIEU/ Primary Examiner, Art Unit 2441	

Notice of References Cited	Application/Control No. 15/783,999	Applicant(s)/Patent Under Reexamination DENOUAL et al.	
	Examiner BENJAMIN M THIEU	Art Unit 2441	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20030142872-A1	07-2003	Koyanagi, Masahiko	H04N21/234327	382/236
*	B	US-20040136598-A1	07-2004	Le Leannec, Fabrice	H04N21/234327	382/232
*	C	US-20070024706-A1	02-2007	Brannon; Robert H. JR.	H04N7/17318	348/142
*	D	US-20140089990-A1	03-2014	van Deventer; Mattijs Oskar	H04N21/218	725/61
*	E	US-20150208095-A1	07-2015	SCHIERL; Thomas	H04N19/70	375/240.28
*	F	US-9860572-B2	01-2018	van Deventer; Mattijs Oskar	H04N21/234363	1/1
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N	WO-2011125051-A1	10-2011	WO	FABLET YOUENN	H04N7/17336
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	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**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	(15/783999).APP.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/02/22 15:38
S2	74	((("DENOUAL") near3 ("Franck"))).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/02/22 16:14
S3	58	((("LE") near3 ("FLOCH") near3 ("Herve"))).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/02/22 16:14
S4	83	((("MAZE") near3 ("Frederic"))).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/02/22 16:14
S5	19	((("LE") near3 ("FEUVRE") near3 ("Jean"))).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/02/22 16:14
S6	20	((("CONCOLATO") near3 ("Cyril"))).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/02/22 16:14
S7	46	(S2 or S3 or S4 or S5 or S6) and Region with Interest	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/22 16:14
S8	35	(S2 or S3 or S4 or S5 or S6) and Region with Interest same spatial	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/22 16:39
S9	0	(S2 or S3 or S4 or S5 or S6) and Region with Interest same spatial with organization	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/22 16:39
S10	11	(S2 or S3 or S4 or S5 or S6) and Region with Interest same spatial with organization	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/22 16:39
S11	2	(14/434741).APP.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/02/22 17:28

S12	1	("20030142872").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/02/27 15:12
S13	11752	((region near2 interest) or "ROI") same spatial	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 15:31
S14	182	S13 and (H04N21/858 OR H04N21/63 OR H04N21/6332 OR H04N21/2343 OR H04N21/845 OR H04N21/4728 OR H04N21/8456 OR H04N21/6332 OR H04N21/8586 OR H04N21/4728 OR H04N21/234327 OR H04N21/631).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 15:33
S15	2263	((region near2 interest) or "ROI") same spatial with (organiz\$7 or information or scal\$7)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 15:35
S16	1544	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") same spatial with (organiz\$7 or information or scal\$7 or position)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 15:37
S17	52	S16 and (H04N21/858 OR H04N21/63 OR H04N21/6332 OR H04N21/2343 OR H04N21/845 OR H04N21/4728 OR H04N21/8456 OR H04N21/6332 OR H04N21/8586 OR H04N21/4728 OR H04N21/234327 OR H04N21/631).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 15:38
S18	24	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") same spatial with (organiz\$7 or information or scal\$7 or position) same (URL or HTTP)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 16:00
S19	81	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) same (URL or HTTP)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 16:07
S20	21	S19 and (H04N21/858 OR H04N21/63 OR H04N21/6332 OR H04N21/2343 OR H04N21/845 OR H04N21/4728 OR H04N21/8456 OR H04N21/6332 OR H04N21/8586 OR H04N21/4728 OR H04N21/234327 OR H04N21/631).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 16:12
S21	0	("2011125051").PN.	US-PGPUB; USPAT;	OR	OFF	2018/02/27 16:13

EAST Search History

			USOCR			
S22	11	"2011125051"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 16:13
S23	2	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) same height same width same (URL or HTTP)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 16:16
S24	20	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) with region same (URL or HTTP)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/02/27 16:19

EAST Search History (Interference)

<This search history is empty>

2/27/2018 4:34:35 PM**C:\Users\bthieu\Documents\EAST\Workspaces\15783999.wsp**



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-cont-CINC	4207
34904 7590 03/05/2018 CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION 15975 ALTON PARKWAY IRVINE, CALIFORNIA 92618-3731			EXAMINER THIEU, BENJAMIN M	
			ART UNIT 2441	PAPER NUMBER
			NOTIFICATION DATE 03/05/2018	DELIVERY MODE ELECTRONIC

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 the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPDocketing@cusa.canon.com
mkavetsky@cusa.canon.com
skalminov@cusa.canon.com

Office Action Summary

Application No.

15/783,999

Applicant(s)

DENOVAL et al.

Examiner

BENJAMIN M THIEU

Art Unit

2441

AIA Status

No

-- 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 MONTHS 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 Preliminary Amendments filed October 13, 2017
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4) ☐ 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*

5) ☒ Claim(s) 1-16,22-30 and 32-33 is/are pending in the application.
5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☒ Claim(s) 1-16,22-30 and 32-33 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov**.

Application Papers

10) ☐ The specification is objected to by the Examiner.

11) ☒ The drawing(s) filed on 13 October 2017 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).

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).

Certified copies:

a) ☒ All b) ☐ Some** c) ☐ None of the:

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)
- 2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date _____
- 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 4) ☐ Other: _____

DETAILED ACTION

1. This Office Action is in response to the Preliminary Amendments filed October 13, 2017. Claim(s) 17-21 and 31 have been canceled. Therefore, Claim(s) 1-16, 22-30, and 32-33 are pending and have been considered as follows.

Notice of Pre-AIA or AIA Status

2. The present application is being examined under the pre-AIA first to invent provisions.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting

provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(I)(1) - 706.02(I)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

4. Claim(s) 1, 4, 14, and 22 is/are rejected on the ground of nonstatutory double patenting as being unpatentable over claim(s) 1, 9, 29, and 54 of U.S. Patent No. 9,883,011 B2.

5. Although the claims at issue are not identical, they are not patentably distinct from each other because claim(s) 1, 9, 29, and 54 of U.S. Patent No. 9,883,011 B2 recites elements of claim(s) 1, 4, 14, and 22 of the instant application and thus anticipate the claims of the instant application. Claims of the instant application therefore are not patently distinct from the earlier patent claims and as such are unpatentable over obvious-type double patenting. A later application claim is not patently distinct from an earlier claim if the later claim is anticipated by the earlier claim.

6. The following comparison as alphabetized shows the limitations that is common in both applications:

U.S. Patent No. 9,883,011 B2	Instant Application: 15/783999
Claim 1: A method for streaming data corresponding to a video, each of a plurality of frames of the video being divided into n spatial tiles, n being an integer, the method comprising: transmitting, by a server, a description file to a client device, said description file including data about a spatial position of each of the n spatial tiles and including data about at least n URLs corresponding to the n spatial tiles, determining by the client device one or more URLs according to the data about the spatial position included in the description file, receiving from the client device, by the server, one or more request messages for requesting one or more spatial tiles, each request message comprising one of the URLs determined by the client device, and transmitting to the client device, by the server, video data corresponding to the one or more spatial tiles, in response to the one or more request messages.	Claim 1: A method for streaming data corresponding to a given video, each frame of the video being divided into n partitions, n being an integer, in order to create n independent partial videos, the method comprising: transmitting, by a server, a notification to a client, said notification including spatial information about a spatial organization of the n partial videos, receiving from the client which received the notification, by the server, one or more messages for requesting one or more partial videos according to a Region Of Interest selected based on an operation by a user of the client, and transmitting to the client, by the server, video data corresponding to the one or more partial videos, in response to the one or more messages from the client.
Claim 9: A method for providing data by a server device to a client device, said data corresponding to a video, each of a plurality of frames of the video being divided into n spatial tiles, n being an integer, the method comprising: transmitting a description file to the client device, said description file including data about the spatial position of each of the n spatial tiles, and including data about at least	Claim 4: A transmitting method for transmitting video data to a client, the method comprising: transmitting, to the client, a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a

n URLs corresponding to the n spatial tiles, and transmitting, to the client device, data corresponding to one or more spatial tiles of the video in response to one or more request messages from the client devices, each request message comprising one of the URLs.	spatial size of each of the n spatial regions of the videos, receiving, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client, and transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client.
Claim 29: A method for obtaining data corresponding to a video by a client device, each of a plurality of frames of the video being divided into n spatial tiles, n being an integer, the method comprising: receiving a description file including data about a spatial position of each of the n spatial tiles and including data about at least n URLs corresponding to the n spatial tiles, determining one or more URLs according to the data about the spatial position included in the description file, and transmitting one or more request messages for requesting one or more spatial tiles of the video, each request message comprising one of the URLs determined by the client device, receiving the one or more spatial tiles of the video requested by the request messages.	Claim 14: A method for receiving video data from a server, the method comprising: receiving, from the server, a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video, transmitting, to the server, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted from the server, and receiving, from the server, the video data corresponding to the one or more spatial regions according to the information transmitted to the server.
Claim 54:	Claim 22:

A client apparatus for obtaining data corresponding to a video, each of a plurality of frames of the video being divided into n spatial tiles, n being an integer, said client apparatus including a memory and a processor coupled to the memory which executes the following: receiving a description file including data about a spatial position of each of the n spatial tiles and including data about at least n URLs corresponding to the n spatial tiles, one or more URLs according to the data about the spatial position included in the description file, and transmitting one or more request messages for requesting one or more spatial tiles of the video, each request message comprising one of the URLs determined by the client device, receiving the one or more spatial tiles of the video corresponding to the requested video sub-tracks, in response to the request messages.	An apparatus for transmitting video data to a client, the apparatus comprising: a hardware processor; and a memory storing one or more programs configured to be executed by the hardware processor, the one or more programs including instructions for: transmitting, to the client, a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video; receiving, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client; and transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client.

Claim Rejections - 35 USC § 103

7. The following is a quotation of pre-AIA 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, 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.

8. **Claim(s) 1-16, 22-30, and 32-33 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Mavlankar et al. (non-patented literature, "An interactive region-of-interest video streaming system for online lecture viewing", hereinafter Mavlankar), in view of Koyanagi (US 2003/0142872 A1, hereinafter Koyanagi).**

9. **As to Claim 1, Mavlankar** discloses a method for streaming data corresponding to a given video, each frame of the video being divided into n partitions, n being an integer, in order to create n independent partial videos (**Mavlankar; Fig. 4; [section 3.1]**, the method comprising:

transmitting, by a server, a notification to a client (**(Mavlankar; Figs3. 2 & 4; [section 3.1]**, where *Mavlankar discloses transmitting a notification, i.e. thumbnail video, to a client device.*),

receiving from the client which received the notification (**(Mavlankar; [section 1, 2nd paragraph]**), where *Mavlankar discloses the ability for a user to select a region of interest the user wishes to view.*), by the server, one or more messages for requesting one or more partial videos according to a Region Of Interest selected based on an operation by a user of the client (**(Mavlankar; [section 3.3, section 4])**, where *Mavlankar discloses receiving a request to view/processor the video frame by frame.*), and

transmitting to the client, by the server, video data corresponding to the one or more partial videos, in response to the one or more messages from the client messages (**(Mavlankar; Figs. 3 & 4; [section 2]**, where *Mavlankar discloses the client devices receiving the video content segments individually.*).

However, **Mavlankar** does not disclose said notification including spatial information about a spatial organization of the n partial videos.

In an analogous art, **Koyanagi** discloses said notification including spatial information about a spatial organization of the n partial videos ((**Koyanagi; Fig. 5; [0106-0111]**), *where Koyanagi discloses the organization of the n tiles to be transmitted.*).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Mavlankar to include said notification including spatial information about a spatial organization of the n partial videos as taught by Koyanagi to enable display of partial view of the media without increasing the processing load (Koyanagi; [0060]).

10. **As to Claim 2, Mavlankar-Koyanagi** discloses the method according to claim 1, wherein the spatial information represents a spatial position of each of the n partial videos (**Mavlankar; Fig. 4; [section 3.1], (Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**).

11. **As to Claim 3, Mavlankar-Koyanagi** discloses the method according to claim 2, wherein the spatial position is represented by a coordinate value of a top-left corner, a width and a height of a partial video (**Mavlankar; Fig. 4; [section 3.1], (Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**).

12. **As to Claim 4, Mavlankar** discloses a transmitting method for transmitting video data to a client, the method comprising:

transmitting, to the client, a notification ((**Mavlankar; Figs3. 2 & 4; [section 3.1]**), *where Mavlankar discloses transmitting a notification, i.e. thumbnail video, to a client device.*),

receiving, from the client which received the notification ((**Mavlankar; [section 1, 2nd paragraph]**), *where Mavlankar discloses the ability for a user to select a region of interest the user wishes to view.*), information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client ((**Mavlankar; [section 3.3, section**

4]), where Mavlankar discloses receiving a request to view/processor the video frame by frame.), and

transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client ((Mavlankar; Figs. 3 & 4; [section 2], where Mavlankar discloses the client devices receiving the video content segments individually.).

However, **Mavlankar** does not disclose (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the videos.

In an analogous art, **Koyanagi** discloses (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the videos ((Koyanagi; Fig. 5; [0106-0111]), where Koyanagi discloses the organization of the n tiles to be transmitted.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Mavlankar to include (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the videos as taught by Koyanagi to enable display of partial view of the media without increasing the processing load (Koyanagi; [0060]).

13. **As to Claim 5, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein the spatial position information represents a coordinate value of each of the n spatial regions (**Mavlankar; Fig. 4; [section 3.1), (Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114]).**

14. **As to Claim 6, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein the spatial position information represents a coordinate value of a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions (**Mavlankar; Fig. 4; [section 3.1), (Koyanagi; Figs. 3-5; [0106-0111, 0114])**).

15. **As to Claim 7, Mavlankar-Koyanagi** discloses the method according to claim 5, wherein the spatial position information represents an x-coordinate value and a y-coordinate value of each of the n spatial regions (**Mavlankar; Fig. 4; [section 3.1), (Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**).

16. **As to Claim 8, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein the spatial position information represents a partition number in the video of each of the n spatial regions (**Mavlankar; Fig. 4; [section 3.1), (Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**).

17. **As to Claim 9, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein the notification further includes partition number information representing a number of partitions of the video corresponding to the n spatial regions in the horizontal direction and in the vertical direction (**Koyanagi; Figs. 3-5; [0106-0111, 0114])**).

18. **As to Claim 10, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein a spatial size of at least one spatial region is different from a spatial size of another spatial region, and the spatial size information represents a spatial size of each of the n spatial regions (**Mavlankar; Fig. 4; [section 3.1), (Koyanagi; Figs. 3-5; [0106-0111, 0114])**).

19. **As to Claim 11, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein the spatial size information further represents a spatial size of a video corresponding to the n spatial regions (**Mavlankar; Fig. 4; [section 3.1], (Koyanagi; Figs. 3-5; [0106-0111, 0114])**).

20. **As to Claim 12, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein each frame of the video corresponding to the n spatial regions is divided into n rectangles (**Mavlankar; Fig. 4; [section 3.1], (Koyanagi; Figs. 3-5; [0106-0111, 0114])**).

21. **As to Claim 13, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein each frame of the video corresponding to the n spatial regions is divided into n partitions and compressed independently in order to create the n spatial regions (**Mavlankar; Fig. 4; [section 3.1], (Koyanagi; Figs. 3-5; [0106-0111, 0114, 0170])**).

22. **As to Claim 14, Mavlankar** discloses a method for receiving video data from a server, the method comprising:

receiving, from the server, a notification ((**Mavlankar; Figs3. 2 & 4; [section 3.1]**), *where Mavlankar discloses transmitting a notification, i.e. thumbnail video, to a client device.*),

transmitting, to the server, information ((**Mavlankar; [section 1, 2nd paragraph]**), *where Mavlankar discloses the ability for a user to select a region of interest the user wishes to view.*)

relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted from the server ((**Mavlankar; [section 3.3, section 4]**), *where Mavlankar discloses receiving a request to view/processor the video frame by frame.*), and, and

receiving, from the server, the video data corresponding to the one or more spatial regions according to the information transmitted to the server ((**Mavlankar; Figs. 3 & 4;**

[section 2], where Mavlankar discloses the client devices receiving the video content segments individually.).

However, **Mavlankar** does not disclose a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video.

In an analogous art, **Koyanagi** discloses a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video (**(Koyanagi; Fig. 5; [0106-0111])**, where Koyanagi discloses the organization of the n tiles to be transmitted.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Mavlankar to include a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video as taught by Koyanagi to enable display of partial view of the media without increasing the processing load (Koyanagi; [0060]).

23. **As to Claim 15, Mavlankar-Koyanagi** discloses the method according to claim 14, wherein the spatial position information represents a coordinate value of each of the n spatial regions (**Mavlankar; Fig. 4; [section 3.1], (Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**).

24. **As to Claim 16, Mavlankar-Koyanagi** discloses the method according to claim 14, wherein the spatial position information represents a coordinate value of a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a

height of each of the n spatial regions (**Mavlankar; Fig. 4; [section 3.1], (Koyanagi; Figs. 3-5; [0106-0111, 0114])**).

25. **As to Claim 22, Mavlankar** discloses an apparatus for transmitting video data to a client, the apparatus comprising:

a hardware processor (**Mavlankar; Fig. 3**); and

a memory storing one or more programs configured to be executed by the hardware processor (**Mavlankar; Fig. 3**), the one or more programs including instructions for:

transmitting, to the client, a notification ((**Mavlankar; Figs3. 2 & 4; [section 3.1]**), *where Mavlankar discloses transmitting a notification, i.e. thumbnail video, to a client device.*);

receiving, from the client which received the notification ((**Mavlankar; [section 1, 2nd paragraph]**), *where Mavlankar discloses the ability for a user to select a region of interest the user wishes to view.*), information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client ((**Mavlankar; [section 3.3, section 4]**), *where Mavlankar discloses receiving a request to view/processor the video frame by frame.*); and

transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client ((**Mavlankar; Figs. 3 & 4; [section 2]**), *where Mavlankar discloses the client devices receiving the video content segments individually.*).

However, **Mavlankar** does not disclose a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video.

In an analogous art, **Koyanagi** discloses a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video (**(Koyanagi; Fig. 5; [0106-0111])**, *where Koyanagi discloses the organization of the n tiles to be transmitted.*).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Mavlankar to include a notification including (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video as taught by Koyanagi to enable display of partial view of the media without increasing the processing load (Koyanagi; [0060]).

26. **As to Claim 23, Mavlankar-Koyanagi** discloses the apparatus according to claim 22, wherein the spatial position information represents a coordinate value of each of the n spatial regions (**Mavlankar; Fig. 4; [section 3.1), (Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**).

27. **As to Claim 24, Mavlankar-Koyanagi** discloses the apparatus according to claim 22, wherein the spatial position information represents a coordinate value of a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions (**Mavlankar; Fig. 4; [section 3.1), (Koyanagi; Figs. 3-5; [0106-0111, 0114])**).

28. **As to Claim 25, Mavlankar-Koyanagi** discloses the apparatus according to claim 23, wherein the spatial position information represents an x-coordinate value and a y-coordinate value of each of the n spatial regions (**Mavlankar; Fig. 4; [section 3.1), (Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**).

29. **As to Claim 26, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein the information received from the client includes one or more URLs associated with the one or more spatial regions **(Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**.

30. **As to Claim 27, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein the information received from the client includes one or more HTTP addresses associated with the one or more spatial regions **(Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**.

31. **As to Claim 28, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein, in a case where a spatial position of the n spatial regions for a first time period and a spatial position of the n spatial regions for a second time period are different from each other, a first notification for the first time period and a second notification for the second time period are transmitted to the client **(Mavlankar; Fig. 4; [section 3.1), (Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**.

32. **As to Claim 29, Mavlankar-Koyanagi** discloses the method according to claim 28, wherein the first notification includes (i) first spatial position information representing a spatial position of each of the n spatial regions for the first time period and (ii) first spatial size information representing a spatial size of each of the n spatial regions for the first time period, and the second notification includes (iii) second spatial position information representing a spatial position of each of the n spatial regions for the second time period and (iv) second spatial size information representing a spatial size of each of the n spatial regions for the second time period **(Mavlankar; Fig. 4; [section 3.1), (Koyanagi; Figs. 3 A-B, 5; [0106-0111, 0114])**.

33. **As to Claim 30, Mavlankar-Koyanagi** discloses the method according to claim 4, wherein the notification further includes a parameter relating to at least one of an image resolution, a frame rate and a bandwidth of the video (**Mavlankar; Fig. 4; [section 3.1], (Koyanagi; Figs. 3 - 5; [0104-0111, 0114])**).

34. **As to Claim 32, Mavlankar-Koyanagi** discloses the apparatus according to claim 22, further comprising a camera unit for performing capturing to obtain the video data (**Mavlankar; Fig. 3), (Koyanagi; Fig. 8)**).

35. **As to Claim 33, Mavlankar-Koyanagi** discloses the method according to claim 14, further comprising determining a Region Of Interest based on a signal from a user interface, wherein the one or more spatial regions include the Region Of Interest (**(Mavlankar; [section 1, 2nd paragraph])**), *where Mavlankar discloses the ability for a user to select a region of interest the user wishes to view. (Mavlankar; [section 3.3, section 4])*, *where Mavlankar discloses receiving a request to view/processor the video frame by frame.*), (**Koyanagi; [0090]**).

Conclusion

36. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. **See PTO-892.**

37. The examiner also requests, in response to this Office action, support be shown for language added to any original claims on amendment and any new claims. That is, indicate support for newly added claim language by specifically pointing to page(s) and line no(s) in the specification and/or drawing figure(s). This will assist the examiner in prosecuting the application.

38. When responding to this office action, Applicant is advised to clearly point out the patentable novelty which he or she thinks the claims present, in view of the state of the art disclosed by the references cited or the objections made. He or she must also show how the amendments avoid such references or objections See 37 CFR 1.111(c).

39. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BENJAMIN M THIEU whose **telephone number** is (571)270-7475 and **fax number** is (571) 270-8475. The examiner can normally be reached on 8:30 - 6:00 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wing Chang can be reached on 571-272-7493. 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.

/BENJAMIN M THIEU/
Primary Examiner, Art Unit 2441
2.27.2018

(43) International Publication Date
13 October 2011 (13.10.2011)(10) International Publication Number
WO 2011/125051 A1(51) International Patent Classification:
H04N 7/173 (2011.01)(21) International Application Number:
PCT/IB2011/051528(22) International Filing Date:
8 April 2011 (08.04.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1052718 9 April 2010 (09.04.2010) FR(71) Applicant (for all designated States except US): CANON
KABUSHIKI KAISHA [JP/JP]; 3-30-2 Shimomaruko,
3-chome, Ohta-ku, Tokyo (JP).

(72) Inventors; and

(75) Inventors/Applicants (for US only): DENOUAL,
Franck [FR/FR]; La Ville-Es-Ray, F-35190 Saint
Domineuc (FR). FABLET, Youenn [FR/FR]; La
Roulais, F-35390 La Dominelais (FR).(74) Agent: LE TOURNEAU, Augustin; Santarelli, 14, Av-
enue de la Grande-Armée, F-75017 Paris (FR).(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,
ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

Published:

— with international search report (Art. 21(3))

(54) Title: METHOD FOR ACCESSING A SPATIO-TEMPORAL PART OF A COMPRESSED VIDEO SEQUENCE

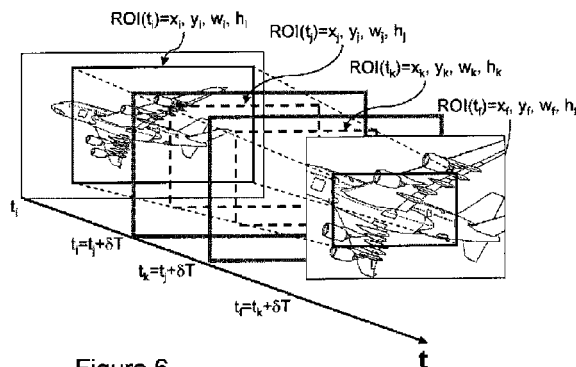


Figure 6

(57) Abstract: The present invention concerns a processing method for accessing a spatio-temporal part (162) of a compressed video sequence (160), as well as an associated device. The method comprises the following steps: - obtaining (S403) a request for access (REQACC) to said part by identifying a temporal section defined between initial (t_i) and final (t_f) times of the initial ($ROI(t_i)$) and final ($ROI(t_f)$) spatial regions - different from the initial region) of the sequence at the initial (t_i) and final (t_f) times; - decomposing (S406, S904, S1003, S1006, S1303, S1309) said access request into a plurality of elementary requests (REQ_e) for access to a video fragment (164_n), each elementary request identifying a fixed spatial region ($maxROI(t_n, t_{n+1})$) to extract in a temporal sub-interval of said temporal section; and - exploiting (S407, S907, S1310) at least one elementary request to access video fragments (164_n) constituting said part to access (162).

**METHOD FOR ACCESSING A SPATIO-TEMPORAL PART OF A COMPRESSED
VIDEO SEQUENCE**

5 The present invention concerns a method of accessing a spatio-temporal part of a video sequence, as well as an associated device. It applies in particular to the compressed sequences which constitute the conventional and economical format for storing video data, in particular on Internet servers.

10 Video compression algorithms, such as those standardized by the standardization organizations ITU, ISO, and SMPTE, exploit the spatial and temporal redundancies of the images in order to generate bitstreams of data of smaller size than the original video sequences. Such compressions make the transmission and/or the storage of the video sequences more efficient.

15 Most of the video compression schemes, such as the MPEG-1, MPEG-2, MPEG-4, H.261, H.263, H.264 or H.265 formats, take advantage of the so-called "temporal" redundancies between several successive images of the same sequence. Thus, most of the images are coded relative to one or more reference images by copying similar blocks and coding the prediction error. This prediction is commonly referred to as temporal or "Inter".

20 In the case of the MPEG-2 format for example, images of I type (I for Intra) are encoded without reference to other images of the sequence. Thus, when all the compressed data of such an image are available, a decoder may decode and display that image immediately. An image of I type thus constitutes a conventional point of access to the video sequence. It is to be noted that, conventionally, these images of I
25 type are presented periodically, with a period of the order of several tenths of a second to a few seconds. In the case of the H.264 format, these images are denoted "IDR" or "SI".

30 The MPEG-2 format also implements images of P type (prediction on the basis of the last I image) or B (bi-directional prediction on the basis of preceding and following images of P or I type) which are encoded by prediction relative to one or more reference images. The data compressed relative to such images (i.e. data coding the prediction errors) are not sufficient to obtain an image that can be displayed. This is because the data of the reference images which were used at the time of the prediction must be obtained. Images of P type and B type do not therefore constitute efficient
35 points of access to the video sequence.

The temporal prediction mechanism consequently proves to be extremely efficient in terms of compression, but imposes constraints on the video decoders that wish to provide proper reconstruction of the images of the same sequence, in particular by limiting the temporal random access for the compressed video sequence only to the images of I type.

Cumulatively with the exploitation of temporal redundancies, the video coders also take advantage of so-called "spatial" redundancies within the same image. For this, each image is decomposed into spatial units, blocks or macroblocks, and a block may be predicted from one or more of its spatially neighboring blocks, which is commonly referred to as spatial prediction or "Intra" prediction.

This mechanism when applied in particular in the case of the Intra images referred to previously also notably improves the compression of a video sequence. However, dependency between the blocks is introduced, and this complicates spatial extraction of part only of the sequence.

To mitigate this drawback, certain coding schemes such as H.264 provide an organization of the blocks into interdependent packets or "slices" of blocks not having spatial dependencies with blocks outside that packet. The organization into packets relies on a technique known as FMO for "*Flexible Macroblock Ordering*".

These packets are very often signaled by markers enabling a decoder to obtain access thereto without performing decoding and complete reconstruction of the image, and in particular of the blocks which precede them in the image. Each packet or slice thus constitutes a point of "access" to the video sequence or of spatial synchronization on the basis of which the decoder has no difficulty in performing decoding independently of the other packets.

Nevertheless, for these blocks, temporal dependencies may remain if the image is coded with reference to one or more other images. Thus, the accumulation of the temporal and spatial predictions means that generally the extraction of a spatio-temporal part of a video sequence, that is to say a spatial portion during a temporal section of several consecutive images of the sequence, is a complex operation.

The extraction of a spatio-temporal part from a video sequence is desirable in numerous applications and these days is the subject of extensive developments.

The W3C ("World Wide Web Consortium", an organization producing standards for the Web) is working on the development of a mechanism for addressing temporal segments or spatial regions in resources that are available on the Web such

as video sequences, by using in particular URIs ("Uniform Resource Identifiers") making it possible to identify, via a string, a physical or abstract resource.

This mechanism, independently of the format of representation of the resource, is termed "Media Fragments".

- 5 The RFC ("Request For Comments") memorandum number 3986 defines a syntax for the URIs, and integrates in particular the concepts of "fragment" and of "queries" or requests. In this context, a fragment is in particular a part, a subset, a view or a representation of a primary resource.

10 The "Media Fragments" addressing enabling the access to sub-parts of the audio or video stream or within images, by addition of parameters to the request, following the URI address makes it possible for example to address:

- temporal segments (or "temporal fragments") defined by initial and terminal times: *t=00:01:20,00:02:00* identifying the segment from 1min20s to 2min00s; and/or
- 15 – spatial regions (or "spatial fragments") defined by a generally rectangular viewing region: *xywh= 10, 10, 256, 256* specifying the upper left corner (10, 10), the width (256) and the height (256) of the rectangle; and/or
- substreams (or "track fragments"), for example a particular audio track associated with a video *track='audio_fr '*; and/or
- 20 – passages (or "named fragments") pre-defined via an identifier, a scene of a film for example: *id= 'the_scene_of_the_kiss'*.

In addition to the syntax of the fragments/requests for the addressing thereof, the same working group is in course of producing a client-server communication protocol based on the HTTP protocol ("Hyper Text Transfer Protocol")
25 used on the Web.

In particular, the protocol defines the HTTP requests sent by a client wishing to obtain fragments as well as the responses sent by the server responsible for the extraction and for the sending of those fragments. Each HTTP request or associated HTTP response is composed of header information and data information.
30 The header information may be considered as description/signaling information (in particular as to the type of the data exchanged and as to the identity of the data sent back – region finally sent back) whereas the data information correspond to the spatial and/or temporal fragment of the resource requested by the client.

When the requested fragment can be converted into "byte ranges" either
35 because the client has already received a description of the resource before sending

his request, or because the server performs an analysis of the resource before sending it, the exchange of fragments is similar to a conventional exchange of data via HTTP, which makes it possible to exploit cache mechanisms and thereby be fully integrated into a Web architecture.

5 If on the other hand the fragment cannot be converted into one or more byte ranges belonging to the original resource, transcoding is then necessary at the server, and the new resource so created is sent to the client like any other resource.

 This addressing mechanism and the associated communication protocol are advantageously flexible in that they are independent from the video format used,
10 from the encoding options of the video sequences and from the capacities available on the servers processing such requests.

 Furthermore, the setting up of this addressing mechanism and of the associated communication protocol will eventually make it possible to significantly reduce the quantity of information exchanged between a client requesting parts of a
15 video and a server storing that video and supplying those requested parts.

 This is because, if a client only wishes to view a temporal interval of a video sequence, he henceforth no longer needs to download the entirety of the video stream, but only the desired temporal interval.

 For this, he may indicate that time interval (example of $t = 1\text{min}20\text{s}$ to $t = 2\text{min}$) in the request to transmit, in the corresponding URI:

`http://www.example.org/my_video.mp4#t=00:01:20,00:02:00.`

 Thus, the server will only search for this portion (or "fragment") of video stream identified in the request and only this is exchanged between the server and the client. Furthermore, the transmission time as well as the bandwidth used on the
25 communication network from the server to the client are reduced.

 Of course, other filtering criteria may be added in this request.

 In other applications, this addressing mechanism also makes it possible to define points of entry into a video stream for which comments, annotations or links to other resources are available, thereby facilitating hyper navigation in the video.

30 As shown above, the "Media Fragments" addressing mechanism enables elementary fragments of temporal or spatial type to be requested but does not make it possible to formulate more sophisticated requests such as the tracking of a spatio-temporal region. In what follows, the "Media Fragments" requests may be referred to using the terms "elementary requests", as opposed to the more advanced requests or
35 "complex requests".

For example if a user is considered who views a video summary or a low resolution of a video with objects or characters that are of interest to him (a ROI(t_i) region at a time t_i and a ROI(t_r) region at a time t_r , **Figure 1**, even though a greater number of regions may be considered in other instances), this user may wish to retrieve a part of the video which corresponds to a region around the object of interest over a given time interval.

This amounts to formulating complex requests mixing at the same time temporal fragments and variable spatial fragments.

However, as described, the "Media Fragments" syntax does not enable such a request to be expressed. The only possibility is to formulate an elementary request over the time interval considered (in our example, between t_i and t_r) with a spatial fragment corresponding to the rectangle encompassing the set of the regions of interest (maxROI rectangle in **Figure 1**).

In this case, the maxROI set of the data is extracted by the server over the temporal section $[t_i, t_r]$, then sent to the client. A major drawback lies in the fact that this approach may lead to the transmission of a very large number of data, and thus unnecessarily occupy the bandwidth of the communication network between the server and the client.

Furthermore, the client must manipulate a high number of data (storage, placing in random access memory, etc.) in order, before being able to exploit the data, to perform a selection of the relevant data among the data received.

There is thus a need to enable tracking of a moving region of interest in a video sequence, that is precise and of lower-cost, in particular in terms of data sent.

Earlier trials on the JPEG-2000 technology are however known, for which a communication protocol (JPIP) for the exchange of portions of image or of video was developed. This protocol also relies on the use of URI addressing and a request-response exchange.

The publication US 2006/262345 in particular describes an example of implementation in which a region of interest in a video sequence is tracked. In particular, the server storing the sequence computes the region of interest to send in each of the successive images according to an estimation of the motion between those successive images. Once the new region has been computed, it is sent by the server to the client who thus has its viewing window updated automatically.

A major drawback lies in the fact that by indicating the region of interest only at the start, the user cannot himself define the spatio-temporal fragments of his choice.

Another publication, US 7 423 649, describes a method of generating an animation on the basis of a region of interest and a trajectory.

This method relies on dedicated JPIP requests in the JPEG-2000 format that are generated for each image of the Motion-JPEG2000 sequence. The method consists of eliminating from that list of requests those for which data have already been received and of re-ordering the remaining requests so as to have a constant-throughput animation.

A major drawback of this approach is that a very high number of requests is generated then sent to the server.

Furthermore, these different mechanisms are closely linked to the prior knowledge of the JPEG-2000 or Motion-JPEG2000 format, working image by image, without a temporal component. In other words, they are not applicable to the coding formats that create in particular inter-image dependencies.

The present invention thus aims to mitigate at least one of the aforesaid drawbacks.

To that end, the invention concerns in particular a processing method for accessing a spatio-temporal part of a compressed video sequence, comprising a step of obtaining a request for access to said spatio-temporal part through identifying a temporal section defined between an initial time and a final time in said sequence, **characterized in that:**

- said access request identifies an initial spatial region of the sequence at the initial time, and a final spatial region of the sequence at the final time that is different from said initial spatial region;

and the method comprises the steps of:

- decomposing said access request into a plurality of elementary requests for access to a video fragment of the sequence, each elementary request identifying a fixed spatial region to extract in a temporal sub-interval of said temporal section; and
- exploiting at least one elementary request to access at least one video fragment constituting said spatio-temporal part to access.

According to the invention, the dividing up of the desired temporal section into several temporal sub-intervals enables finer fixed spatial regions to be defined. This is because, during a temporal sub-interval, the regions of interest tend to undergo

less modification than during the whole of the temporal section. This results in a reduction in the quantity of data transmitted.

Furthermore, as will be seen below, this decomposition makes it possible to modify, without complexity, the temporal sub-intervals and thus the associated fixed spatial regions, to adjust the quantity of data transmitted to according to certain constraints.

Lastly, the obtainment of elementary requests as defined here enables compatibility to be maintained with the "*Media Fragments URI*" recommendation in course of development.

10 This results in efficient access to the regions of interest which vary over time, that is compatible with the aforementioned recommendation, which recommendation is moreover adapted to any type of coding of the video sequence.

In an embodiment, the method comprises a step of dynamically adjusting said decomposition of the access request during the processing of elementary requests. This adjustment makes it possible in particular to modify the duration of the temporal sub-interval associated with each elementary request. This results in an adjustment of the fixed spatial regions, and thus of the data transmitted over the communication network.

20 It will be understood here that the present invention is concerned in particular with seeking a compromise between a high number of precise elementary requests (that is to say extracting less image data) sent out for example by the client terminal and a reduced number of less precise elementary requests (extracting more image data) still sent out by the client. It is to be noted that a high number of precise requests lightens the workloads of the client terminal and of the communication network (little image data conveyed), but in compensation increases the workload of the server (high number of requests to process). Conversely, a reduced number of less precise requests lightens the workload of the server, but ends up with more data exchanged (increase in the load for the network) and with more processing at the client side in order to extract the relevant data.

30 In particular, the adjusting step comprises the re-computation of the elementary requests not yet exploited into a plurality of elementary requests associated with temporal sub-intervals of modified duration. Of course, the duration of the temporal sub-intervals may be extended if the conditions for processing the data are optimum, or else be reduced if certain processing resources reach saturation. To be precise, in this

last case, the fixed spatial regions will be of reduced size, and thus a reduced number of video data will be transmitted.

According to a particular feature, the re-computation of the elementary requests not yet exploited and the modification of said duration depend on a performance criterion of a client terminal establishing said access request and/or of a server device storing said video sequence and/or of a communication network linking the client terminal and the server device. The rate of the data transmitted may thus easily be adjusted to a limiting capacity in the processing process.

According to a feature of the invention, the method comprises the steps of:

- transmitting said elementary request to a server device storing said video sequence and receiving, in return, at least one corresponding extracted fragment; and
- re-computing the elementary requests not yet exploited on the basis of said received fragment.

The quality of the responses received (by a terminal client or a proxy, for example) progressively with the exploitation of the elementary requests constitutes a good indicator of the efficiency of the settings adopted, (for example the duration of the sub-intervals), and reflects in particular the state of occupancy of the server device and/or of the communication network. Thus, an adjustment of the elementary requests on the basis thereof proves to be efficient.

In an embodiment, said decomposing depends on a performance criterion of a client terminal establishing said access request and/or of a server device storing said video sequence and/or of a communication network linking the client terminal and the server device. This provision makes it possible, from the outset, to have a relatively efficient decomposition, given the constraints of workload and resources involved in the processing.

In particular, said performance criterion is chosen from among:

- the available computation capacity on the client terminal;
- a priority value associated with the client terminal;
- a speed of processing by said client terminal;
- a time limit for access to said sequence part by the client terminal;
- the occupancy rate of the communication network bandwidth;
- a time of response by the server device to an elementary request submitted to him;

– the presence of an error response of specific type by the server device to an elementary request submitted to it.

In an embodiment of the invention, the duration of the temporal sub-intervals corresponding to the elementary requests depends on the spatial accessibility
5 of image data composing said video sequence.

"Spatial accessibility" refers to the concept whereby image data may be obtained independently from a greater or lesser number of other image data at the same point in time (that is to say depending on the presence of a greater or lesser number of "packets" or "slices" in the image).

10 As the resources necessary to manipulate image data (for example to decode them) depend on their dependencies (temporal and/or spatial), this provision makes it possible to take account of this criterion to choose optimally the decomposition adapted to the equipment and network involved.

In an embodiment of the invention, the video sequence being compressed
15 using a temporal prediction mechanism, the duration of the temporal sub-intervals corresponding to the elementary requests depends on the period separating two images without temporal dependency in the video sequence, that is to say in particular between two consecutive "Intra" images.

In particular, at least one temporal sub-interval is aligned with images of the
20 video sequence which are not compressed by temporal prediction. In other words, the intermediate times which define the temporal sub-intervals correspond to images without temporal dependency.

By way of example, they may be Intra images "I" in the MPEG-2 or MPEG-4 format or else IDR images in the H.264 format.

25 This provision makes it possible to simplify the operations of extraction at the server. This is because, in the absence of temporal dependency between two consecutive intermediate images, the server only has to be concerned with the extraction, and not with the possible spatial dependency.

It will moreover be noted that the determination of the intermediate times
30 aligned with images without temporal dependency is of low cost since these images are very often indexed and easily detectable in the compressed sequence.

Furthermore, it may be provided that said initial time be offset to align with the last image of the video sequence that precedes said initial time and that is not compressed by temporal prediction. This simplifies in particular the determination of

temporal sub-intervals aligned with *Intra* images by mere application of a synchronization distance provided in the sequence compressed.

In an embodiment, said decomposition comprises a step of performing linear interpolation, along a temporal axis, of at least one intermediate spatial region on the basis of said initial and final spatial regions. This mechanism enables simple
5 definition of the region of interest tracked during its motion, so as to deduce therefrom the fixed spatial region for the needs of the invention.

In particular, said decomposition comprises the linear interpolation of two intermediate spatial regions corresponding to the two extreme times of a said temporal
10 sub-interval. The extreme positions of the tracked region of interest are thus identified, to obtain a video fragment corresponding to a temporal sub-interval.

In particular, said fixed spatial region associated with said temporal sub-interval encompasses said corresponding two intermediate spatial regions. In particular, said fixed spatial region is formed from the minimum rectangle
15 encompassing said two intermediate spatial regions. In this way, the fixed spatial region is easily constructed, while optimizing the quantity of data finally extracted.

Of course, geometric groups other than the rectangle may be implemented, in particular a circle or more complex shapes adapted to encompass several regions of interest.

As a variant of the linear interpolation, it may be provided that the
20 decomposition comprises the following steps:

- determining at least one set of geometric data (for example a shape, an object, etc.) present in both the initial and final regions;
- estimating a variation (spatial movement and/or spatial deformation, of
25 greater or lesser complexity: straight line, curve, etc.) of said set in said sequence between the initial and final times; and

said fixed spatial region associated with an elementary request taking into account said estimation of variation.

This provision however requires more computations (for the estimation of a
30 complex movement in particular), but however enables more precise tracking of the desired region of interest during each temporal sub-interval.

In an embodiment of the invention, said decomposition into elementary requests is implemented at a client terminal establishing said access request. In this case, the exploitation of the elementary requests may be their transmission to the
35 server for the purposes of being executed.

This enables the client terminal to dynamically modify the temporal decomposition of the spatio-temporal part according to the accessibility of the stream, in particular reflected by the responses from the server.

As a variant, said decomposition into elementary requests is implemented
5 at a server device storing said compressed video sequence. An example of exploitation may then be the execution of the elementary requests.

This enables the server to make provision, according to the computation capacities of various clients that may access the spatio-temporal part, for different decompositions into requests for elementary fragments.

10 Furthermore, in another approach, the server may thus publish the access (for example a link to a Web page) to that spatio-temporal part using a list of requests for elementary fragments. It is these requests which are then accessible to standard clients.

In this case, said server device makes available to a client terminal the list
15 of said elementary requests. For the author of a video, this configuration enables easy sharing of sub-parts of it with other users.

In another variant, said decomposition into elementary requests is implemented at an intermediate device located on a communication network between a client terminal making said access request and a server device storing said
20 compressed video sequence. The use of an intermediate device makes it possible to provide a solution for access to a video sequence spatio-temporal part, which integrates servers of fragments implementing the invention with standard servers of fragments. The intermediate device may, like the client, adapt the granularity of the requests according to the responses from the servers.

25 In particular, said intermediate device is a proxy which receives said access request from the client terminal, sends each of said elementary requests to said server device, stores each of the video fragments received from the server device and transmits a response to the access request from the client terminal that is established on the basis of said stored video fragments. This provision has a double advantage: of
30 reducing the processing load at the client terminal, and also of storing, in temporary memory of the proxy, the responses to complex spatio-temporal requests with a view to responding more rapidly to future identical requests.

In an embodiment of the invention, the decomposition of the access request, in particular by said server device, comprises iteratively determining the
35 duration of said temporal sub-intervals.

In particular, said iterative determining comprises iteratively sub-dividing the temporal sub-intervals for as long as the ratio between the estimated costs of transmitting the video fragments respectively corresponding to a sub-interval after iteration and to a sub-interval before iteration is less than a threshold value, generally a threshold with the value 1/2 when iterative division by 2 is carried out.

It is to be noted that when this determining is conducted on the server device, the estimated costs may be substantially the real transmission costs since it has available the video sequence to evaluate these costs. A better evaluation of the compromise between the number of requests and the quantity of data transmitted is thereby obtained.

When this determining is conducted on the client terminal or on the intermediate device, these costs may be estimated on the basis of external information, for example the compression rate over the desired sequence part.

In an embodiment of the invention, said plurality of elementary requests corresponds to a plurality of distinct temporal sub-intervals fully decomposing said temporal section. In this way, the group of fragments obtained constitutes the entirety of the desired part of the video sequence.

According to a particular feature of the invention, a said elementary request comprises at least one parameter defining the fixed spatial region, and a component representing a spatial variation of said fixed spatial region during said corresponding temporal sub-interval. The spatial variation in particular concerns a movement and/or a deformation of said fixed region. This provision provides a syntax that is simple (as close as possible to that provided for example in the "*Media Fragments URI*" recommendation) and efficient for accessing each elementary fragment of the spatio-temporal part to access.

In a complementary manner, the invention concerns a processing device for accessing a spatio-temporal part of a compressed video sequence on the basis of an access request, said access request identifying a temporal section defined between an initial time and a final time in said sequence, **characterized in that:**

– said access request furthermore identifies an initial spatial region of the sequence at the initial time, and a final spatial region of the sequence at the final time that is different from said initial spatial region;

and the device comprises:

– a decomposition module adapted for decomposing said access request into a plurality of elementary requests for access to a video fragment of the sequence,

each elementary request identifying a fixed spatial region to extract in a temporal sub-interval of said temporal section; and

- a module for exploiting at least one elementary request to access at least one video fragment constituting said spatio-temporal part to access.

5 The access device has similar advantages to those of the method set forth above, in particular of accessing, at optimized costs, a part of the video sequence by tracking a region of interest which may vary and move over time.

Optionally, the device may comprise means relating to the features of the method set out above.

10 The invention also concerns a system for accessing a spatio-temporal part of a video sequence stored on a server device, comprising:

- an access device as described above;
- a client terminal provided with means for establishing said access request; and

15 - a server device storing said video sequence and adapted to process at least one said elementary request to extract at least one video fragment constituting said spatio-temporal part to access.

The invention also concerns an information storage means, possibly totally or partially removable, that is readable by a computer system, comprising instructions
20 for a computer program adapted to implement a method in accordance with the invention when that program is loaded and executed by the computer system.

The invention also concerns a computer program readable by a microprocessor, comprising portions of software code adapted to implement a method in accordance with the invention, when it is loaded and executed by the
25 microprocessor.

The information storage means and computer program have features and advantages that are analogous to the methods they implement.

Still other particularities and advantages of the invention will appear in the following description, illustrated by the accompanying drawings, in which:

30 - **Figure 1** illustrates the access to a part of a video sequence using the mechanisms of the W3C recommendation on media fragments;

- **Figure 2** represents an example of a system for the implementation of the invention;

35 - **Figure 3** illustrates the access to a part of a video sequence by a method according to the invention;

- **Figure 4** illustrates, in flow diagram form, general steps of the present invention;
- **Figures 5 and 6** illustrate the implementation of the steps of **Figure 4** via an example;
- 5 - **Figure 7** illustrates, in flow diagram form, steps for the adjustment of decomposition parameters for complex requests, in an embodiment in which this processing is carried out at the client terminal of **Figure 2**;
- **Figure 8** is a diagrammatic representation of a client terminal and of a server device for an implementation of the invention;
- 10 - **Figure 9** illustrates, in flow diagram form, steps of an implementation of the invention when the decomposition of the requests is carried out at the server device of **Figure 2**;
- **Figure 10** illustrates in more detail, in flow diagram form, steps of adjusting parameters for decomposition at the steps of **Figure 9**;
- 15 - **Figure 11** illustrates, in flow diagram form, steps of generating elementary requests, implemented at the time of a particular processing operation of **Figure 10**;
- **Figure 12** illustrates, in flow diagram form, steps of generating elementary requests, implemented at the time of another processing operation of **Figure 10**;
- 20 - **Figure 13** illustrates, in flow diagram form, steps of an implementation of the invention when the decomposition of the requests is carried out at an intermediate node between the client terminal and the server device of **Figure 2**;
- **Figure 14** illustrates examples of possible syntax when the decomposition of the requests is carried out at the intermediate node; and
- 25 - **Figure 15** shows a particular hardware configuration of a device adapted for an implementation of the method or methods according to the invention.

As represented in **Figure 2**, an example of a system 100 for the implementation of the invention comprises a server 110 linked to a client terminal 120, via a communication network 130 and possibly a proxy 140. Other client terminals (not represented) may be connected to the same network 130.

The communication network 130 may be of any nature, wired or wireless, mobile phone based or computer based such as the Internet.

According to the case concerned, the server 110 may be a web server which a user accesses using a mobile terminal 120 (telephone, personal digital

assistant, etc.) or a fixed terminal (computer, television set equipped with Internet access).

In a multimedia application, the server 110 may be merely a fixed video camera or in a network, a portable video camera or a video server.

5 The server 110 stores, in a multimedia database 150, video sequences 160 that are compressed to reduce the costs of storage and distribution. The video sequences 160 have in particular been compressed using temporal and spatial prediction mechanisms. In what follows, any image coded independently of the other images of the same sequence is termed "*synchronization image*". This is the case for
10 example of the "Intra" images in MPEG-1, 2 or 4, or the "IDR" or "SI" images in H.264. These images may be decoded by themselves, without needing the other images of the compressed video sequence. Thus, they enable a video decoder to begin to play the video sequence at a given time.

 From this definition also arises the definition of "*synchronization distance*"
15 which represents the time interval separating two synchronization images of the same video sequence. Generally this distance is constant in the sequence. It may be expressed in milliseconds or seconds or even in images when the frame rate is known.

 The invention concerns in particular the access, by the client terminal 120, to a spatio-temporal part of the video sequence 160 stored on the server device 110. A
20 spatio-temporal part results in particular from spatial filtering over target spatial regions of the images of the video sequence and of possible temporal filtering by applying the spatial filtering solely to a temporal section of the video sequence.

 The client terminal 120 (and/or the proxy 140 the case arising) and the server device 110 are equipment that implement the "*Media Fragments*" mechanisms
25 for addressing and communicating (request/response) as introduced previously. In this context, the client terminal 120 (or the proxy 140) is an apparatus sending elementary requests in accordance with the "*Media Fragments URI*" recommendation (under the W3C specification) and receiving the fragments extracted by a Media Fragments server. Similarly, the server device 110 is an apparatus adapted to process *Media*
30 *Fragments* requests and to return binary data corresponding to those requests.

Figure 3 provides a diagram of an example of a spatio-temporal part 162 to access in the video sequence 160, defined by two times, initial t_i and final t_f , temporally delimiting that part in the sequence ($t_0=0s$ being for example the start of the sequence), and by two spatial regions in the images at these two initial and final times.

In particular, in the initial image I_{ti} , the region of interest (or "ROI") is defined by a grayed horizontal rectangle $ROI(t_i)$, while in the final image I_{tf} , the region of interest is defined by a rectangle $ROI(t_f)$, also grayed. Other shapes of region of interest may however be used.

5 These four items of information (t_i , t_f , $ROI(t_i)$, $ROI(t_f)$) defining the part to access are in particular specified by a user at the dedicated interface on the client terminal 120.

10 According to an embodiment of the invention, the client terminal 120 establishes a request for access REQACC to that part by identifying the temporal section of said sequence, defined between an initial time t_i and a final time t_f , and the regions of interest including the initial spatial region $ROI(t_i)$ at the initial time, and the final spatial region $ROI(t_f)$ at the final time, this latter being different from said initial spatial region such that the region of interest for the user moves in the part of the sequence of interest to him.

15 As shown conjointly in **Figures 2** and **3**, this access request REQACC is decomposed or converted into a plurality of elementary requests REQ_n for access to a video fragment 164 of the sequence 160, each elementary request identifying a fixed spatial region $maxROI(t_n, t_{n+1})$ to extract in a temporal sub-interval $[t_n, t_{n+1}]$ of said temporal section $[t_i, t_f]$. Next at least one elementary request REQ_n is exploited, for
20 example sent by the client terminal or processed at said server device, to extract at least one video fragment 164 constituting said part to access.

The extracted fragments may then be sent back, in the form of elementary responses REP_n and grouped together to form the part to access 162 returned to the client terminal 120 in the form of a response REPACC.

25 In the example of **Figure 2**, this decomposition may be carried out at the proxy 140. However, as will be seen subsequently, other embodiments may be envisaged, such as an implementation on the server 110 or preferably on the client terminal 120.

30 In the example of **Figure 3**, the access request REQACC has been decomposed into three elementary requests REQ_n , each in accordance with the *Media Fragments URI* recommendation. These three elementary requests respectively address the three following temporal sub-intervals: $[t_i, t_j]$, $[t_j, t_k]$ and $[t_k, t_f]$, and the three fixed spatial regions: $maxROI(t_i, t_j)$, $maxROI(t_j, t_k)$ and $maxROI(t_k, t_f)$, as described later and defined on the basis of the grayed intermediate spatial regions $ROI(t_j)$ for the time t_j
35 and $ROI(t_k)$ for the intermediate time t_k .

The three fragments then obtained are the fragments identified as 164_1 , 164_2 and 164_3 . The desired part 162 which is returned to the client terminal 120 is thus constituted by these three fragments. It is thus noted that in the first instance, the invention enables the quantity of image data transmitted to be considerably reduced
5 relative to a conventional approach using *Media Fragments* requests (the sum of the volumes of the parallelepipeds 164_n is very appreciably less than the volume of the parallelepiped of **Figure 1**).

As also described later, in an embodiment, the invention furthermore makes it possible to optimize the volume of video data exchanged between the client
10 and the server, by dynamically adjusting the decomposition of the access request REQACC during the processing of elementary requests, and in particular the duration of the temporal sub-intervals.

Figures 4 to 6 illustrate in more detail an embodiment of the invention, using an example in which, at the step S400, a user receives on his communicating
15 device (PC, mobile telephone, etc.), an address in URI form of a video 160 (**Figure 6**) produced by one of his friends as well as a summary (**Figure 5**) of that video.

This summary may be in the form of a video of very low resolution and/or of very low quality, or in the form of a series of key images such as those represented in **Figure 5**.

On the basis of the summary and a graphical interface (not represented),
20 the user may request access, by extraction, to a part of the video 160 of his choice, by defining key times t_i and t_f (step S401) and for each key time the associated region of interest (step S402), i.e. respectively $ROI(t_i)$ defined by the information x_i , y_i , w_i and h_i , and $ROI(t_f)$ defined by the information x_f , y_f , w_f and h_f . In the Figure, only two key times
25 have been represented. Of course, a greater number of such times and their associated regions of interest will generally be defined by the user, the temporal sections then being processed in turn. In particular, care could be taken to choose key times that are not too far apart (of the order of a few times the synchronization distance), in order for the movement between the regions of interest defined over a
30 temporal section to be able to be assimilated to a linear movement. In this way, the implementation of a linear interpolation as described below will not introduce too many errors.

The user next clicks on a "download" button of the interface. The processing of the present invention may then be implemented to take on the task of
35 retrieving the video data so selected.

For this, at the step S403, the client terminal 120 translates the series of key times into a series of complex spatio-temporal requests REQACC for access to the video stored at the address represented by the URI. It may be recalled that these requests specify two items of temporal information t_i and t_r and two associated items of spatial information, $ROI(t_i)$ and $ROI(t_r)$, corresponding to two successive key times.

In the embodiment now described, the client terminal 120 incorporates a decision module which operates for the decomposition of these REQACC requests according to the invention.

As, on starting up, this module has very little or no information as to the video format and the possibilities of random access in the video (that is to say the presence and the frequency of synchronization images), it initializes a downsampling factor " δT " to an initialization value (step S404). The object of this downsampling factor is to indicate the duration of the temporal sub-intervals on the basis of which will be created the elementary requests in accordance with the *Media Fragments URI* recommendation. Below, " δT " will be designated in the same way by the term "factor" or "duration".

According to the level of prior knowledge of the video format possessed by the decision module, the factor δT may take several initial values:

- $\delta T = 1$ second where the client terminal 120 has no indication as to the video stream;
- δT takes a value of time such that the decomposition of the regions of interest ROI makes it possible to obtain a reduction in volume of the higher data at a certain threshold considered to be significant, for example a factor of 2 (comparing for example the volumes of **Figures 1 and 3**);
- $\delta T =$ synchronization distance of the video 160, if the client terminal 120 was able to obtain that information, through knowledge for example of the images without temporal dependency.

However, if a complex request REQACC has already been processed, the last δT factor used for that processing may be kept to begin the decomposition of the following complex request.

The processing continues at step S405 at which the decision module retrieves the following complex request from the list of complex spatio-temporal requests. At the first iteration, the decision module retrieves the first complex request, i.e. that which corresponds to the time interval between the first key image (I_{t_i}) and the second key image (I_{t_r}), as well as to the associated spatial regions $ROI(t_i)$ and $ROI(t_r)$.

This request REQACC is decomposed, at step S406, into a series of elementary requests REQ_n over time intervals $[t_n, t_{n+1} = t_n + \delta T]$ as illustrated in **Figure 6** for $n=i, j$ and k . It is to be noted that according to the value of δT , the final time t_f does not necessarily satisfy $t_f = t_{k-1} + \delta T$.

5 In particular, the intermediate times t_n are chosen in order for them to be aligned with the images without temporal dependency, for example with *Intra* images explicitly indexed in an MPEG-2 or MPEG-4 stream. This choice simplifies the processing operations to perform on the server.

It is implemented in particular where the synchronization distance is known.
10 Moreover, in an embodiment, the initial time t_i indicated by the user is offset to a preceding time aligned with the last image without temporal dependency (*Intra* image). Thus, the following intermediate images t_n automatically fall on images without temporal dependency since the temporal section to access is decomposed into multiples of the synchronization distance.

15 It is to be noted that an offset of t_f towards the *Intra* image following the portion indicated by the user is possible. However, the absence of offset is not detrimental, the last sub-interval created then containing fewer images than the previous ones.

A decomposition example is described in more detail below with reference
20 in particular to **Figure 10**.

As a result of this decomposition, at the intermediate times t_n so obtained, the processing determines an intermediate region of interest $ROI(t_n)$ (see **Figure 3** for example, or the region x_j, y_j, w_j, h_j in **Figure 6**) in each of the intermediate images I_{t_n} . This determination may simply rely on a linear interpolation, along the temporal axis,
25 between the initial and final regions of interest $ROI(t_i)$ and $ROI(t_f)$.

At the step S407, the client terminal 120 next exploits these standard requests REQ_n to which has been given the form
 $URI\#t=t_n, t_n + \delta T \&xywh=maxROI(t_n, t_n + \delta T)$, with t_n comprised between t_i and t_f of the current request REQACC, by sending them to the server 110. In each of these
30 requests, the spatial region defined by $maxROI(t_n, t_n + \delta T)$ is fixed, which ensures that these requests are in accordance with the *Media Fragments URI* recommendation.

As illustrated in the example of **Figure 3**, $maxROI(t_n, t_n + \delta T)$ is a rectangle encompassing the regions of interest $ROI(t_n)$ and $ROI(t_n + \delta T)$, in particular the smallest rectangle encompassing these regions. Other shapes for this fixed spatial region may
35 however be used, in particular depending on the shapes of the regions of interest.

At step S407, the decision module thus sends an elementary request to the server 110, in the temporal order of the requests.

Further to step S407, the server 110 also exploits the elementary request REQ_n received by executing it to extract the corresponding fragment 164_n, then sends
5 back to the client 120, either the corresponding binary data or a super-set of those data (in particular by extracting the entirety of the "slices" concerned in the request), or an error message, at step S408.

The response REP_n from the server 110 is next analyzed at S409 in order to adjust the temporal downsampling factor δT , as described below with reference to
10 **Figure 7.**

The adjustment of this factor δT and thus of the duration of the temporal sub-intervals $[t_n, t_n + \delta T]$ may depend on a performance criterion of the client terminal 120 and/or of the server device 110 and/or of the communication network 130, and in particular on the following criteria:

- 15
 - the available computation capacity on the client terminal;
 - a priority value associated with the client terminal;
 - a speed of processing by said client terminal;
 - a time limit for access to said sequence part by the client terminal;
 - the occupancy rate of the communication network bandwidth;
- 20
 - a time of response by the server device to an elementary request submitted to him;
 - the presence of an error response of specific type by the server device to an elementary request submitted to it;
 - the accessibility of the video sequence or the spectral granularity of the
25 video data in the sequence (in particular the dimension of the *slices* in the images or the synchronization distance).

Further to this adjustment, the client terminal 120 determines (test S410) whether there is still an elementary request REQ_n to be processed.

In the affirmative, the client terminal 120 sends the following elementary
30 request REQ_n at step S407.

In the negative, the client terminal 120 considers the following complex request REQ_{ACC} by returning to step S405 and loops again on the steps of decomposition and analysis so long as the last complex request has not been reached.

With reference to **Figure 7**, a description is now given of processing for adjustment of the decomposition parameters for the complex requests REQACC, in a preferred embodiment in which this processing is carried out at the client terminal 120.

Of course, this processing may also be carried out on the server device 110
5 as described below, or even at the proxy 140 as also mentioned below.

The processing commences by a step S700 of initializing the decision module, consisting of retrieving the current duration δT as well as the current complex request REQACC and the response REP_n from the server 110 to the last elementary request REQ_n processed if it exists.

10 Step S701 makes it possible to test whether the response REP_n from the server 110 is an error message.

If that is the case, the decomposition of step S406 may be called into question and performed again depending on the type of error.

In this case, the client terminal 120 determines (test S702) whether the
15 server 110 is overloaded, that is to say whether the processing resources are overloaded with regard to properly processing the elementary requests REQ_n not yet processed or sent.

To perform this test, the client terminal 120 relies on the HTTP communication protocol. To be precise, in accordance with the *Media Fragments URI*
20 recommendation, the REP_n responses are generally based on the HTTP protocol. In this case the conventional error codes are the 5xx codes defined by that same HTTP protocol and more particularly the codes 500 "*Internal Server Error*" and 503 "*Service Unavailable*".

If the server replies with the error 500 "*Internal Server Error*" the decision
25 module then has no precise information on the problems that exist at the server 110. If the preceding elementary requests did not fail (that is to say that it did indeed receive the video fragments corresponding to those preceding requests), it may thus consider that the server 110 is becoming overloaded, and thus that the test S702 is true.

Similarly, if on reception of an error response 503 "*Service Unavailable*",
30 the "*Retry-after*" header is present in that response, the test S702 is then considered as true.

In this case (output "yes" from test S702), the decision module increases the duration δT at the step S703, for example by doubling it, which leads to a new computation of the elementary requests REQ_n of the current complex request
35 REQACC (step S704), but uniquely for the elementary requests not yet sent, that is to

say generally for the temporal subsection $[t_{\alpha}, t_f]$, if REQ_{α} is the last request processed. This re-computation applies the same mechanisms as those provided at step S406, i.e. determining the intermediate times t_n with the new value δT , then the intermediate regions of interest $ROI(t_n)$ and lastly the fixed spatial regions $maxROI(t_n, t_{n+1}=t_n+\delta T)$ between two consecutive intermediate times.

On the other hand, if no indication is given by the server 110, the test S702 may then be considered as false, and the decision module leaves the factor δT unchanged. It then proceeds to the following step S410.

If the response REP_n is not an error message (test S701 false), the headers of that response as well as the response times are analyzed at step S705 in order to know whether or not the server 110 was precisely able to extract the data from the video fragment concerned in the request REQ_n , and whether or not it is overloaded.

For this, the client terminal 120 analyses the values of the "Content-Range" HTTP headers of the response REP_n from the server 110, and compares them with the "Range" headers (in particular the values representing the spatial part of the video fragment) of the request REQ_n sent by the client 120.

Because the server extracts the data from the images by whole slices to simplify its processing, the values returned by the server reflect, indirectly, the structuring of the images in slices. Thus the separation between these values is a good indication of the accessibility level of the stream, in particular in terms of spatial granularity (test S706).

The closer these values, the greater the precision with which the server 110 is capable of extracting the fragments. Conversely, the greater the separation, the more the client 120 will be called upon to extract the relevant data from the response (the entire slices returned).

This is why, in case of low spatial accessibility (test S706 false), a performance criterion of the client terminal 120 is evaluated at S707 then compared to a threshold at S708 in order to determine whether it has sufficient resources and/or capacities available to extract the relevant data.

The performance criterion of the client terminal may in particular consist in an evaluation of the workload of that terminal, that is to say the level of occupancy of internal resources (for example the processor, the random access memory, etc.), but also in an evaluation of a level of priority attributed to said terminal, of a processing speed or of a downloading time limit entered by the user.

In case of low performance of the client terminal 120 (overload, output "yes" from test S708), the decision module reduces the duration δT of downsampling, for example by half and/or by maintaining the alignment on the images without temporal dependency, at step S709. This is followed by updating of the elementary requests REQ_n of the current complex request $REQACC$, by computing them again using the new period δT , but uniquely for the requests not yet processed.

This reduction in particular makes it possible, ultimately, to have a greater number of elementary requests REQ_n , and thus to obtain more precise fragments 164_n . The processing load then on the client terminal is lower.

If the client terminal 120 is not overloaded (test S708 false), the decision module evaluates the load of the communication network 130, at the step S710. For this, the decision module keeps statistics (response time to a *ping* command, occupancy of the bandwidth [estimated for example by a ratio between the number of bytes received in response to a request and the time elapsed between sending that request and the response to it]) on the volume of the data exchanged and periodically evaluates the bandwidth available for the client terminal 120.

At test S711, the decision module determines whether the network is overloaded or saturated, by comparison of the statistics and/or bandwidth with threshold values.

In case the network is underused (output "no" from test S711), the decision module tends to give preferential treatment to the less frequent and less precise requests by increasing the duration δT , at the step S712.

Conversely, if the network is saturated (output "yes" from test S711), the decision module will seek to send a greater number of more precise requests, by reducing the duration δT (step S709).

Further to these updates of the duration δT , the decomposition of the current complex request $REQACC$ is re-computed for the remaining elementary requests at S704, and this new duration δT is henceforth considered for the future decompositions (step S406).

It is to be noted that the updating of the duration δT may also be implemented in the form of a linear function of the characteristics (in terms of computational power) of the client terminal 120 and/or of the bandwidth of the communication network 130 between the client and the server.

Figure 8 diagrammatically illustrates a client terminal 120 and a server device 110 for this implementation of the invention.

These two items of equipment possess a network interface (respectively 121 and 111) with the communication network 130, so as to be able to communicate requests and responses in accordance with the *Media Fragments URI* recommendation.

5 The client terminal 120 also comprises a video stream description analyzer 122 by which it obtains an identification of a video sequence 160 to process, a description of the key times (t_n) and of the regions of interest ($ROI(t_n)$) specified by the user. All this information is stored in a database 123. It also comprises a module 124 for load analysis with regard to the use of the internal resources of the terminal 120, of
10 the network 130 and of the server 110 by analysis of the responses REP_n .

The decision module mentioned above is represented here by the module 125 and, using the information in the database 123 and from the load analysis, produces complex requests REQ_{ACC} then decomposes (possibly a simple update) those requests into elementary requests REQ_n .

15 These latter are formed at the construction block 126 before transmission to the server 110 by the interface 121.

The responses REP_n received are analyzed by the module 127 in order to provide the data from the video fragments to a video decoder, internally or externally of said client terminal 120.

20 For its part, the server 110 is linked to a device 150 for storage of the video sequences 160, which may possibly be equipped with a video encoder.

These video sequences are analyzed by an analysis module 112 to obtain a video stream description which is then stored in a database 113.

25 The requests REQ_i received via the interface 111 are analyzed by the module 114, to obtain in particular the temporal interval concerned and the fixed spatial region to extract.

Based on this information, description data in the database 113 and video data in the device 150, a fragment extraction module 115 extracts the fragments concerned in the requests received.

30 A response construction module 116 retrieves these fragment video data and arranges them in the form of a response REP_n in accordance with the *Media Fragments URI* recommendation, to be transmitted to the client 120.

With reference to **Figure 9**, a description is now given of an embodiment of the invention in which said decision module 125 is implemented in the server 110. This

embodiment makes it possible for example in particular for the author of a video to share sub-parts thereof with other authors.

For this, at step S900, the user-author views the video 160 he has just recorded. He selects passages of interest therefrom at S901 by specifying an initial
5 time t_1 and a final time t_2 , then frames the regions of interest $ROI(t_1)$ and $ROI(t_2)$ at S902.

At step S903, the user may specify other key times $\{t_c\}$ in the selected passage, in particular if the latter is very long and if the regions of interest vary greatly. The key times are in particular chosen aligned with images of the video sequence
10 which do not have temporal dependency. On this occasion, he also specifies the regions of interest $ROI(t_c)$ for each of these key times, on which will be based the interpolation of the intermediate regions ROI and the decomposition .

As input to the step S904, a list is thus available of temporal sections $[t_i, t_f]$ and of associated regions of interest $ROI(t_i)$ and $ROI(t_f)$, with $t_i=t_1$ or t_c and $t_f=t_c$ or t_2 .
15 This list is equivalent to an aforementioned list of complex requests REQACC.

It is to be noted, as a variant, that this information may be sent by a client terminal to the server, in a REQACC request format as explained below with regard to
Figure 13.

Step S904, described in **Figure 10**, then consists of translating one of
20 these temporal sections and associated regions of interest into a series of elementary requests REQ_n in accordance with the *Media Fragments URI* recommendation.

The list of elementary requests thus produced is temporarily stored on the server 110 at step S905.

Step S906 enables each of these temporal sections to be processed
25 successively, until the final time t_2 is reached.

When the last temporal section has been processed (S906 true), the list of elementary requests enabling each spatio-temporal part 162 of the video to be obtained is then exploited by the server, here published (step S907) to be made available and communicable to any user/device wishing to retrieve the new video so
30 obtained.

For example, the user may send this list of requests by email to his friends in the form of a *playlist*. This list, which is loaded onto a video sharing server on the Web at the same time as the video itself, thus enables any client 120 connecting to that sharing server, to play or download that subset of the video.

Furthermore, if the author of the video only wishes to publish the spatio-temporal part (and not the whole video) on a video sharing Web server, also client terminal 120, the latter may easily download the fragments 164 composing that video part, so avoiding the author having to load the whole of his video on the sharing server.

5 With reference to **Figures 10 to 12**, a description is now given of step S904 of decomposing the spatio-temporal requests REQACC into elementary requests REQ_n.

10 The first step S1000 consists, for the decision module of the server 110, of retrieving the times t_i and t_f delimiting the current temporal section as well as the associated regions ROI(t_i) and ROI(t_f).

Next, at S1001, the server selects, from a predefined list, what type of client 120 he wishes to exchange his video with (mobile telephone, PC, Web server, etc.). This predefined list classifies the types of clients 120 according to their computation/processing capacities.

15 A quick analysis of the capacities of the type of client chosen is carried out at S1002, by comparison for example with predefined threshold values.

20 If the type is a type of client with limited computation capacities (test S1002 true), the server 110 then generates elementary requests over short intervals of time (δT small) with more precise regions of interest ROI at S1003. To be precise, as the client terminal 120 will not necessarily be able to process a high volume of data, the video fragments that will be sent are made as precise as possible.

25 **Figure 11** illustrates an embodiment of this step S1003 during which a complex spatio-temporal request REQACC is decomposed into elementary requests REQ_n over a small time interval (δT small) and over which the same fixed spatial region applies.

For this processing, the decision module 125 commences by retrieving, at S1100, the synchronization distance T of the recorded video.

30 At 1101, it retrieves the initial and final times t_i and t_f corresponding to the current complex spatio-temporal request to determine the duration D of the temporal section corresponding to that current request.

The test S1102 compares this duration D to the synchronization distance T.

If the duration D of the temporal section is equal to or less than the synchronization distance T, the decision module 125 sets $\delta T = D$ at S1103. This means that the temporal section is not decomposed into sub-intervals. In this case, a *Media*

Fragments URI compatible request is nevertheless formed between the times t_i and t_f for the spatial region $\max\text{ROI}(t_i, t_f)$.

If the duration D of the temporal section is greater than the synchronization distance T , the server then analyses (S1104) the video stream in terms of spatial accessibility (organization of the packets/slices enabling the synchronization; size of those packets/slices; number of packets/slices per image; etc.).

The higher the number of slices (output "yes" from test S1105), the better is the spatial accessibility and the greater the duration δT that the decision module can consider. In this case, it sets $\delta T = D$ at S1103.

Conversely, if the stream does not have numerous spatial resynchronization points (coarse granularity – output "no" from test S1105), the decision module sets $\delta T = T$ (S1106) in order to give precedence to the retrieval of video fragments that are more precise.

Returning to **Figure 10**, conversely if the type of client chosen possesses high computation capacities (test S1002 false), the server selects (at S1004), from a list of predefined network bandwidths, a bandwidth on which it envisages communicating. This may for example be a choice from among the different means of communication available to the server (wifi link, Ethernet link, mobile telephone link, ADSL link, etc.).

If it is a rather narrow bandwidth, less than the megabit per second (Mbit/s) for example, (the test S1005 is then true), the server 110 generates requests over shorter intervals of time with more precise regions of interest ROI (S1003 as described earlier), that is to say with a δT supposed to be low, close to the synchronization distance known by the server.

It is thus noted that step S1003 is carried out as soon as the server considers that the client terminal 120 or the network 130 is liable to experience saturation.

Conversely, if the server 110 selects a wide bandwidth, it may generate less precise elementary requests at S1006, typically with a δT that is a multiple of the synchronization distance.

This step is thus carried out principally when the server considers that the recipient 120 of the fragments and the network 130 are not liable to experience saturation. **Figure 12** illustrates an embodiment of this step S1006.

At the start of processing the server 110 possesses information relative to the current complex request REQACC, i.e. in addition to the video sequence

concerned, the times t_i and t_f delimiting the current temporal section as well as the associated regions $ROI(t_i)$ and $ROI(t_f)$.

The decision module starts by retrieving the synchronization distance T of the video sequence at S1200.

5 At S1201, it retrieves the initial and final times t_i and t_f corresponding to the current complex spatio-temporal request to determine the duration D of the temporal section corresponding to that current request.

The test S1202 determines whether this duration D is greater than twice the synchronization distance T .

10 In the negative, the decision module sets $\delta T = D$ at S1203 (in similar manner to S1103).

In the affirmative, the current temporal section may be decomposed into smaller sub-intervals of time, notably for example of the order of T . In this case, the decision module 125 performs a loop to search for the best temporal decomposition at
15 steps S1204 to S1212.

In detail, at S1204, it initializes two parameters $d_1 = D/2$ and $d_2 = D$.

Next, at S1205, it computes the intermediate regions of interest $\max ROI(t_n, t_n + \delta T)$ for the current value of the factor $\delta T = d_1$. These intermediate regions are in particular obtained by linear interpolation along the temporal axis, between the
20 initial and final regions $ROI(t_i)$ and $ROI(t_f)$.

At S1206, the decision module computes the transmission cost, denoted C_1 , of the video fragments for the current factor δT .

These costs correspond in particular to the quantity of video data to transmit moreover taking into account the accessibility of the video stream (which
25 requires the transmission of the whole packets/slices). It may be estimated by approximation by computing the volumes 164_n , or on the basis of statistics (cost in bits of the macro-blocks of the images and regions to transmit) available to the coder, or by extraction of the corresponding data and retrieval of their size.

At S1207, it computes the transmission cost, denoted C_2 , of the video
30 fragments for the factor δT at the preceding iteration. The computation may consist in retrieving the cost C_1 computed at the preceding iteration.

At S1208, the decision module 125 compares the costs C_1 and C_2 relative to a threshold value, for example C_1/C_2 with $1/2$.

If the decomposition enables a significant saving in terms of rate (for
35 example: $C_1 < C_2/2$ – output "yes" from test S1208), the decision module continues the

decomposition into more precise requests, while first of all ensuring that the factor δT (d_1) remains greater than the synchronization distance T (test S1209) then by updating (S1210) the two parameters: $d_1 = d_1/2$ and $d_2 = d_1$. It then loops again to step S1205.

5 If the decomposition does not enable a saving (output "no" from test S1208), the decision module chooses $\delta T = d_2$ (E1211), which thus corresponds to the decomposition of the preceding iteration.

Lastly, if the factor δT risks being lower than T (output "no" from test S1209), the decomposition stops with the value d_1 (S1212) of the decomposition of the current iteration as factor δT .

10 Thus, the decomposition continues so long as the saving in terms of transmission cost remains worthwhile (test S1108 true) and so long as the time interval obtained remains greater than or equal to T (test S1110 true). A good compromise between the precision of the elementary requests REQ_n , their frequency and the size of the data to transmit is thus obtained.

15 Returning to **Figure 10**, once the duration δT has been obtained either at step S1003 or at step S1006, the processing continues at S1007 with the downsampling of the current temporal section into sub-intervals of duration equal to δT . It is to be noted that this step may already have been carried out at step S1205.

20 Next the intermediate regions of interest $ROI(t_n)$ for each of the intermediate times (t_n) separating two sub-intervals are computed (S1008) by linear interpolation on the temporal axis between the initial and final regions $ROI(t_i)$ and $ROI(t_f)$ (also carried out at step S1205).

An elementary request REQ_n for access to the part 162 of video sequence 160 is then generated (S1009) by indicating a said sub-interval and the rectangle
25 $\max ROI(t_n, t_{n+1} = t_n + \delta T)$ encompassing the two computed intermediate regions $ROI(t_n)$ and $ROI(t_{n+1})$ corresponding to that interval.

Steps S1010 and S1011 enable iteration over all the sub-intervals until the end t_f of the current temporal section is attained.

30 With reference to **Figure 13**, a description is now given of an embodiment of the invention in which said decision module 125 is implemented in an intermediate node of the network 130, in particular in a proxy or "proximity" server 140.

In this embodiment, the client terminal 120 sends the proxy 140 complex spatio-temporal requests REQ_{ACC} . A particular syntax (not compatible with the *Media Fragments URI* recommendation in its current state) is adopted for transmitting all the
35 necessary parameters.

Figure 14 illustrates examples of possible syntax. In these examples, the client terminal 120 signals the temporal section $[t_i, t_f]$ of the desired part 162 in conventional manner, and gives information on the spatial part by adding a component "t" to the conventional parameter "xywh": "xywh_t" in which the component "t" enables a spatial variation to be indicated (including spatial movement and/or spatial deformation) of the region of interest $ROI(t_i)=xywh$ over time.

In the first example given relative to a simple translation (the region of interest maintains its dimensions), the component "t" corresponds to a translation vector (T_x, T_y) of the region of interest between t_i and t_f .

In the second example given relative to a translation and a zoom with use of the SVG syntax, the parameter "t" combines a translation vector and transformation factors, here homothetic factors (sx, sy) along the horizontal and vertical axes.

Optionally, the client terminal 120 may also transmit, in its request, a "granularity" parameter indicating whether or not it wishes to obtain fine granularity (precise and more frequent requests). This is the case of the third example provided in which the parameter "t" is an affine transformation matrix A.

Of course parameters describing more complex transformations may be provided.

Step S1300 corresponds to the reception of these requests by the proxy 140. The latter then determines the presence or not of a granularity indication at S1301. For this it goes through the complex spatio-temporal request and stores the parameters present in the request (time interval requested, first spatial region requested, transformation parameters to apply and, the case arising, the parameter indicating whether the client wishes to have fine granularity or not).

If the request indicates a request for fine granularity (output "yes" from test S1301), at S1302 the proxy 140 initializes the factor δT to a value T which may either be one second, or the synchronization period if it is known to the proxy 140, or the last value used by the proxy for the video requested.

This factor δT is applied to the complex request REQACC received at S1300 to generate a list of elementary requests REQ_n over time intervals of duration δT (S1303).

The elementary requests REQ_n are then successively submitted to the server 110 (for example in their temporal order). Step S1304 first consists in transmitting the first requests REQ_i corresponding to the interval $[t_i, t_i+\delta T]$, then, at the following iterations, the requests REQ_n .

At S1305, the response REP_n from the server 110 is received and kept in memory of the proxy. This response comprises in particular the extracted video fragment 164_n.

Further to this response, the proxy may decide to adjust its factor δT at step S1306. Conditions justifying the adjustment of the factor δT correspond for example to the following cases:

- an error of the server. This case leads to the doubling of the factor δT ;
- a temporal extraction greater than the time interval requested. This case leads to adjusting the value of factor δT to the duration of the extracted temporal segment;
- a spatial extraction different from the requested region. If the extracted region is larger than the requested region, this case leads to dividing the factor δT by 2; otherwise in doubling the factor δT since it indicates that the requested video is providing good spatial granularity.

Other performance criteria cited previously may also be used.

If an adjustment is necessary, the processing loops on step S1303 to update the decomposition into elementary requests, in particular for the requests not yet submitted.

If no adjustment is necessary, the decision module performs a loop on the following elementary request at S1307 until the last one.

When the last request has been reached (test S1307 false), the proxy 140 sends a response REPACC to the client 120 in the form of an HTTP response with multiple byte ranges, each byte range corresponding to a response REP_n from the server 110 stored at S1305.

If the client has not expressed any wish as to the granularity of the response or indicated a coarse granularity (output "no" from test S1301), at S1309 the proxy 140 then applies a decomposition similar to that described above with reference to steps S1202 to S1212.

The elementary requests REQ_n so obtained are successively sent to the server 110 (S1310) and each response REP_n is stored (S1311) to form the response REPACC at S1308.

With reference now to **Figure 15**, a description is given by way of example of a particular hardware configuration of a device for video sequence access adapted for an implementation of the methods according to the invention.

A device implementing the present invention is for example a micro-computer 50, a workstation, a personal assistant, or a mobile telephone connected to different peripherals. According to still another embodiment of the invention, the device takes the form of a camera provided with a communication interface to enable
5 connection to a network.

The peripherals connected to the device comprise for example a digital camera 64, or a scanner or any other means of image acquisition or storage, connected to an input/output card (not shown) and supplying multimedia data, for example of video sequence type, to the device according to the invention.

10 The device 50 comprises a communication bus 51 to which there are connected:

- a central processing unit CPU 52 taking for example the form of a microprocessor;
- a read only memory 53 in which may be contained the programs whose
15 execution enables the implementation of the methods according to the invention. It may be a flash memory or EEPROM;
- A random access memory 54, which, after powering up of the device 50, contains the executable code of the programs of the invention necessary for the implementation of the invention. As this memory 54 is of random access type (RAM), it
20 provides fast accesses compared to the read only memory 53. This RAM memory 54 stores in particular the various images and the various blocks of pixels as the processing is carried out on the video sequences;
- a screen 55 for displaying data, in particular video and/or serving as a graphical interface with the user, who may thus interact with the programs according to
25 the invention, using a keyboard 56 or any other means such as a pointing device, for example a mouse 57 or an optical stylus;
- a hard disk 58 or a storage memory, such as a memory of compact flash type, able to contain the programs of the invention as well as data used or produced on implementation of the invention;
- 30 - an optional diskette drive 59, or another reader for a removable data carrier, adapted to receive a diskette 63 and to read/write thereon data processed or to process in accordance with the invention; and
- a communication interface 60 connected to the telecommunications network 130, the interface 60 being adapted to transmit and receive data.

In the case of audio data, the device 50 is preferably equipped with an input/output card (not shown) which is connected to a microphone 62.

The communication bus 51 permits communication and interoperability between the different elements included in the device 50 or connected to it. The
5 representation of the bus 51 is non-limiting and, in particular, the central processing unit 52 unit may communicate instructions to any element of the device 50 directly or by means of another element of the device 50.

The diskettes 63 can be replaced by any information carrier such as a compact disc (CD-ROM) rewritable or not, a ZIP disk or a memory card. Generally, an
10 information storage means, which can be read by a micro-computer or microprocessor, integrated or not into the video sequence processing device, and which may possibly be removable, is adapted to store one or more programs whose execution permits the implementation of the methods according to the invention.

The executable code enabling the device for accessing a spatio-temporal
15 part of a video sequence to implement the invention may equally well be stored in read only memory 53, on the hard disk 58 or on a removable digital medium such as a diskette 63 as described earlier. According to a variant, the executable code of the programs is received by the intermediary of the telecommunications network 130, via the interface 60, to be stored in one of the storage means of the device 50 (such as the
20 hard disk 58) before being executed.

The central processing unit 52 controls and directs the execution of the instructions or portions of software code of the program or programs of the invention, the instructions or portions of software code being stored in one of the aforementioned storage means. On powering up of the device 50, the program or programs which are
25 stored in a non-volatile memory, for example the hard disk 58 or the read only memory 53, are transferred into the random-access memory 54, which then contains the executable code of the program or programs of the invention, as well as registers for storing the variables and parameters necessary for implementation of the invention.

It will also be noted that the device implementing the invention or
30 incorporating it may be implemented in the form of a programmed apparatus. For example, such a device may then contain the code of the computer program(s) in a fixed form in an application specific integrated circuit (ASIC).

The device described here and, particularly, the central processing unit 52, may implement all or part of the processing operations described in relation with

Figures 1 to 14, to implement the methods of the present invention and constitute the devices of the present invention.

The preceding examples are only embodiments of the invention which is not limited thereto.

- 5 In particular, the alignment of the initial t_i , final t_f , and intermediate or key t_n/t_c times with images having no temporal dependency may be advantageously implemented in any one of the implementations of the invention.

CLAIMS

1. A processing method for accessing a spatio-temporal part (162) of a compressed video sequence (160), comprising a step of obtaining (S403, S901-903, S1000, S1300) a request for access (REQACC) to said spatio-temporal part by identifying a temporal section defined between an initial time (t_i) and a final time (t_f) in said sequence, **characterized in that:**

– said access request (REQACC) identifies an initial spatial region ($ROI(t_i)$) of the sequence at the initial time (t_i), and a final spatial region ($ROI(t_f)$) of the sequence at the final time (t_f) that is different from said initial spatial region;

and the method comprises the steps of:

– decomposing (S406, S904, S1003, S1006, S1303, S1309) said access request into a plurality of elementary requests (REQ_n) for access to a video fragment (164_n) of the sequence, each elementary request identifying a fixed spatial region ($maxROI(t_n, t_{n+1})$) to extract in a temporal sub-interval of said temporal section; and

– exploiting (S407, S907, S1310) at least one elementary request to access at least one video fragment (164_n) constituting said spatio-temporal part to access (162).

2. A method according to claim 1, comprising a step of dynamically adjusting (S409, S704, S1306) said decomposition of the access request (REQACC) during the processing of elementary requests.

3. A method according to claim 2, wherein the adjusting step comprises the re-computation of the elementary requests (REQ_n) not yet exploited into a plurality of elementary requests associated with temporal sub-intervals of modified duration (δT).

4. A method according to claim 3, comprising the steps of:

– transmitting (S407, S1304, S1310) said elementary request (REQ_n) to a server device (110) storing said video sequence and receiving (S408, S1305, S1311), in return, at least one corresponding extracted fragment ($164_n, REP_n$); and

– re-computing the elementary requests (REQ_n) not yet exploited on the basis of said received fragment.

5. A method according to one of the preceding claims, in which said decomposition or possible re-computation of the elementary requests (REQ_n) not yet exploited and the associated modification of said duration (δT) depend on a performance criterion of a client terminal (120) establishing said access request and/or

of a server device (110) storing said video sequence and/or of a communication network (130) linking the client terminal and the server device.

6. A method according to one of the preceding claims, in which the duration (δT) of the temporal sub-intervals corresponding to the elementary requests
5 (REQ_n) depends on the spatial accessibility of image data composing said video sequence (160).

7. A method according to one of the preceding claims, in which the video sequence (160) being compressed using a temporal prediction mechanism, the duration (δT) of the temporal sub-intervals corresponding to the elementary requests
10 (REQ_n) depends on the period (T) separating two images without temporal dependency in the video sequence.

8. A method according to claim 7, wherein a temporal sub-interval is aligned with images of the video sequence which are not compressed by temporal prediction.

15 9. A method according to claim 7 or 8, in which said initial time (t_i) is offset to align with the last image of the video sequence that precedes said initial time and that is not compressed by temporal prediction.

10. A method according to one of the preceding claims, in which said decomposition comprises a step of performing linear interpolation (S1205), along a
20 temporal axis, of two intermediate spatial regions (ROI(t_n), ROI(t_{n+1})) corresponding to the two extreme times (t_n , t_{n+1}) of a said temporal sub-interval, on the basis of said initial (ROI(t_i)) and final (ROI(t_f)) spatial regions.

11. A method according to claim 10, wherein said fixed spatial region (maxROI(t_n , t_{n+1})) associated with said temporal sub-interval encompasses said
25 corresponding two intermediate spatial regions (ROI(t_n), ROI(t_{n+1})).

12. A method according to one of claims 1 to 11, wherein said decomposition into elementary requests (REQ_n) is implemented at a client terminal (120) establishing said access request (REQACC).

13. A method according to one of claims 1 to 11, wherein said
30 decomposition into elementary requests (REQ_n) is implemented at a server device (110) storing said compressed video sequence (160).

14. A method according to claim 13, wherein said server device (110) makes available (S907) to a client terminal (120) the list of said elementary requests.

15. A method according to one of claims 1 to 11, wherein said
35 decomposition into elementary requests (REQ_n) is implemented at an intermediate

device (140) located on a communication network (130) between a client terminal (120) making said access request (REQACC) and a server device (110) storing said compressed video sequence (160).

16. A method according to claim 15, wherein said intermediate device
 5 (140) is a proxy which receives (S1300) said access request (REQACC) from the client terminal (120), sends (S1304) each of said elementary requests (REQ_n) to said server device (110), stores (S1305) each of the video fragments (164_n) received from the server device (110) and transmits (S1308) a response (REPASS) to the access request (REQACC) from the client terminal (120) that is established on the basis of
 10 said stored video fragments.

17. A method according to one of the preceding claims, in which the decomposition (S406, S904, S1003, S1006, S1303, S1309) of the access request (REQACC) comprises iteratively determining (S1210) the duration (δT) of said temporal sub-intervals.

18. A method according to claim 17, wherein said iterative determining comprises iteratively sub-dividing (S1210) the temporal sub-intervals for as long as the ratio between the estimated costs ($C1$, $C2$) of transmitting the video fragments respectively corresponding to a sub-interval after iteration and to a sub-interval before iteration is less than (S1208) a threshold value.

19. A method according to one of the preceding claims, in which a said elementary request (REQ_n) comprises at least one parameter ($xywh$) defining the fixed spatial region ($\max ROI(t_n, t_{n+1})$), and a component (t) representing a spatial variation of said fixed spatial region during said corresponding temporal sub-interval.

20. A processing device for accessing a spatio-temporal part (162) of a
 25 compressed video sequence (160) on the basis of an access request (REQACC), said access request identifying a temporal section defined between an initial time (t_i) and a final time (t_f) in said sequence, **characterized in that:**

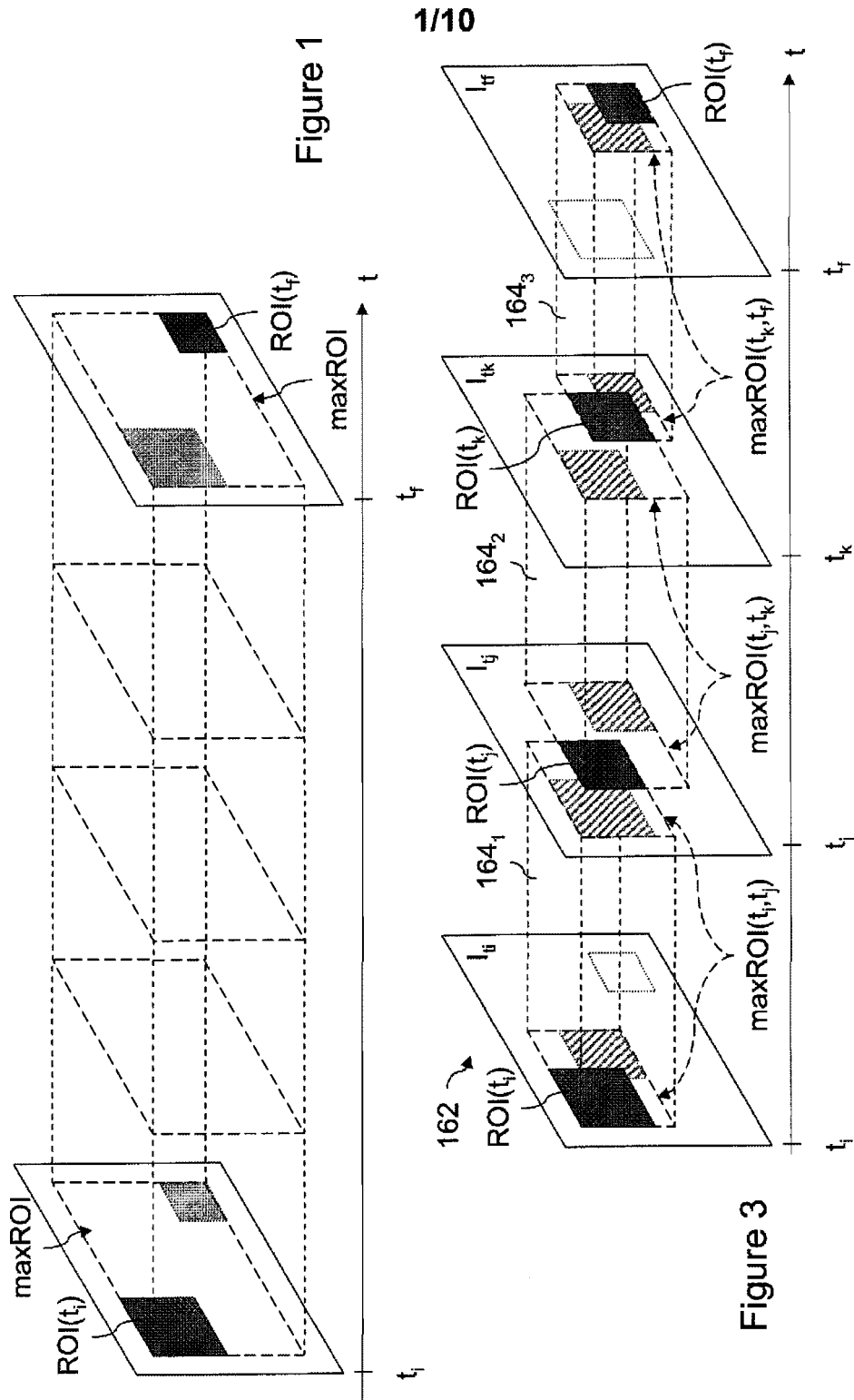
– said access request (REQACC) furthermore identifies an initial spatial region ($ROI(t_i)$) of the sequence at the initial time (t_i), and a final spatial region ($ROI(t_f)$) of the sequence at the final time (t_f) that is different from said initial spatial region;
 30 and the device comprises:

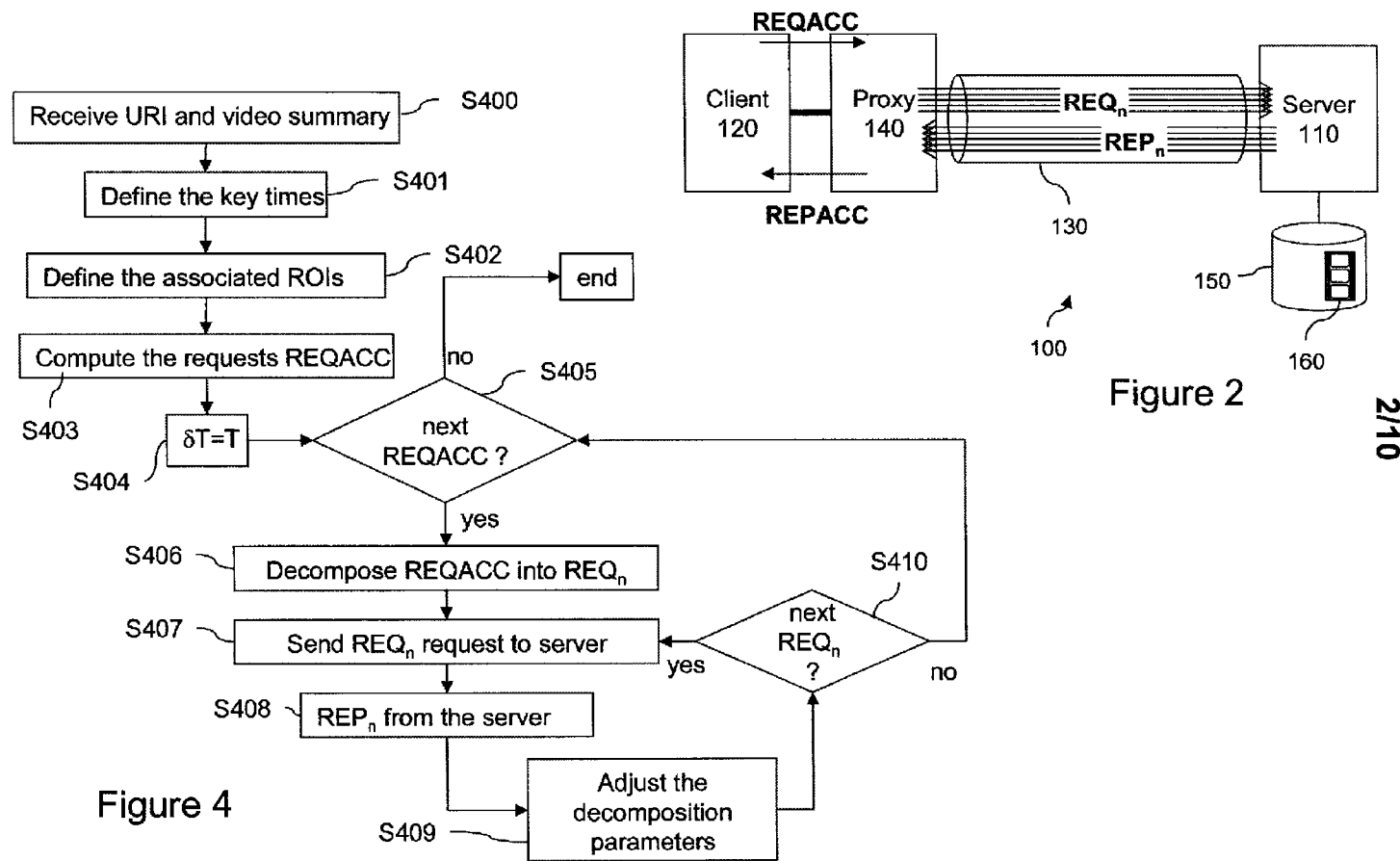
– a decomposition module (125) adapted for decomposing said access request into a plurality of elementary requests for access (REQ_n) to a video fragment (164_n) of the sequence, each elementary request identifying a fixed spatial region ($\max ROI(t_n, t_{n+1})$) to extract in a temporal sub-interval of said temporal section; and
 35

– a module for exploiting at least one elementary request to access at least one video fragment (164_n) constituting said spatio-temporal part (162) to access.

21. A means of information storage, possibly totally or partially removable, that is readable by a computer system, comprising instructions for a computer program
5 adapted to implement the method according to any one of claims 1 to 19, when the program is loaded and executed by the computer system.

22. A computer program product readable by a microprocessor, comprising portions of software code adapted to implement the method according to any one of claims 1 to 19, when it is loaded and executed by the microprocessor.





2/10

3/10

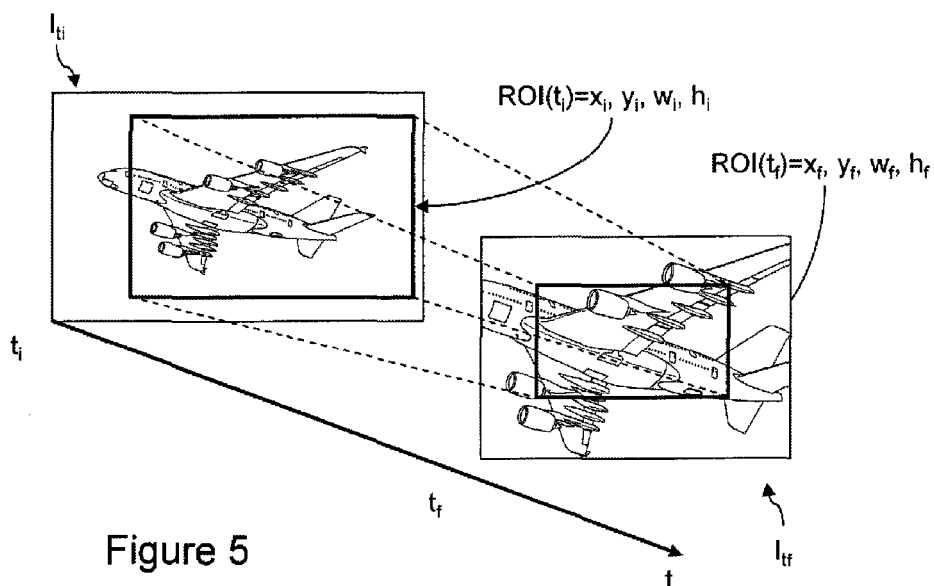


Figure 5

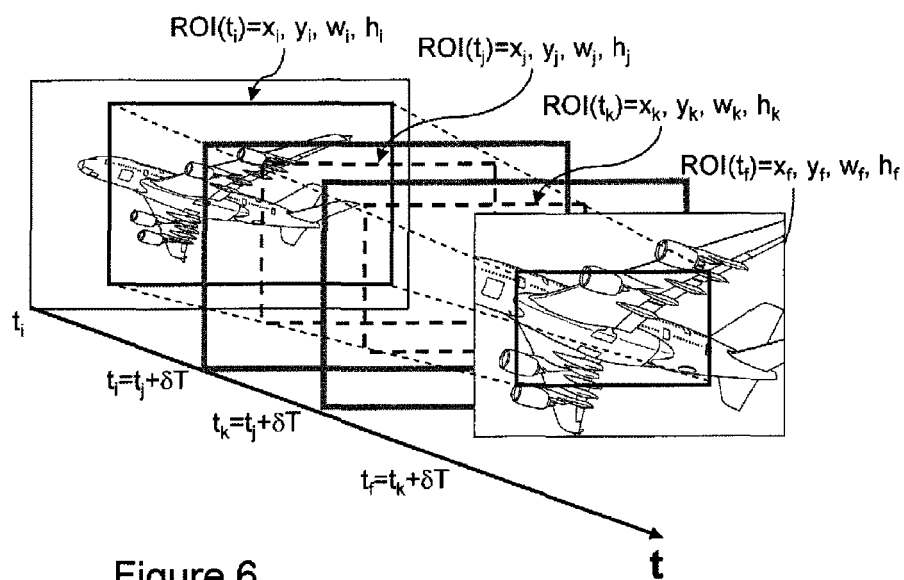


Figure 6

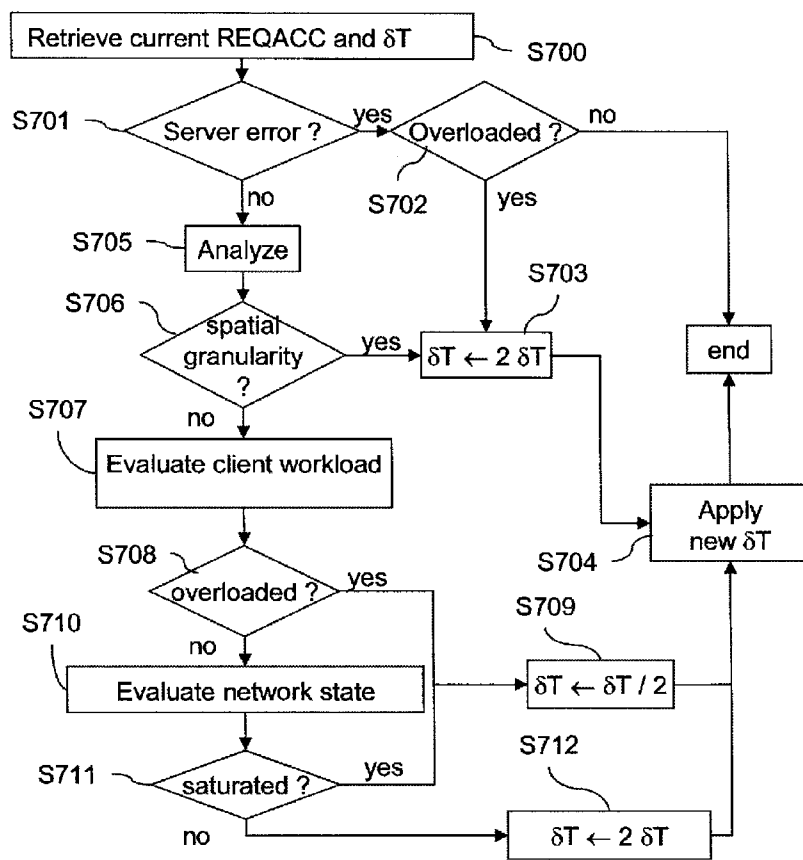


Figure 7

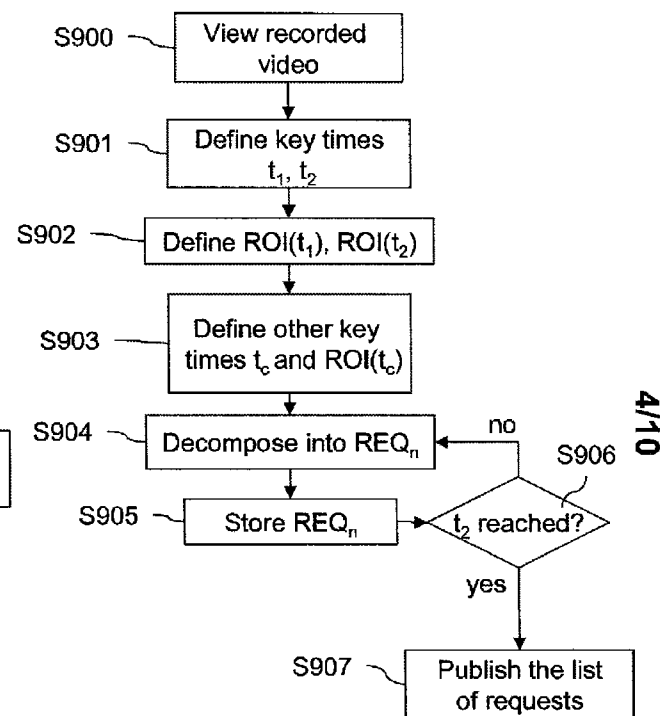


Figure 9

4/10

5/10

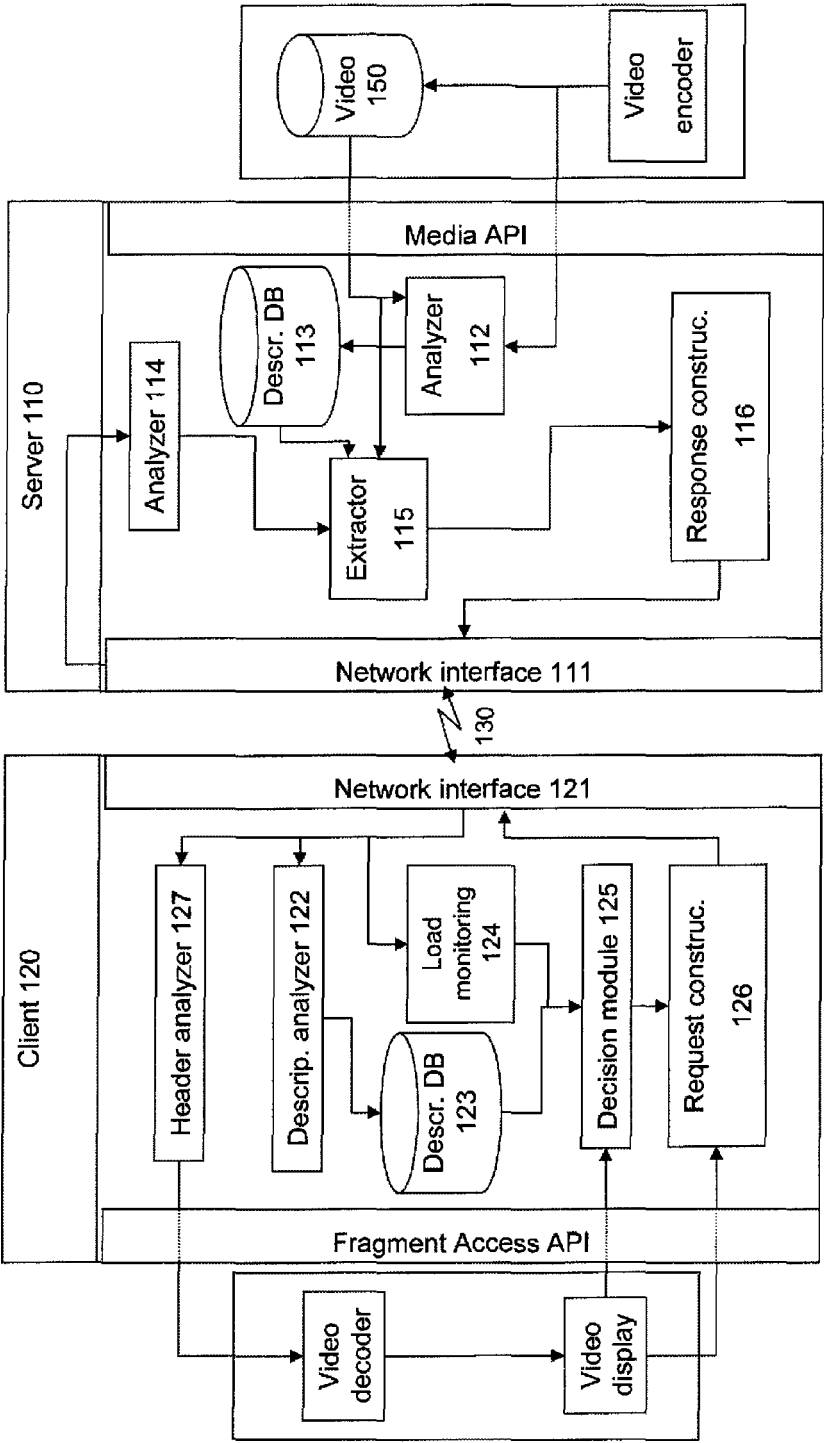
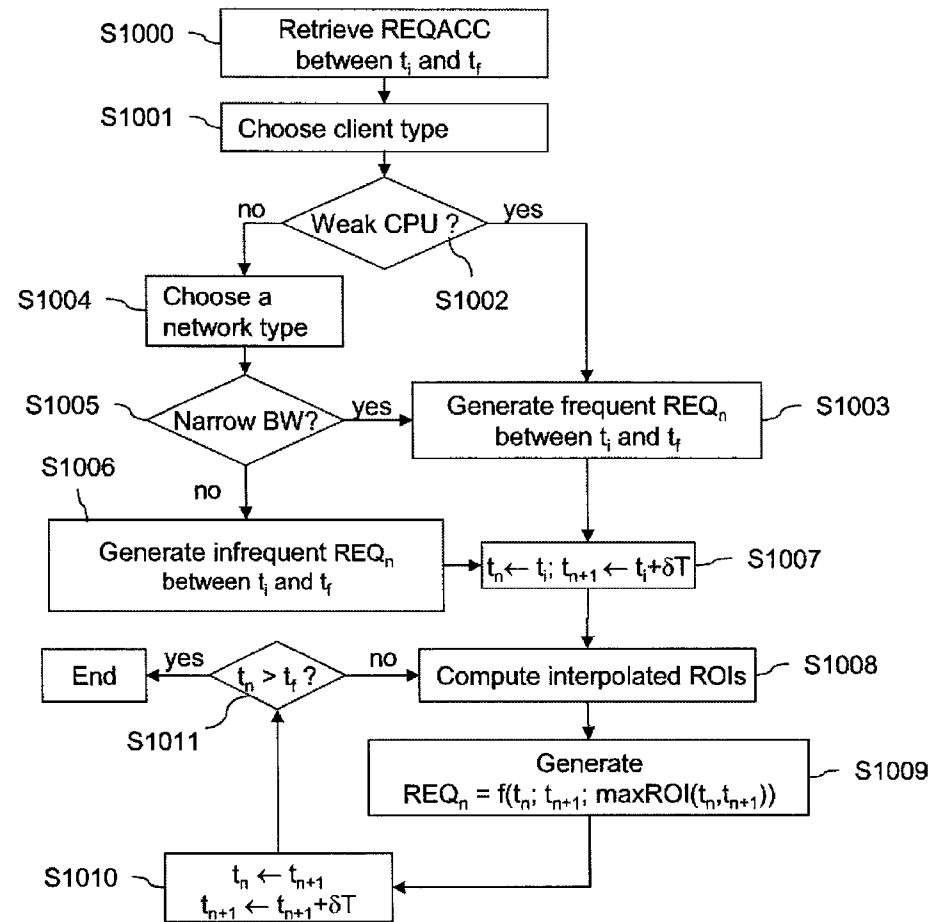


Figure 8

6/10

Figure 10



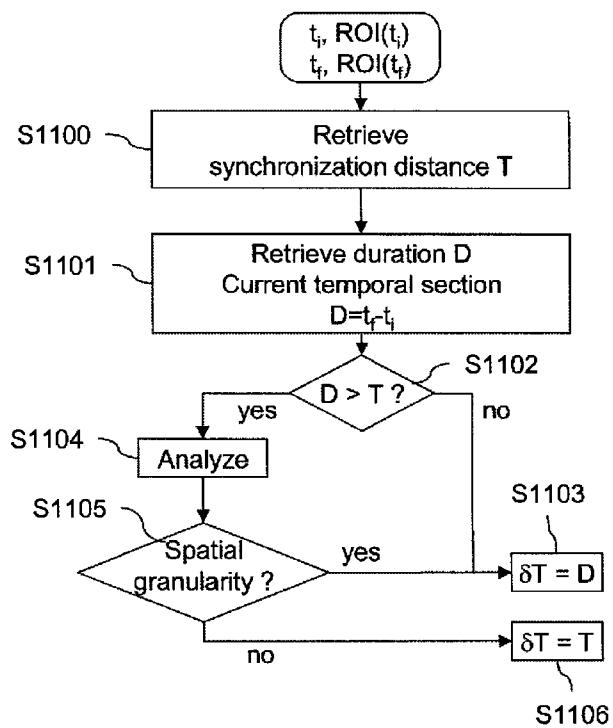


Figure 11

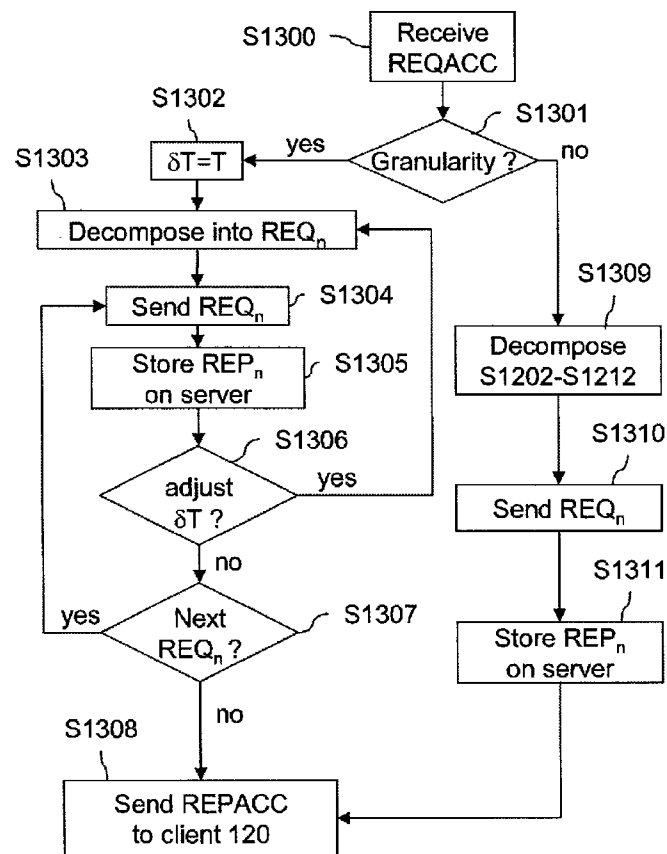


Figure 13

7/10

8/10

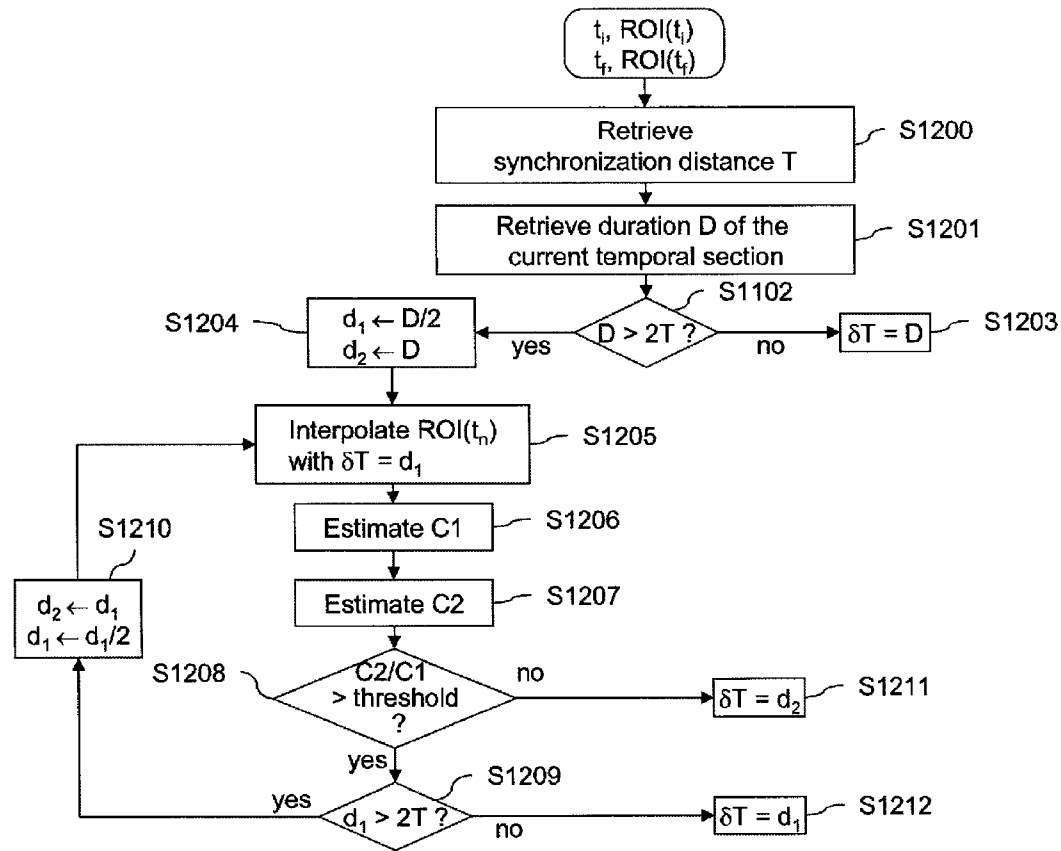
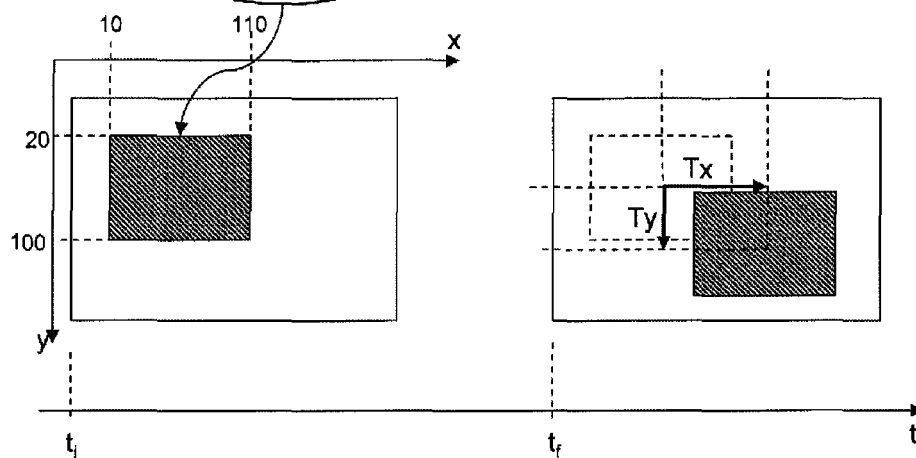


Figure 12

9/10

Example 1:

URI#xywh $t=10, 20, 100, 80$ & $T=T_x, T_y$ & $t=t_i, t_f$ 

Example 2:

URI#xywh $t=10, 20, 100, 80$ & translate= (T_x, T_y) & scale= (s_x, s_y) & $t=t_i, t_f$

Example 3:

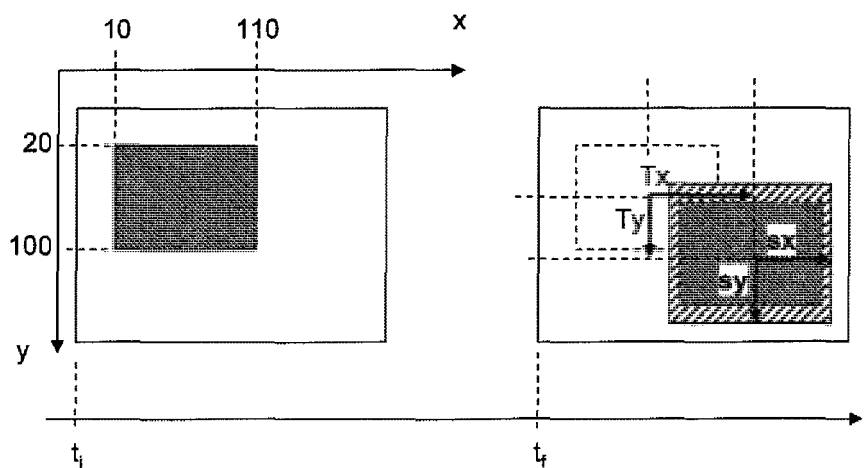
URI#xywh $t=10, 20, 100, 80$ & A= $s_x, 0, 0, s_y, T_x, T_y$ & $t=t_i, t_f$ & granularity=high

Figure 14

10/10

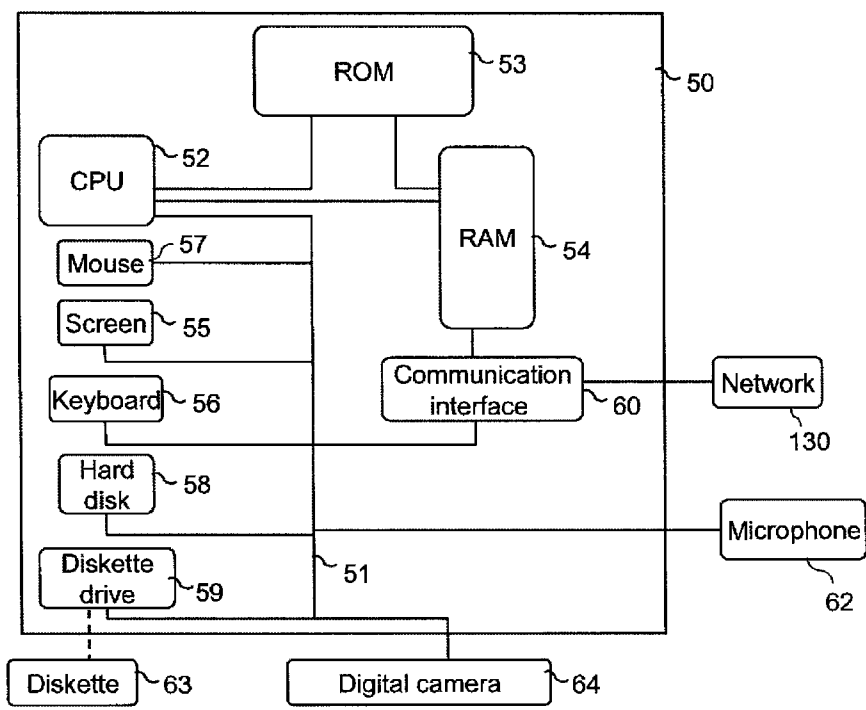


Figure 15

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/051528

A. CLASSIFICATION OF SUBJECT MATTER INV. H04N7/173 ADD.		
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		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/300701 A1 (KARAOGUZ JEYHAN [US] ET AL) 3 December 2009 (2009-12-03) abstract figures 1,6 paragraphs [0024] - [0029], [0039] - [0049]	1-22
X	US 2002/021353 A1 (DENIES MARK [US]) 21 February 2002 (2002-02-21) abstract figure 4 paragraphs [0020] - [0032], [0039] - [0053], [0056] - [0059] ----- -/--	1-22
☒ Further documents are listed in the continuation of Box C. ☒ 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 "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		Date of mailing of the international search report
7 July 2011		15/07/2011
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Dobbelaere, Dirk

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2011/051528

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/062478 A1 (CETIN AHMET E [TR] ET AL) 23 March 2006 (2006-03-23) abstract figures 1-5 paragraphs [0007] - [0009], [0014] - [0018], [0039] - [0041], [0056] - [0067] -----	1-22
A	EP 1 710 719 A1 (RICOH KK [JP]) 11 October 2006 (2006-10-11) abstract paragraphs [0006] - [0016], [0031] - [0033], [0042] - [0062] figures 1-3,5-13 -----	1-22
A	ISLAM A ET AL: "JPEG2000 for Wireless Applications", PROCEEDINGS OF THE INTERNATIONAL SOCIETY FOR OPTICAL ENGINEERING (SPIE), SPIE, USA, vol. 5203, 1 January 2003 (2003-01-01), pages 255-271, XP002316046, ISSN: 0277-786X, DOI: DOI:10.1117/12.512536 pp 262-265: Part II: Region-Of-Interest Coding in Motion JPEG2000 -----	1-22

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2011/051528

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009300701	A1	03-12-2009	NONE
US 2002021353	A1	21-02-2002	NONE
US 2006062478	A1	23-03-2006	NONE
EP 1710719	A1	11-10-2006	JP 2006295386 A 26-10-2006 US 2006228033 A1 12-10-2006

Form PCT/ISA/210 (patent family annex) (April 2005)

<i>Index of Claims</i> 	Application/Control No. 15/783,999	Applicant(s)/Patent Under Reexamination DENOUAL et al.
	Examiner BENJAMIN M THIEU	Art Unit 2441

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

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	02/27/2018								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
	11	✓								
	12	✓								
	13	✓								
	14	✓								
	15	✓								
	16	✓								
	17	-								
	18	-								
	19	-								
	20	-								
	21	-								
	22	✓								
	23	✓								
	24	✓								
	25	✓								
	26	✓								
	27	✓								
	28	✓								
	29	✓								
	30	✓								
	31	-								
	32	✓								
	33	✓								

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Franck DENOUAL	Confirmation No.:	4207
Application No.:	15/783999		
Filed:	10/13/2017	Examiner:	Benjamin M. Thieu
For:	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA	Art Unit:	2441

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

RESPONSE TO OFFICE ACTION / AMENDMENT

Dear Sir:

In response to the Office Action dated March 5, 2018, please amend the above-identified application as follows:

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

Remarks begin on page 9 of this paper.

Amendments to the Claims:

Please amend the claims as shown below. This Listing of Claims will replace prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A method for streaming data corresponding to a given video, each frame of the video being divided into n partitions, n being an integer, in order to create n independent partial videos, the method comprising:

transmitting, by a server, a notification to a client, said notification including spatial information representing, by a pixel position on a frame of the video, a spatial position of each ~~about a spatial organization of the n partial videos,~~

receiving from the client which received the notification, by the server, one or more messages for requesting one or more partial videos according to a Region Of Interest selected based on an operation by a user of the client, and

transmitting to the client, by the server, video data corresponding to the one or more partial videos, in response to the one or more messages from the client.

2. (Currently Amended) The method according to claim 1, wherein the spatial information represents both of an x-axis direction pixel position and a y-axis direction pixel position ~~a spatial position~~ of each of the n partial videos.

3. (Currently Amended) The method according to claim 2, wherein the spatial position is represented by a ~~coordinate value of~~ pixel position in a top-left corner, a width and a height of a partial video.

4. (Currently Amended) A transmitting method for transmitting video data to a client, the method comprising:

transmitting, to the client, a notification including (i) spatial position information representing, by a pixel position on a frame of a video, a spatial position of each of n spatial regions of ~~a the~~ video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the ~~videoes~~video,

receiving, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client, and

transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client.

5. (Currently Amended) The method according to claim 4, wherein the spatial position information represents ~~a coordinate value~~both of an x-axis direction pixel position and a y-axis direction pixel position of each of the n spatial regions.

6. (Currently Amended) The method according to claim 4, wherein the spatial position information represents ~~a coordinate value of~~a pixel position in a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions.

7. (Currently Amended) The method according to claim ~~5~~4, wherein the ~~spatial position information represents~~pixel position of each of the n-spatial regions is indicated by a value according to a number of pixels between a reference pixel of the frame and a pixel in a top-left corner of each of the n spatial regions in an x-coordinate value~~x-axis direction~~ and a ~~y-coordinate value of each of the n spatial regions~~y-axis direction.

8. (Currently Amended) The method according to claim 4, wherein the spatial position information ~~represents~~ further includes number information relating to a partition number in the video of each of the n spatial regions.

9. (Original) The method according to claim 4, wherein the notification further includes partition number information representing a number of partitions of the video corresponding to the n spatial regions in the horizontal direction and in the vertical direction.

10. (Currently Amended) The method according to claim 4, wherein a spatial size of at least one spatial region among the n spatial region of the frame of the video is different from a spatial size of another spatial region among the n spatial region of the frame of the video, and the spatial size information represents a both of the spatial size of each of the n spatial regions the at least one spatial region and the spatial size of said another spatial region.

11. (Original) The method according to claim 4, wherein the spatial size information further represents a spatial size of a video corresponding to the n spatial regions.

12. (Original) The method according to claim 4, wherein each frame of the video corresponding to the n spatial regions is divided into n rectangles

13. (Original) The method according to claim 4, wherein each frame of the video corresponding to the n spatial regions is divided into n partitions and compressed independently in order to create the n spatial regions.

14. (Currently Amended) A method for receiving video data from a server, the method comprising:

receiving, from the server, a notification including (i) spatial position information representing, by a pixel position on a frame of a video, a spatial

position of each of n spatial regions of ~~a~~the video, n being integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video,

transmitting, to the server, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted from the server, and

receiving, from the server, the video data corresponding to the one or more spatial regions according to the information transmitted to the server.

15. (Currently Amended) The method according to claim 14, wherein the spatial position information represents ~~a coordinate value~~both of an x-axis direction pixel position and a y-axis direction pixel position of each of the n spatial regions.

16. (Currently Amended) The method according to claim 14, wherein the spatial position information represents ~~a coordinate value of~~pixel position in a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions.

17-21. (Canceled)

22. (Currently Amended) An apparatus for transmitting video data to a client, the apparatus comprising:

a hardware processor; and

a memory storing one or more programs configured to be executed by the hardware processor, the one or more programs including instructions for:

transmitting, to the client, a notification including (i) spatial position information representing by a pixel position on a frame of a video, a spatial position of each of n spatial regions of ~~a~~the video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video;

receiving, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client; and

transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client.

23. (Currently Amended) The apparatus according to claim 22, wherein the spatial position information represents ~~a coordinate value~~both of an x-axis direction pixel position and a y-axis direction pixel position of each of the n spatial regions.

24. (Currently Amended) The apparatus according to claim 22, wherein the spatial position information represents a ~~coordinate value of~~pixel position in a top-left corner of each of the n spatial regions, and the spatial size information represents both of a width and a height of each of the n spatial regions.

25. (Currently Amended) The apparatus according to claim 23, wherein the ~~spatial position information represents~~pixel position of each of the n spatial regions is indicated by a value according to a number of pixels between a reference pixel of the frame and a pixel in a top-left corner of each of the n spatial regions in an x-coordinate value~~x-axis direction~~and a y-coordinate value~~y-axis direction~~of each of the n spatial regions.

26. (Original) The method according to claim 4, wherein the information received from the client includes one or more URLs associated with the one or more spatial regions.

27. (Original) The method according to claim 4, wherein the information received from the client includes one or more HTTP addresses associated with the one or more spatial regions.

28. (Original) The method according to claim 4, wherein, in a case where a spatial position of the n spatial regions for a first time period and a spatial position of the n spatial regions for a second time period are different from each other, a first notification for the first time period and a second notification for the second time period are transmitted to the client.

29. (Original) The method according to claim 28, wherein the first notification includes (i) first spatial position information representing a spatial position of each of the n spatial regions for the first time period and (ii) first spatial size information representing a spatial size of each of the n spatial regions for the first time period, and the second notification includes (iii) second spatial position information representing a spatial position of each of the n spatial regions for the second time period and (iv) second spatial size information representing a spatial size of each of the n spatial regions for the second time period.

30. (Original) The method according to claim 4, wherein the notification further includes a parameter relating to at least one of an image resolution, a frame rate and a bandwidth of the video.

31. (Canceled)

32. (Original) The apparatus according to claim 22, further comprising a camera unit for performing capturing to obtain the video data.

33. (Original) The method according to claim 14, further comprising determining a Region Of Interest based on a signal from a user interface, wherein the one or more spatial regions include the Region Of Interest.

REMARKS

Summary of the Amendment

The Application has been carefully reviewed in light of the Office Action dated March 5, 2018. In this response, claims 1-8, 10, 14-16 and 22-25 have been amended without adding new subject matter. Accordingly, claims 1-16, 22-30, 32 and 33 are currently under examination.

Double Patenting

Claims 1, 4, 14 and 22 were rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1, 9, 29 and 54 of U.S. Patent No. 9,883,011 B2.

Claims 1, 4, 14 and 22 have been amended to feature "spatial (position) information representing, by a pixel position on a frame of the video, a spatial position of each of the n partial videos (regions of a video)."

None of the claims of U.S. Patent No. 9,883,011 B2 include the above-described feature. Therefore, Applicant respectfully requests that the double patenting rejection be withdrawn.

Claim Rejections - 35 U.S.C. § 103

Claims 1-16, 22-30 and 32-33 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Mavlankar et al. (non-patented literature, "An interactive region-of-interest video streaming system for online lecture viewing", hereinafter Mavlankar), in view of Koyanagi (US 2003/0142872 A1, hereinafter Koyanagi).

The claims as amended feature a server providing to a client, spatial information representing, by a pixel position on a frame of a video, a spatial position of each of n spatial region. This feature improves the convenience for a case where a server provides a video corresponding to a specific spatial region to a client. Support for the claim amendment includes reference numeral 872 of Fig. 8a as well as page 29, lines 24-32 of the Specification.

The Mavlankar reference discloses that a server provides a thumbnail video to a client and the client may select a Region of Interest. The Examiner concedes on page 9, lines 7 to 9 in the Office Action that the Mavlankar reference does not disclose (i) spatial position information representing a spatial position of each of n spatial regions of a video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video.

The Koyanagi reference discloses that the information processing apparatus may effectively use the bandwidth of the transmission line by acquiring not the entirety of the frames of the moving image but a necessary number of segment areas (paragraph 0019). Koyanagi also discloses image management data to be used by the encoding device 1 (see Fig. 5) and image related information to be provided from the encoding device 1 to the decoding device 3 (see Fig. 4). Fig. 5 illustrates the pointers to the tiles [0, 0], [1, 0], [0, 1], and [1, 1] (namely, memory addresses in which bit streams of the tiles are stored) (paragraphs 0204-0209).

Neither of the cited references discloses “a notification including (i) spatial position information...”

The Office Action concluded that Koyanagi discloses “a notification (i) spatial position information” in Fig. 5 and paragraphs [0106]-[0111] (on page 9, lines 10 to 14 of the Office Action). However, as explained above, the image management data illustrated in Fig. 5 of Koyanagi is not to be provided to the decoding device 3, but to be used within the encoding device 1. This is also clear from the description in paragraphs [0106], [0121], and [0122] of Koyanagi.

Further, the information disclosed in Fig. 5 and paragraphs [0106]-[0111] of Koyanagi is not the information related to the spatial position of each tile as but the information (pointers) related to the memory addresses in which the bit streams of the tiles are stored. This is clear from the description in paragraphs [0112] and [0113] of Koyanagi.

Therefore, none of the references discloses “notification including (i) spatial position information...”

Claim 10 as amended is based on a case that the spatial sizes of the tiles are not equal as shown by 870 in Fig. 8A of the Specification. If a client is notified of the spatial sizes of the tiles as defined in currently amended claim 10 of the present application, the convenience can be improved in a use case of providing a video corresponding to a specific spatial region among a plurality of spatial regions having unequal spatial sizes.

The Office Action concluded that claim 10 of the present application is disclosed by "Mavlankar; Fig. 4; [section 3.1], and Koyanagi; Figs. 3-5; [0106-0111, 0114]" (see the item 18 on page 10 of the office action).

However, neither Mavlankar nor Koyanagi discloses that the n spatial regions have different spatial sizes in a case where a frame of a video is spatially divided into n regions.

Koyanagi describes (a) a case of spatially dividing each frame of a video into 2×2 , (b) a case of spatially dividing each frame of a video into 4×4 , and (c) a case of spatially dividing each frame of a video into 8×8 , but the spatial regions have the same size in all of the cases.

Therefore, the difference between currently amended claim 10 of the present application and the cited references is clear.

For the foregoing reasons, allowance of claims 1, 4, 14 and 22 are respectfully requested.

The remaining claims are dependent claims. Because each independent claim is believed allowable, the claims depending therefrom are also believed allowable for at least the same reasons as discussed above with reference to the independent claims. Furthermore, the dependent claims are also deemed to define an additional aspect of the invention, and individual consideration on its own merits is respectfully requested.

CONCLUSION

Applicant respectfully submits that all of the claims pending in the application meet the requirements for patentability and respectfully requests that the Examiner indicate the allowance of such claims.

Any amendments to the claims which have been made in this response which have not been specifically noted to overcome a rejection based upon prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto.

If any additional fee is required, please charge Deposit Account Number 502456.

Should the Examiner have any questions, the Examiner may contact Applicant's representative at the telephone number below.

Respectfully submitted,

6/5/2018
Date

/Amichai Kotev/
Amichai Kotev, Reg. No. 57,668
Patent Attorney for Applicant

Canon U.S.A. Inc., Intellectual Property Division
15975 Alton Parkway
Irvine, CA 92618-3731

Telephone: (949) 932-3313
Fax: (949) 932-3560

Electronic Acknowledgement Receipt	
EFS ID:	32812570
Application Number:	15783999
International Application Number:	
Confirmation Number:	4207
Title of Invention:	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA
First Named Inventor/Applicant Name:	Franck DENOUAL
Customer Number:	34904
Filer:	Amichai Kotev/Frank Martinez
Filer Authorized By:	Amichai Kotev
Attorney Docket Number:	1000-18542-NP-cont-CINC
Receipt Date:	05-JUN-2018
Filing Date:	13-OCT-2017
Time Stamp:	17:42:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10131471WOUS02_1000-18542-NP-cont-CINC_NFOA_Response.pdf	123666	yes	12
			b25ff49edb58fd70c093932a286d9727de33e5f		

Multipart Description/PDF files in .zip description			
	Document Description	Start	End
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	8
	Applicant Arguments/Remarks Made in an Amendment	9	12
Warnings:			
Information:			
Total Files Size (in bytes):		123666	
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.			



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-cont-CINC	4207
34904 7590 06/19/2018 CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION 15975 ALTON PARKWAY IRVINE, CALIFORNIA 92618-3731 UNITED STATES OF AMERICA			EXAMINER THIEU, BENJAMIN M	
			ART UNIT 2441	PAPER NUMBER
			NOTIFICATION DATE 06/19/2018	DELIVERY MODE ELECTRONIC

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 the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPDocketing@cusa.canon.com
mkavetsky@cusa.canon.com
skalminov@cusa.canon.com

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 or 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 examiners 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 applicants 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 applicants 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 examiners 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 examiners initials.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

34904 7590 07/11/2018
CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION
15975 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-3731
UNITED STATES OF AMERICA

EXAMINER

THIEU, BENJAMIN M

ART UNIT

PAPER NUMBER

2441

DATE MAILED: 07/11/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-cont-CINC	4207

TITLE OF INVENTION: METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	10/11/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

34904 7590 07/11/2018
CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION
15975 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-3731
UNITED STATES OF AMERICA

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-cont-CINC	4207

TITLE OF INVENTION: METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	10/11/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
THIEU, BENJAMIN M	2441	709-217000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached. ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.	2. For printing on the patent front page, list (1) The names of up to 3 registered patent attorneys or agents OR, alternatively, (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 1 _____ 2 _____ 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-cont-CINC	4207
34904	7590	07/11/2018	EXAMINER	
THIEU, BENJAMIN M				
ART UNIT			PAPER NUMBER	
2441				

DATE MAILED: 07/11/2018

CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION
15975 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-3731
UNITED STATES OF AMERICA

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 12 minutes 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, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 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. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b) (2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/783,999	Applicant(s) DENOVAL et al.	
	Examiner BENJAMIN M THIEU	Art Unit 2441	AIA Status No

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment filed 6/5/2018 and Interview on 7/6/2018.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are See Continuation Sheet. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☒ All b) ☐ Some *c) ☐ None of the:

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)).

* Certified copies not received: ____.

Applicant has **THREE MONTHS FROM THE "MAILING DATE"** of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in **ABANDONMENT** of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☒ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date ____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material ____.	7. ☐ Other ____.
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date, <u>7/6/2018</u> .	

/BENJAMIN M THIEU/ Primary Examiner, Art Unit 2441	

Continuation of 3. The allowed claim(s) is/are: 1,3-4,6,8-14,16,22,24,26-30 and 32-33

DETAILED ACTION

1. This Office Action is in response to the Amendment filed June 5, 2018. Claim(s) 1-8, 10, 14-16, and 22-25 have been amended. Therefore, Claim(s) 1-16, 22-30, 32 and 33 are pending and have been considered as follows.

Notice of Pre-AIA or AIA Status

2. The present application is being examined under the pre-AIA first to invent provisions.

Interview Summary

3. A proposed amendment was submitted for applicant's consideration. Examiner suggested the Applicant to amend claims as shown in the Examiner's Amendment below in order to place the application in condition for allowance.

EXAMINER'S AMENDMENT

4. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

5. Authorization for this examiner's amendment was given in a telephone interview with the Applicant's Representative, Amichai Kotev (Reg. No. 57,688) on July 6, 2018.

6. **The application has been amended as follows:**

Claim 1. (Currently Amended) A method for streaming data corresponding to a given video, each frame of the video being divided into n partitions, n being an integer, in order to create n independent partial videos, the method comprising:

transmitting, by a server, a notification to a client, said notification including spatial information representing, by a pixel position on a frame of the video, a spatial position of each of the n partial videos,

receiving from the client which received the notification, by the server, one or more messages for requesting one or more partial videos according to a Region Of Interest selected based on an operation by a user of the client, and

transmitting to the client, by the server, video data corresponding to the one or more partial videos, in response to the one or more messages from the client,

wherein the pixel position of each of the n partial videos is represented by a value according to a number of pixels between a reference pixel position on the frame and a pixel position in a top-left corner of each of the n partial videos in an x-axis direction and a y-axis direction.

Claim 2. (Canceled)

Claim 3. (Currently Amended) The method according to claim [[2]] 1, wherein the spatial position is represented by ~~a pixel position in a top-left corner~~, a width and a height of a partial video in addition to the value.

Claim 4. (Currently Amended) A transmitting method for transmitting video data to a client, the method comprising:

transmitting, to the client, a notification including (i) spatial position information representing, by a pixel position on a frame of a video, a spatial position of each of n spatial regions of the video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video,

receiving, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client, and

transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client,

wherein the pixel position of each of the n spatial regions is represented by a value according to a number of pixels between a reference pixel position and a pixel position in a top-left corner of each of the n spatial regions in an x-axis direction and a y-axis direction.

Claim 5. (Canceled)

Claim 6. (Currently Amended) The method according to claim 4, wherein ~~the spatial position information represents a pixel position in a top-left corner of each of the n spatial regions, and~~ the spatial size information represents both of a width and a height of each of the n spatial regions.

Claim 7. (Canceled)

Claim 14. (Currently Amended) A method for receiving video data from a server, the method comprising:

receiving, from the server, a notification including (i) spatial position information representing, by a pixel position on a frame of a video, a spatial position of each of n spatial regions of the video, n being integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video,

transmitting, to the server, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted from the server, and

receiving, from the server, the video data corresponding to the one or more spatial regions according to the information transmitted to the server,

wherein the pixel position of each of the n spatial regions is represented by a value according to a number of pixels between a reference pixel position and a pixel position in a top-left corner of each of the n spatial regions in an x-axis direction and a y-axis direction.

Claim 15. (Canceled)

Claim 16. (Currently Amended) The method according to claim 14, wherein ~~the spatial position information represents a pixel position in a top-left corner of each of the n spatial regions, and~~ the spatial size information represents both of a width and a height of each of the n spatial regions.

Claim 22. (Currently Amended) An apparatus for transmitting video data to a client, the apparatus comprising:

a hardware processor; and

a memory storing one or more programs configured to be executed by the hardware processor, the one or more programs including instructions for:

transmitting, to the client, a notification including (i) spatial position information representing, by a pixel position on a frame of a video, a spatial position of each of n spatial regions of the video, n being an integer, and (ii) spatial size information representing a spatial size of each of the n spatial regions of the video;

receiving, from the client which received the notification, information relating to identification of one or more spatial regions from among the n spatial regions defined in the notification, the one or more spatial regions corresponding to video data to be transmitted to the client; and

transmitting, to the client, the video data corresponding to the one or more spatial regions which are identified according to the information received from the client,

wherein the pixel position of each of the n spatial regions is represented by a value according to a number of pixels between a reference pixel position and a pixel position in a top-left corner of each of the n spatial regions in an x-axis direction and a y-axis direction.

Claim 23. (Canceled)

Claim 24. (Currently Amended) The apparatus according to claim 22, wherein ~~the spatial position information represents a pixel position in a top-left corner of each of the n spatial regions, and~~ the spatial size information represents both of a width and a height of each of the n spatial regions.

Claim 25. (Canceled)

Allowable Subject Matter

7. Claim(s) 1, 3-4, 6, 8-14, 16, 22, 24, 26-30, and 32-33 are allowed.
8. The following is an examiner's statement of reasons for allowance:

The prior art of record does not disclose or suggest either singly or in combination transmitting, by a server, a notification to a client, said notification including spatial information representing, by a pixel position on a frame of the video, a spatial position of each of the n partial videos, and wherein the pixel position of each of the n partial videos is represented by a value according to a number of pixels between a reference pixel position on the frame and a pixel position in a top-left corner of each of the n partial videos in an x-axis direction and a y-axis direction.

For these reasons, the Examiner believes the limitations indicated above and in combination with the rest of the limitations are allowable over the prior art of record.

9. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BENJAMIN M THIEU whose **telephone number** is (571) 270-7475 and **fax number** is (571) 270-8475. The examiner can normally be reached on 8:30 - 6:00 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wing Chang can be reached on 571-272-7493. 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.

/BENJAMIN M THIEU/
Primary Examiner, Art Unit 2441
7.6.2018

<i>Examiner-Initiated Interview Summary</i>	Application No. 15/783,999	Applicant(s) DENOUAL et al.	
	Examiner BENJAMIN M THIEU	Art Unit 2441	AIA Status No

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

(1) BENJAMIN M. THIEU. (3) Amichai Kotev (Reg. No. 57,688).

(2) _____. (4) _____.

Date of Interview: 06 July 2018.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐ 101 ☐ 112 ☐ 102 ☐ 103 ☒ Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1-16,22-30 and 32-33.

Identification of prior art discussed: N/A.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

The Examiner proposed an Examiner's Amendment to advance the prosecution of the application.

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/BENJAMIN M THIEU/ Primary Examiner, Art Unit 2441	

<i>Search Notes</i> 	Application/Control No. 15/783,999	Applicant(s)/Patent Under Reexamination DENOVAL et al.
	Examiner BENJAMIN M THIEU	Art Unit 2441

CPC - Searched*		
Symbol	Date	Examiner
H04N21/858, H04N21/63, H04N21/6332, H04N21/2343, H04N21/845, H04N21/4728, H04N21/8456, H04N21/6332, H04N21/8586, H04N21/4728, H04N21/234327, H04N21/631	02/27/2018	BT

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Performed Inventor Search	02/27/2018	BT
Searched EAST (US-PGPUB, USPAT, EPO, JPO, DERWENT, IBM_TDB)	02/27/2018	BT
See Updated EAST Search Notes	07/06/2018	BT

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	See Attached EAST Search Notes	07/06/2018	BT

/BENJAMIN M THIEU/ Primary Examiner, Art Unit 2441	

Issue Classification 	Application/Control No. 15/783,999	Applicant(s)/Patent Under Reexamination DENOUAL et al.
	Examiner BENJAMIN M THIEU	Art Unit 2441

CPC						
Symbol					Type	Version
H04L	/	67	/	42	F	2013-01-01
H04N	/	21	/	234327	I	2013-01-01
H04N	/	21	/	4728	I	2013-01-01
H04N	/	21	/	631	I	2013-01-01
H04N	/	21	/	6332	I	2013-01-01
H04N	/	21	/	8456	I	2013-01-01
H04N	/	21	/	8586	I	2013-01-01
H04L	/	65	/	602	I	2013-01-01
H04L	/	67	/	02	I	2013-01-01

CPC Combination Sets					
Symbol	Type	Set	Ranking	Version	
/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/BENJAMIN M THIEU/ Primary Examiner, Art Unit 2441	06 July 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5A

Issue Classification 	Application/Control No. 15/783,999	Applicant(s)/Patent Under Reexamination DENOUAL et al.
	Examiner BENJAMIN M THIEU	Art Unit 2441

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G06F		15	16

NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
709	217

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/BENJAMIN M THIEU/ Primary Examiner, Art Unit 2441 (Primary Examiner)	06 July 2018 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 5A

Issue Classification 	Application/Control No. 15/783,999	Applicant(s)/Patent Under Reexamination DENOUAL et al.
	Examiner BENJAMIN M THIEU	Art Unit 2441

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	7	10		19	13	28								
	2	8	11		20	14	29								
2	3	9	12		21	15	30								
3	4	10	13	19	22		31								
	5	16	14		23	21	32								
4	6		15	20	24	18	33								
	7	17	16		25										
5	8		17	11	26										
6	9		18	12	27										

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/BENJAMIN M THIEU/ Primary Examiner, Art Unit 2441 (Primary Examiner)	06 July 2018 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 5A

<i>Index of Claims</i> 	Application/Control No. 15/783,999	Applicant(s)/Patent Under Reexamination DENOUAL et al.
	Examiner BENJAMIN M THIEU	Art Unit 2441

✓	Rejected
=	Allowed

-	Cancelled
÷	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	02/27/2018	07/06/2018							
1	1	✓	=							
	2	✓	-							
2	3	✓	=							
3	4	✓	=							
	5	✓	-							
4	6	✓	=							
	7	✓	-							
5	8	✓	=							
6	9	✓	=							
7	10	✓	=							
8	11	✓	=							
9	12	✓	=							
10	13	✓	=							
16	14	✓	=							
	15	✓	-							
17	16	✓	=							
	17	-	-							
	18	-	-							
	19	-	-							
	20	-	-							
	21	-	-							
19	22	✓	=							
	23	✓	-							
20	24	✓	=							
	25	✓	-							
11	26	✓	=							
12	27	✓	=							
13	28	✓	=							
14	29	✓	=							
15	30	✓	=							
	31	-	-							
21	32	✓	=							
18	33	✓	=							

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	132	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) with region same pixel AND (URL or HTTP)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/07/06 17:31
L3	3	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) with region same pixel with direction AND (URL or HTTP)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/07/06 17:32
L4	3	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") with video and spatial with (organiz\$7 or information or scal\$7 or position) with video same pixel with direction with video	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/07/06 17:33
L7	54	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) with region and pixel with direction AND (URL or HTTP)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/07/06 17:34
L8	0	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) same (URL or HTTP) and pixel with direction with video	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/07/06 17:34
L10	1	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) with region and pixel with direction with video AND (URL or HTTP)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/07/06 17:35
L12	32	(select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") same spatial with (organiz\$7 or information or scal\$7 or position) and pixel with (number or count) with video	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/07/06 17:36
L14	0	(select\$4 or identify\$4 or determin\$4 or	US-PGPUB;	ADJ	ON	2018/07/06

		detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") same spatial with (organiz\$7 or information or scal\$7 or position) same pixel with (number or count) with video	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			17:37

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	0	((select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) with region same pixel AND (URL or HTTP)).CLM.	US-PGPUB; USPAT	ADJ	ON	2018/07/06 17:31
L5	0	((select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) with region same pixel with direction AND (URL or HTTP)).clm.	US-PGPUB; USPAT	ADJ	ON	2018/07/06 17:33
L6	0	((select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) with region and pixel with direction AND (URL or HTTP)).clm.	US-PGPUB; USPAT	ADJ	ON	2018/07/06 17:34
L9	0	((select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) same (URL or HTTP) and pixel with direction with video).clm.	US-PGPUB; USPAT	ADJ	ON	2018/07/06 17:35
L11	0	((select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") and spatial with (organiz\$7 or information or scal\$7 or position) with region and pixel with direction with video AND (URL or HTTP)).clm.	US-PGPUB; USPAT	ADJ	ON	2018/07/06 17:35
L13	1	((select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") same spatial with (organiz\$7 or information or scal\$7 or position) and pixel with (number or count) with video).clm.	US-PGPUB; USPAT	ADJ	ON	2018/07/06 17:36
L15	0	((select\$4 or identify\$4 or determin\$4 or detect\$4 or receiv\$4 or send\$4 or transmit\$4) with ((region near2 interest) or "ROI") same spatial with (organiz\$7 or information or scal\$7 or position) same pixel with (number or count) with video).clm.	US-PGPUB; USPAT	ADJ	ON	2018/07/06 17:37

7/ 6/ 2018 5:39:55 PM**C:\Users\bthieu\Documents\EAST\Workspaces\15783999.wsp**



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 4207

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
15/783,999	10/13/2017	709	2441	1000-18542-NP-cont-CINC		
APPLICANTS CANON KABUSHIKI KAISHA, Tokyo, JAPAN; INVENTORS Franck DENOUE, Saint Domineuc, FRANCE; Hervé LE FLOCH, Rennes, FRANCE; Frédéric MAZE, LANGAN, FRANCE; Jean LE FEUVRE, Cachan, FRANCE; Cyril CONCOLATO, Combs la Ville, FRANCE; ** CONTINUING DATA ***** This application is a CON of 14/434,741 04/09/2015 PAT 9883011 which is a 371 of PCT/EP2013/071370 10/11/2013 ** FOREIGN APPLICATIONS ***** UNITED KINGDOM 1306897.8 04/16/2013 UNITED KINGDOM 1218370.3 10/12/2012 ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 10/27/2017						
Foreign Priority claimed ☒ Yes ☐ No 35 USC 119(a-d) conditions met ☒ Yes ☐ No Verified and Acknowledged <u>/BENJAMIN M THIEU/</u> Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY FRANCE	SHEETS DRAWINGS 18	TOTAL CLAIMS ~~27~~ 21	INDEPENDENT CLAIMS 4
ADDRESS CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION 15975 ALTON PARKWAY IRVINE, CA 92618-3731 UNITED STATES						
TITLE METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA						
FILING FEE RECEIVED 2580	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-cont-CINC	4207
34904 7590 07/26/2018 CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION 15975 ALTON PARKWAY IRVINE, CA 92618-3731			EXAMINER THIEU, BENJAMIN M	
			ART UNIT 2441	PAPER NUMBER
			NOTIFICATION DATE 07/26/2018	DELIVERY MODE ELECTRONIC

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 the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

skalminov@cusa.canon.com
IPDocketing@cusa.canon.com
mkavetsky@cusa.canon.com



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Application No. : 15783999
Applicant : Denoual
Filing Date : 10/13/2017
Date Mailed : 07/26/2018

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The informalities requiring correction are indicated in the attachment(s). If the informality pertains to the abstract, specification (including claims) or drawings, the informality must be corrected with an amendment in compliance with 37 CFR 1.121 (or, if the application is a reissue application, 37 CFR 1.173). Such an amendment may be filed after payment of the issue fee if limited to correction of informalities noted herein. See Waiver of 37 CFR 1.312 for Documents Required by the Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004). In addition, if the informality is not corrected until after payment of the issue fee, for purposes of 35 U.S.C. 154(b)(1)(iv), "all outstanding requirements" will be considered to have been satisfied when the informality has been corrected. A failure to respond within the above-identified time period will result in the application being ABANDONED.

See attachment(s).

*A copy of this notice **MUST** be returned with the reply. Please address response to
"Mail Stop Issue Fee, Commissioner for Patents,
P.O. Box 1450, Alexandria, VA 22313-1450".*

/Joseph Boris/
Publication Branch
Office of Data Management
(571) 272-4200

Application No. 15783999

**SPECIFICATION REFERS TO ITS OWN PAGE/PARAGRAPH NUMBER(S) AND/OR
SPECIFICATION REFERS TO NONEXISTENT CLAIM(S)**

- ☐ The patent will be printed in numbered columns with intercolumnar line numbers and without paragraph numbers. Any reference(s) within the applicant-filed specification to its own page number(s) or paragraph number(s) will have no meaning in the printed patent.

In response to this notice, the applicant either should file an amendment to the specification that removes the reference(s) to the page number(s) or paragraph number(s) or should submit a letter stating that the patent specification should be printed with the reference(s) to the page number(s) or paragraph number(s).

See Page(s)/Paragraph(s) .

- ☒ The specification refers by number to one or more claims that are not present in the allowed application – that is, the claim number(s) mentioned in the specification are higher than the total number of allowed claims.

In response to this notice, the applicant either should file an amendment to the specification that removes the reference(s) to the nonexistent claim(s) or should submit a letter stating that the patent specification should be printed with the reference(s) to the nonexistent claim(s).

See Page(s)/Paragraph(s) page 13.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15-783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-conf-CINC	4207
34904 7590 07/26/2018 CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION 15975 ALTON PARKWAY IRVINE, CA 92618-3731			EXAMINER THIEU, BENJAMIN M	
			ART UNIT 2441	PAPER NUMBER
			NOTIFICATION DATE 07/26/2018	DELIVERY MODE ELECTRONIC

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 the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

skalminov@cusa.canon.com
IPDocketing@cusa.canon.com
mkavetsky@cusa.canon.com



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Application No. : 15783999
Applicant : Denoual
Filing Date : 10/13/2017
Date Mailed : 07/26/2018

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The informalities requiring correction are indicated in the attachment(s). If the informality pertains to the abstract, specification (including claims) or drawings, the informality must be corrected with an amendment in compliance with 37 CFR 1.121 (or, if the application is a reissue application, 37 CFR 1.173). Such an amendment may be filed after payment of the issue fee if limited to correction of informalities noted herein. See Waiver of 37 CFR 1.312 for Documents Required by the Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004). In addition, if the informality is not corrected until after payment of the issue fee, for purposes of 35 U.S.C. 154(b)(1)(iv), "all outstanding requirements" will be considered to have been satisfied when the informality has been corrected. A failure to respond within the above-identified time period will result in the application being ABANDONED.

See attachment(s).

*A copy of this notice MUST be returned with the reply. Please address response to
"Mail Stop Issue Fee, Commissioner for Patents,
P.O. Box 1450, Alexandria, VA 22313-1450".*

/Joseph Boris/
Publication Branch
Office of Data Management
(571) 272-4200

Application No. 15783999

**SPECIFICATION REFERS TO ITS OWN PAGE/PARAGRAPH NUMBER(S) AND/OR
SPECIFICATION REFERS TO NONEXISTENT CLAIM(S)**

- ☐ The patent will be printed in numbered columns with intercolumnar line numbers and without paragraph numbers. Any reference(s) within the applicant-filed specification to its own page number(s) or paragraph number(s) will have no meaning in the printed patent.

In response to this notice, the applicant either should file an amendment to the specification that removes the reference(s) to the page number(s) or paragraph number(s) or should submit a letter stating that the patent specification should be printed with the reference(s) to the page number(s) or paragraph number(s).

See Page(s)/Paragraph(s) .

- ☒ The specification refers by number to one or more claims that are not present in the allowed application – that is, the claim number(s) mentioned in the specification are higher than the total number of allowed claims.

In response to this notice, the applicant either should file an amendment to the specification that removes the reference(s) to the nonexistent claim(s) or should submit a letter stating that the patent specification should be printed with the reference(s) to the nonexistent claim(s).

See Page(s)/Paragraph(s) page 13.

Electronic Acknowledgement Receipt	
EFS ID:	33765737
Application Number:	15783999
International Application Number:	
Confirmation Number:	4207
Title of Invention:	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA
First Named Inventor/Applicant Name:	Franck DENOUAL
Customer Number:	34904
Filer:	Amichai Kotev/Frank Martinez
Filer Authorized By:	Amichai Kotev
Attorney Docket Number:	1000-18542-NP-cont-CINC
Receipt Date:	20-SEP-2018
Filing Date:	13-OCT-2017
Time Stamp:	11:58:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10131471WOUS02_1000-18542-NP-cont-CINC_NTFCAP_Response.pdf	83201	yes	3
			260581f8d098d402872954a3e1534cfebf6444f2		

Multipart Description/PDF files in .zip description					
Document Description			Start	End	
Applicant Arguments/Remarks Made in an Amendment			1	1	
Claims			2	2	
Applicant Arguments/Remarks Made in an Amendment			3	3	
Warnings:					
Information:					
2	Miscellaneous Incoming Letter	10131471WOUS02_1000-1854 2-NP-cont-CINC_NTFCAP.pdf	265755	no	3
			f27b612f4ecc7c458ebe04afca8a284fc76f07e0		
Warnings:					
Information:					
Total Files Size (in bytes):			348956		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application Franck DENOUAL
of:

Application No.: 15/783999

Filed: 10/13/2017

For: METHOD AND
CORRESPONDING DEVICE
FOR STREAMING VIDEO
DATA

Confirmation 4207
No.:

Examiner: Benjamin M. Thieu

Art Unit: 2441

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

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Dear Sir:

In response to the Notice to File Corrected Application Papers of Nonprovisional Application, 15/783999 mailed 7/26/2018, please amend the above-identified application, and please reconsider the instant application based on the amendments and remarks presented herein.

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

Remarks begin on page 3 of this paper.

Amendments to the Specification:

Please amend page 13, last paragraph, lines 33-34 of the originally filed present application as follows:

In an embodiment, the description file comprises parameters for video sub-tracks, the parameters including data about the possible or forbidden associations of the different video sub-tracks, said possible or forbidden associations being indicated by an identifier attribute if the data are streamed according to the DASH standard.

~~69. A method according to any one of claims 48 to 68, wherein~~ In an embodiment, the received video data comprises:

REMARKS

In response to the Notice to File Corrected Application Papers, mailed on 7/26/2018 (hereinafter referred to as the "Notice"), Applicant respectfully requests consideration of the foregoing amendments and the following remarks. The Notice alleged that the specification refers by number to one or more claims that are not present in the allowed application - that is, the claim number(s) mentioned in the specification are higher than the total number of allowed claims. In response, Applicant amended the page 13, last paragraph, lines 33-34 of the originally filed present application. No new matter has been added by way of the subject amendments. A copy of the Notice is submitted herewith.

The Office issued a Notice of Allowability on 7/11/2018. The Issue Fee is due on 10/11/2018. Applicant thanks the USPTO for the allowance.

If any additional fee is required, please charge same to Deposit Account Number 502456.

Should the Examiner have any questions, the Examiner may contact Applicant's representative at the telephone number below.

Respectfully submitted,

8/31/2018
Date

/Amichai Kotev/
Amichai Kotev, Reg. No. 57,668
Patent Attorney for Applicant

Canon U.S.A. Inc., Intellectual Property Division
15975 Alton Parkway
Irvine, CA 92618-3731

Telephone: (949) 932-3313
Fax: (949) 932-3560



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-cont-CINC	4207
34904 7590 09/27/2018 CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION 15975 ALTON PARKWAY IRVINE, CA 92618-3731			EXAMINER THIEU, BENJAMIN M	
			ART UNIT 2441	PAPER NUMBER
			NOTIFICATION DATE 09/27/2018	DELIVERY MODE ELECTRONIC

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 the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

skalminov@cusa.canon.com
IPDocketing@cusa.canon.com
mkavetsky@cusa.canon.com

 Response to Rule 312 Communication	Application No. 15/783,999	Applicant(s)
	Examiner	Art Unit

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

1. ☒ The amendment filed on 20 September 2018 under 37 CFR 1.312 has been considered, and has been:

a) ☒ entered.

b) ☐ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.

Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

Kimberly Payne

PUBLISHING DIVISION

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

34904 7590 07/11/2018
CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION
15975 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-3731
UNITED STATES OF AMERICA

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/783,999	10/13/2017	Franck DENOUAL	1000-18542-NP-cont-CINC	4207

TITLE OF INVENTION: METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	10/11/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
THIEU, BENJAMIN M	2441	709-217000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached. ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.	2. For printing on the patent front page, list (1) The names of up to 3 registered patent attorneys or agents OR, alternatively, (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.	1 <u>Canon USA, Inc.</u> 2 <u>I.P. Division</u> 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

Canon Kabushiki Kaisha

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

TOKYO, JAPAN

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☒ Issue Fee
- ☒ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 502456 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Amichai Kotev/

Date 9/25/2018

Typed or printed name Amichai Kotev

Registration No. 57,668

Electronic Patent Application Fee Transmittal				
Application Number:		15783999		
Filing Date:		13-Oct-2017		
Title of Invention:		METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA		
First Named Inventor/Applicant Name:		Franck DENOUAL		
Filer:		Amichai Kotev/Sally Mayfield		
Attorney Docket Number:		1000-18542-NP-cont-CINC		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1000

Electronic Acknowledgement Receipt	
EFS ID:	33905668
Application Number:	15783999
International Application Number:	
Confirmation Number:	4207
Title of Invention:	METHOD AND CORRESPONDING DEVICE FOR STREAMING VIDEO DATA
First Named Inventor/Applicant Name:	Franck DENOUAL
Customer Number:	34904
Filer:	Amichai Kotev/Shea Traylor
Filer Authorized By:	Amichai Kotev
Attorney Docket Number:	1000-18542-NP-cont-CINC
Receipt Date:	03-OCT-2018
Filing Date:	13-OCT-2017
Time Stamp:	17:44:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$1000
RAM confirmation Number	100418INTEFSW00005049502456
Deposit Account	502456
Authorized User	Michael Kavetsky
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)
 37 CFR 1.20 (Post Issuance fees)
 37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	10131471WOUS02_1000-1854 2-NP-cont- CINC_IssueFeeTransmittal_Due 101118.pdf	121789 d4d5725eee4605b6aa798564f952271387 b0f62	no	1

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30355 e8594f06d55d9afc7d565f42ae73d58443ae 9e61	no	2

Warnings:

Information:

Total Files Size (in bytes):	152144

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.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/783,999	11/20/2018	10135952	1000-18542-NP-cont-CINC	4207

34904 7590 10/31/2018

CANON U.S.A. INC. INTELLECTUAL PROPERTY DIVISION
15975 ALTON PARKWAY
IRVINE, CA 92618-3731

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Franck DENOUAL, Saint Domineuc, FRANCE;
CANON KABUSHIKI KAISHA, Tokyo, JAPAN;
Hervé LE FLOCH, Rennes, FRANCE;
Frédéric MAZE, LANGAN, FRANCE;
Jean LE FEUVRE, Cachan, FRANCE;
Cyril CONCOLATO, Combs la Ville, FRANCE;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

IR103 (Rev. 10/09)