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Stewart

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(54) METHOD USING ADAPTIVE-BIT-RATE PLAYLISTS FOR DYNAMIC SERVER CAPACITY AND BROADBAND HANDOVERS

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(51) **Int. Cl.**

H04N 7/16	(2011.01)
H04N 21/238	(2011.01)
H04L 45/74	(2022.01)
H04N 21/2381	(2011.01)

(52) **U.S. Cl.**
CPC ***H04N 21/23805*** (2013.01); ***H04L 45/74*** (2013.01); ***H04N 21/2381*** (2013.01)

(58) **Field of Classification Search**
CPC H04N 21/23805; H04N 21/2381; H04N 21/2225; H04N 21/23116; H04N 21/2393; H04N 21/4622; H04N 21/6131; H04N 21/6405; H04N 21/8456; H04N 21/26258; H04L 45/74
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2005/0128979	A1*	6/2005	Wu	H04L 61/00 370/331
2005/0286466	A1*	12/2005	Tagg	H04L 67/141 370/329
2007/0091907	A1*	4/2007	Seshadri	H04L 65/403 370/428
2013/0007814	A1*	1/2013	Cherian	H04L 65/4076 725/62
2013/0198335	A1*	8/2013	Goel	H04N 21/234336 709/219
2013/0286868	A1*	10/2013	Oyman	H04L 41/5006 370/252
2015/0063346	A1*	3/2015	Eswara	H04L 65/1043 370/352
2015/0067819	A1*	3/2015	Shribman	H04L 67/567 709/218

(Continued)

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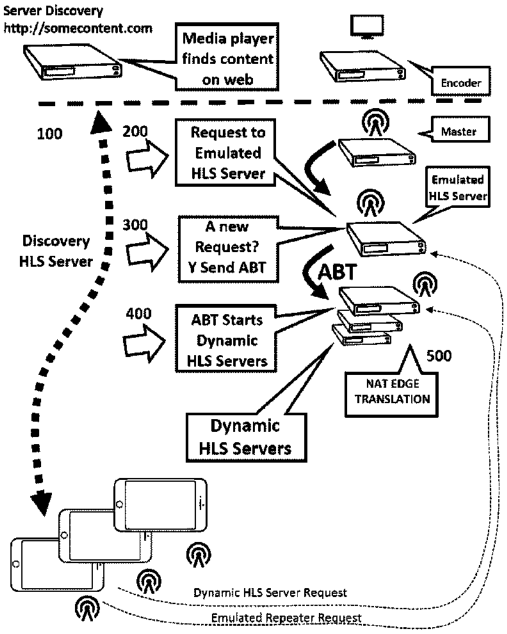
(74) *Attorney, Agent, or Firm* — Lowe Graham Jones PLLC

(57) ABSTRACT

A method of using HLS (or DASH) server emulation to implement dynamic server capacity using point-to-multi-point or point-to-point Internet communication protocols. In a wireless handover setting, this system utilizes network address translators running on distributed gateways or tower infrastructure. The system uses adaptive bit rate emulated servers to effectively update and resynthesize playlist files for dynamic adaptive-bit-rate HLS playback.

19 Claims, 8 Drawing Sheets


Server Discovery
http://somecontent.com
Media player finds content on web
Encoder
Master
100
200
Request to Emulated HLS Server
Emulated HLS Server
300
A new Request? Y Send ABT
ABT
Discovery HLS Server
400
ABT Starts Dynamic HLS Servers
500
NAT EDGE TRANSLATION
Dynamic HLS Servers
Dynamic HLS Server Request
Emulated Repeater Request

(56) **References Cited**

U.S. PATENT DOCUMENTS

2015/0319644	A1*	11/2015	Grunenberger	H04W 4/50 370/338
2016/0112953	A1*	4/2016	Go	H04W 52/0229 370/329
2016/0127891	A1*	5/2016	Nylander	H04W 76/11 370/329
2016/0142321	A1*	5/2016	Gage	H04L 45/74 370/235
2016/0173959	A1*	6/2016	Seema	H04N 21/6587 725/116
2016/0337426	A1*	11/2016	Shribman	H04L 65/612
2016/0373372	A1*	12/2016	Gillon	H04L 41/12
2018/0084018	A1*	3/2018	Arky	H04W 4/06
2019/0373301	A1*	12/2019	Gunasekara	H04N 21/47202
2020/0267437	A1*	8/2020	Pantos	H04N 21/26258

* cited by examiner

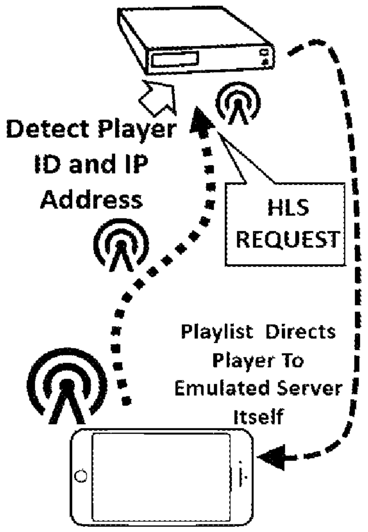


FIG.1A

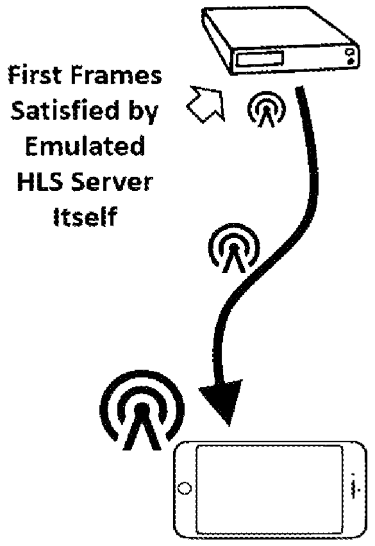


FIG.1B

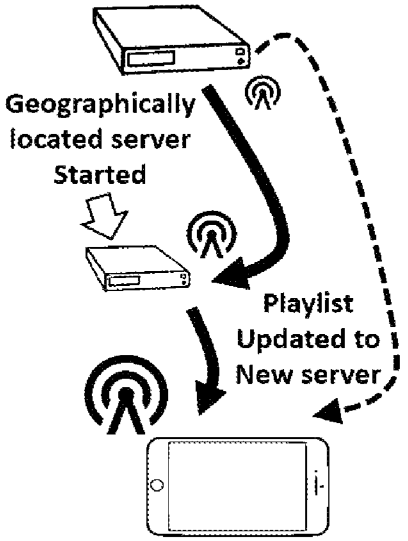


FIG.1C

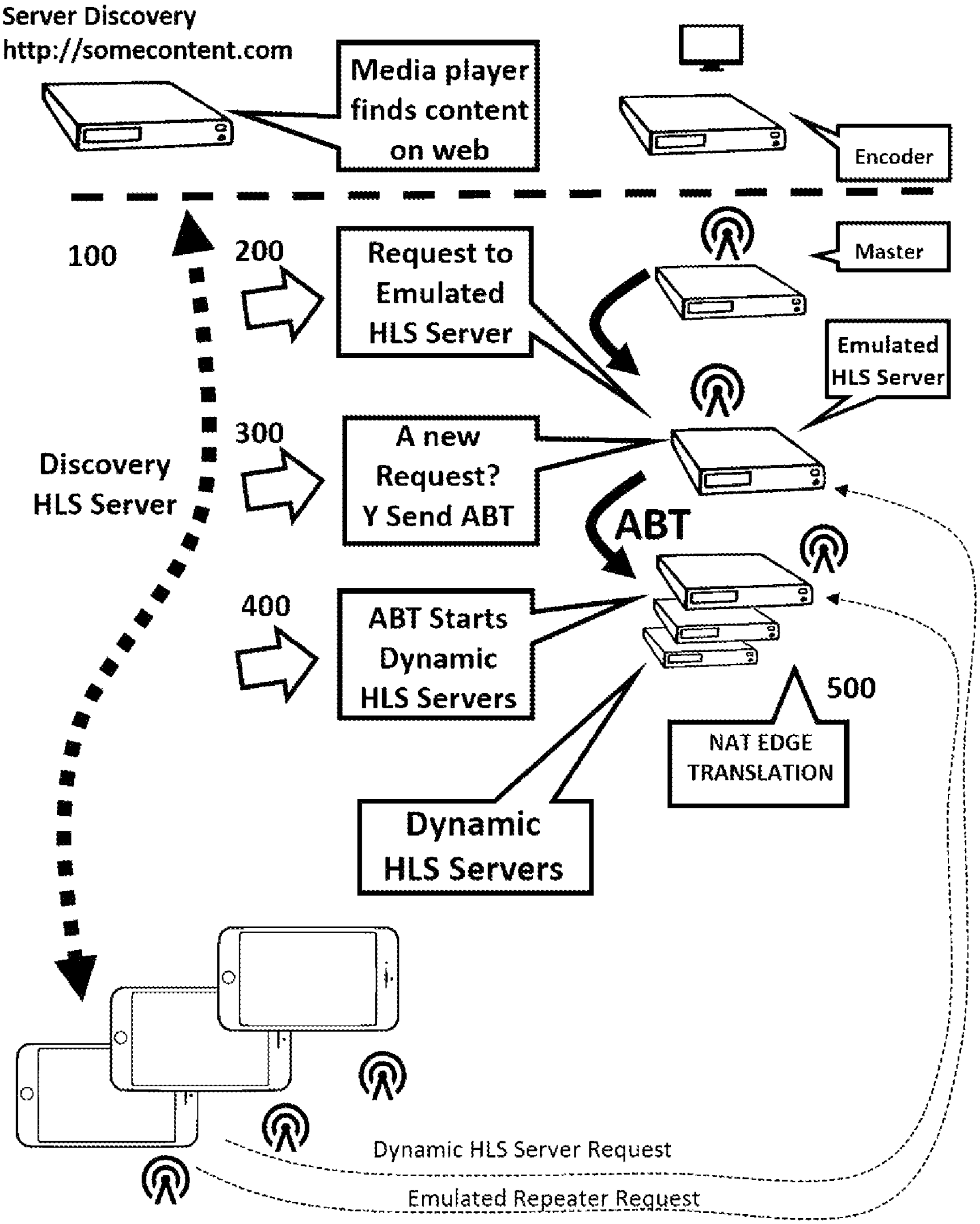

Server Discovery
http://somecontent.com
Media player finds content on web
Encoder
100
200
Request to Emulated HLS Server
Master
Emulated HLS Server
300
A new Request? Y Send ABT
Discovery HLS Server
ABT
400
ABT Starts Dynamic HLS Servers
500
NAT EDGE TRANSLATION
Dynamic HLS Servers
Dynamic HLS Server Request
Emulated Repeater Request

FIG.2

Broadband Handover

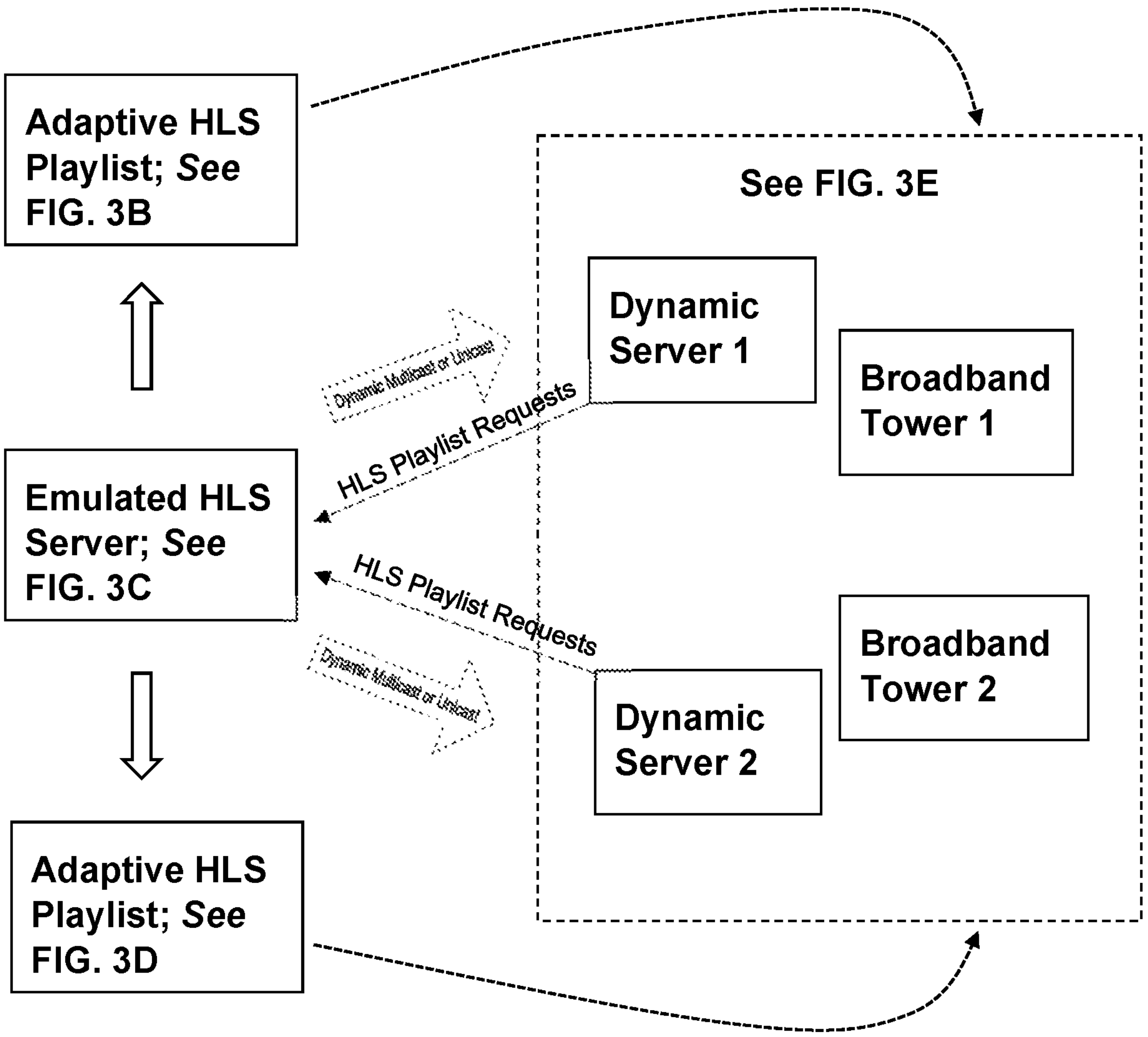
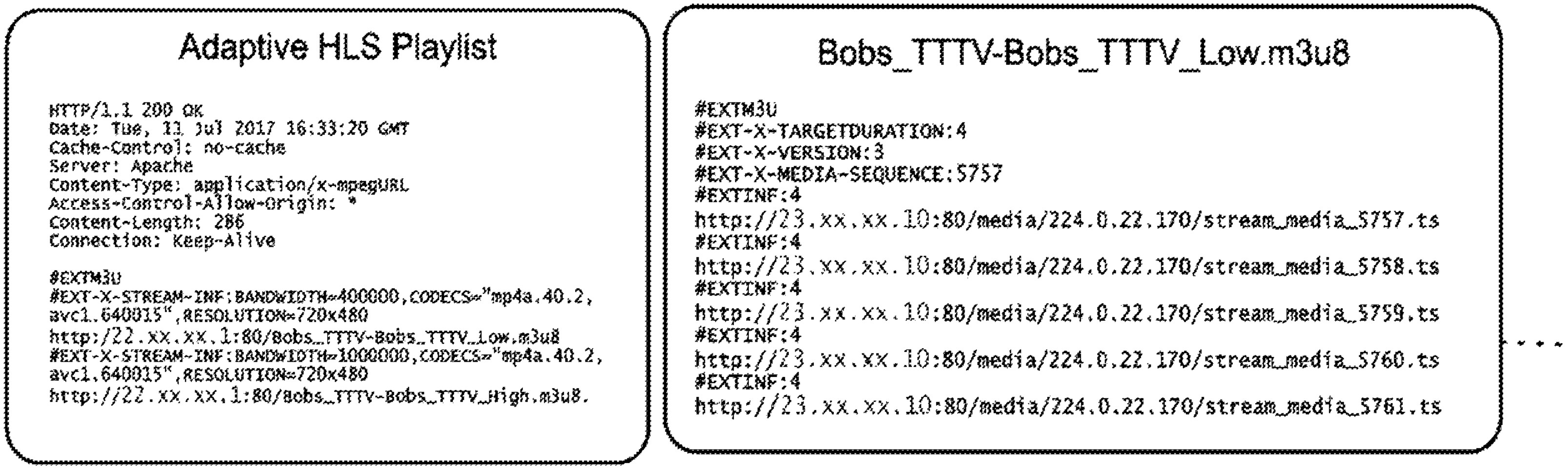

Adaptive HLS Playlist; *See* FIG. 3B
See FIG. 3E
Dynamic Server 1
Broadband Tower 1
Dynamic Multicast or Unicast
HLS Playlist Requests
Emulated HLS Server; *See* FIG. 3C
HLS Playlist Requests
Dynamic Multicast or Unicast
Broadband Tower 2
Dynamic Server 2
Adaptive HLS Playlist; *See* FIG. 3D

FIG. 3A



Adaptive HLS Playlist

```
HTTP/1.1 200 OK
Date: Tue, 11 Jul 2017 16:33:20 GMT
Cache-Control: no-cache
Server: Apache
Content-Type: application/x-mpegURL
Access-Control-Allow-Origin: *
Content-Length: 286
Connection: Keep-Alive

#EXTM3U
#EXT-X-STREAM-INF:BANDWIDTH=400000,CODECS="mp4a.40.2,
avc1.640015",RESOLUTION=720x480
http:/22.xx.xx.1:80/Bobs_TTTV-Bobs_TTTV_Low.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=1000000,CODECS="mp4a.40.2,
avc1.640015",RESOLUTION=720x480
http://22.xx.xx.1:80/Bobs_TTTV-Bobs_TTTV_High.m3u8.
```

Bobs_TTTV-Bobs_TTTV_Low.m3u8

```
#EXTM3U
#EXT-X-TARGETDURATION:4
#EXT-X-VERSION:3
#EXT-X-MEDIA-SEQUENCE:5757
#EXTINF:4
http://23.xx.xx.10:80/media/224.0.22.170/stream_media_5757.ts
#EXTINF:4
http://23.xx.xx.10:80/media/224.0.22.170/stream_media_5758.ts
#EXTINF:4
http://23.xx.xx.10:80/media/224.0.22.170/stream_media_5759.ts
#EXTINF:4
http://23.xx.xx.10:80/media/224.0.22.170/stream_media_5760.ts
#EXTINF:4
http://23.xx.xx.10:80/media/224.0.22.170/stream_media_5761.ts
```

FIG. 3B

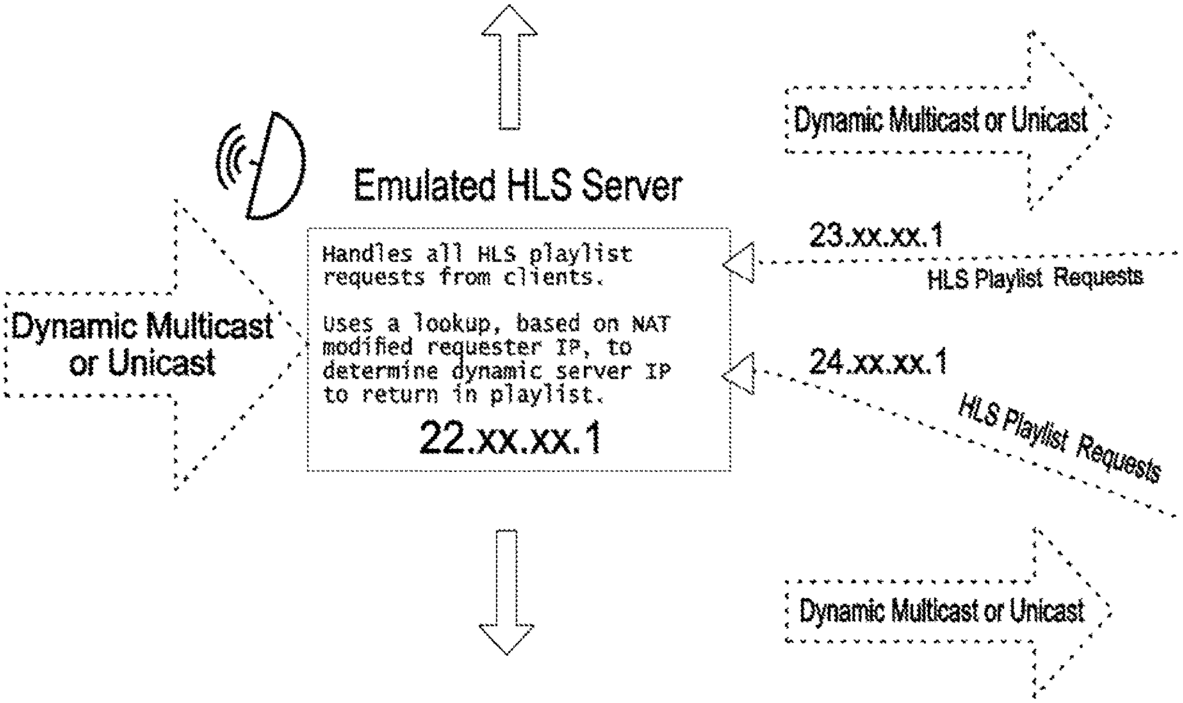
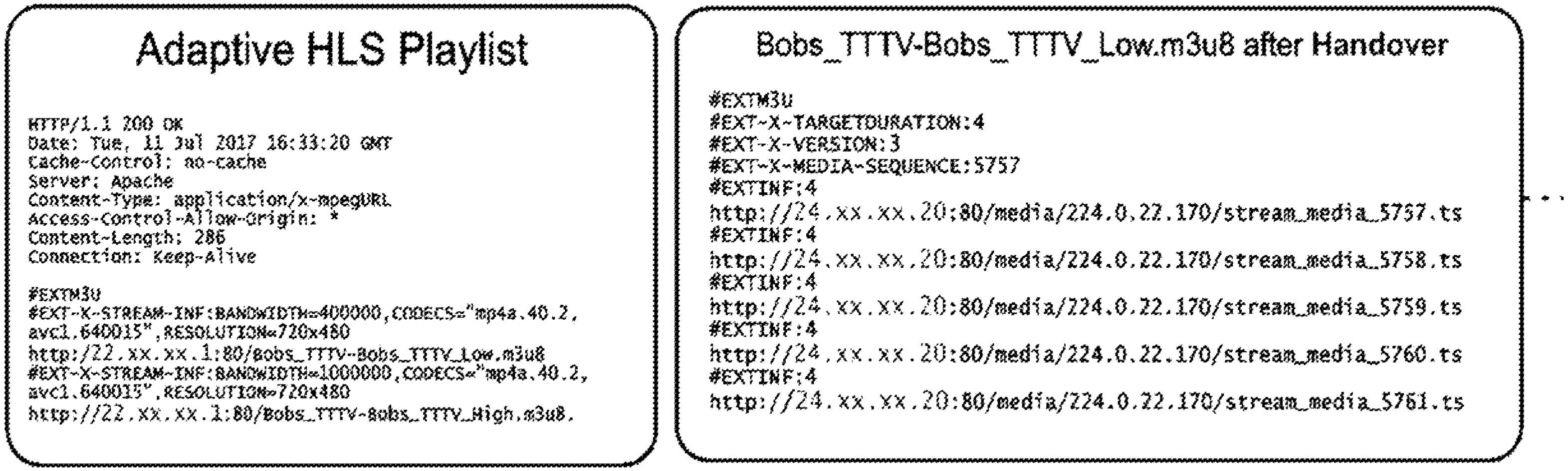

Dynamic Multicast or Unicast
Emulated HLS Server
Handles all HLS playlist requests from clients.
Uses a lookup, based on NAT modified requester IP, to determine dynamic server IP to return in playlist.
22.xx.xx.1
Dynamic Multicast or Unicast
23.xx.xx.1
HLS Playlist Requests
24.xx.xx.1
HLS Playlist Requests
Dynamic Multicast or Unicast

FIG. 3C



Adaptive HLS Playlist

```
HTTP/1.1 200 OK
Date: Tue, 11 Jul 2017 16:33:20 GMT
Cache-Control: no-cache
Server: Apache
Content-Type: application/x-mpegURL
Access-Control-Allow-Origin: *
Content-Length: 286
Connection: Keep-Alive

#EXTM3U
#EXT-X-STREAM-INF:BANDWIDTH=400000,CODECS="mp4a.40.2,
avc1.640015",RESOLUTION=720x480
http:/22.xx.xx.1:80/Bobs_TTTV-Bobs_TTTV_Low.m3u8
#EXT-X-STREAM-INF:BANDWIDTH=1000000,CODECS="mp4a.40.2,
avc1.640015",RESOLUTION=720x480
http://22.xx.xx.1:80/Bobs_TTTV-Bobs_TTTV_High.m3u8.
```

Bobs_TTTV-Bobs_TTTV_Low.m3u8 after Handover

```
#EXTM3U
#EXT-X-TARGETDURATION:4
#EXT-X-VERSION:3
#EXT-X-MEDIA-SEQUENCE:5757
#EXTINF:4
http://24.xx.xx.20:80/media/224.0.22.170/stream_media_5757.ts
#EXTINF:4
http://24.xx.xx.20:80/media/224.0.22.170/stream_media_5758.ts
#EXTINF:4
http://24.xx.xx.20:80/media/224.0.22.170/stream_media_5759.ts
#EXTINF:4
http://24.xx.xx.20:80/media/224.0.22.170/stream_media_5760.ts
#EXTINF:4
http://24.xx.xx.20:80/media/224.0.22.170/stream_media_5761.ts
```

FIG. 3D

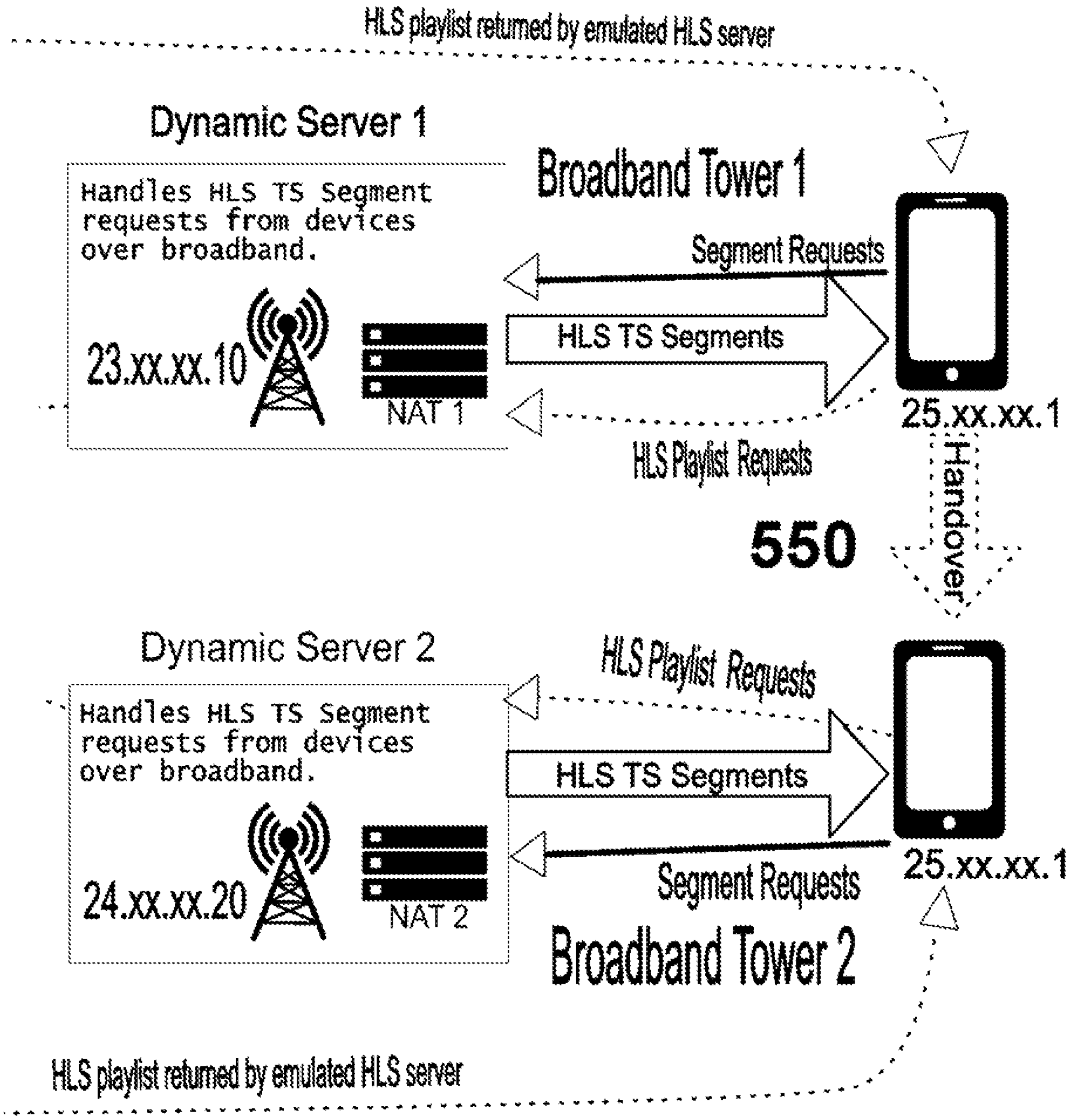

HLS playlist returned by emulated HLS server
Dynamic Server 1
Handles HLS TS Segment requests from devices over broadband.
23.xx.xx.10
NAT 1
Broadband Tower 1
Segment Requests
HLS TS Segments
HLS Playlist Requests
25.xx.xx.1
Handover
550
Dynamic Server 2
Handles HLS TS Segment requests from devices over broadband.
24.xx.xx.20
NAT 2
HLS Playlist Requests
HLS TS Segments
Segment Requests
25.xx.xx.1
Broadband Tower 2
HLS playlist returned by emulated HLS server

FIG. 3E

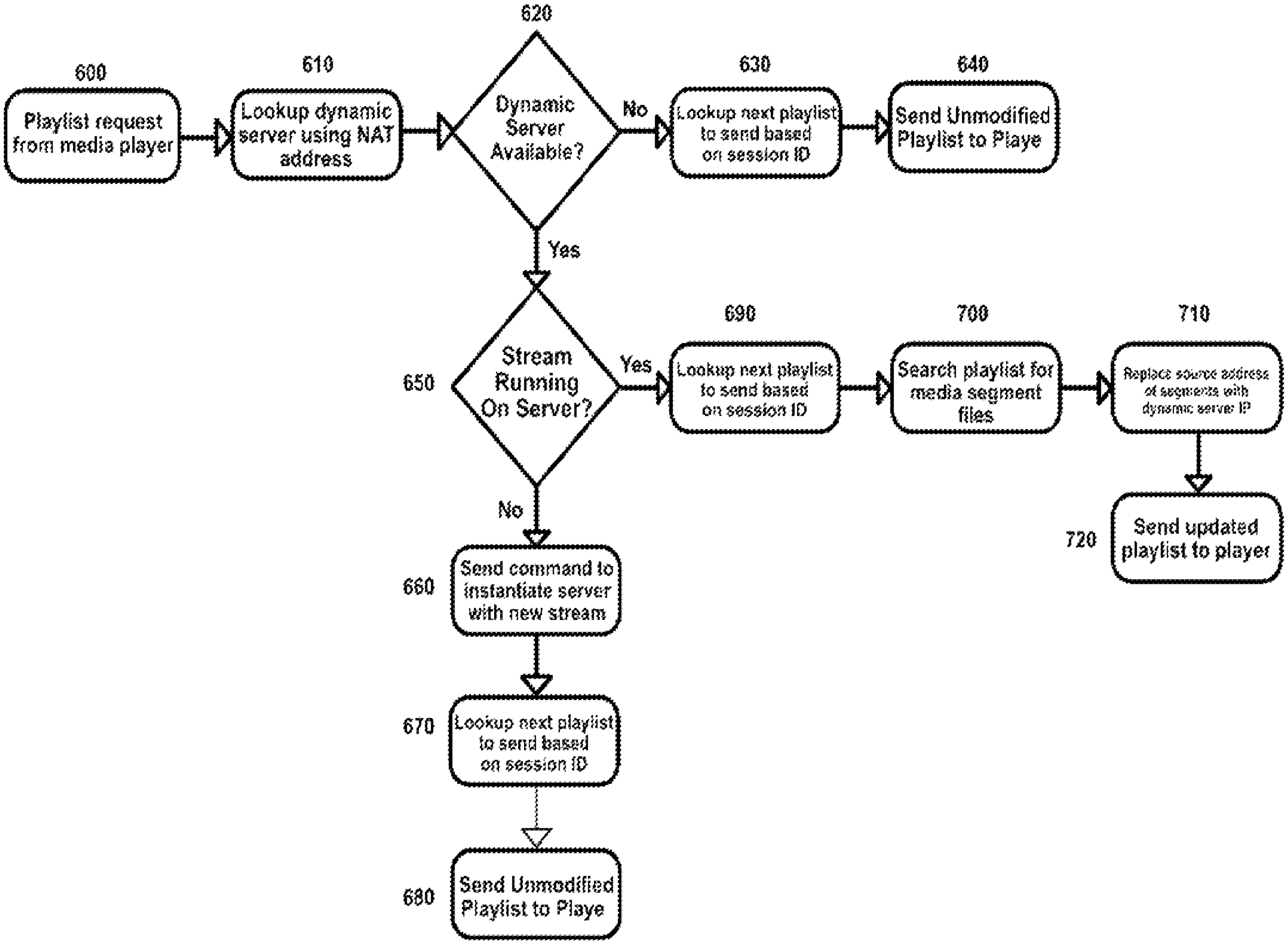

600
Playlist request from media player
610
Lookup dynamic server using NAT address
620
Dynamic Server Available?
No
630
Lookup next playlist to send based on session ID
640
Send Unmodified Playlist to Playe
Yes
650
Stream Running On Server?
Yes
690
Lookup next playlist to send based on session ID
700
Search playlist for media segment files
710
Replace source address of segments with dynamic server IP
720
Send updated playlist to player
No
660
Send command to instantiate server with new stream
670
Lookup next playlist to send based on session ID
680
Send Unmodified Playlist to Playe

FIG.4

METHOD USING ADAPTIVE-BIT-RATE PLAYLISTS FOR DYNAMIC SERVER CAPACITY AND BROADBAND HANDOVERS

PRIORITY CLAIM

This application claims the benefit of prior U.S. provisional application Ser. No. 62/827,704 filed Apr. 1, 2019, the contents of which are incorporated by reference.

FIELD OF THE INVENTION

The field of the invention relates to the use of dynamic bandwidth consumption by Internet media distribution systems, specifically hyper-text transfer protocol live streaming (HLS) and Moving Picture Experts Group dynamic adaptive streaming (DASH).

BACKGROUND OF THE INVENTION

For Internet media delivery of live content there are two dominant adaptive-bit-rate rivals. Hyper-Text Transfer Protocol Live Stream (HLS), and Moving Picture Experts Groups Dynamic Adaptive Streaming over HTTP (DASH).

In HLS (and DASH) the end user media player is pointed through a discovery process to an adaptive-bit-rate playlist server, which sends multi-bit-rate playlists and associated video segments. This process leaves the end user's media player logically in charge of which playlist segments will optimize available bandwidth. As soon as the end user's playback commences, the playlist server's address is fixed (static).

Large interactive data structures are increasingly distributed geographically to towers or gateways to improve user response times. Consequently, tower or gateways could include adaptive bit rate servers to increase efficiency. Media distributing systems are more efficient when they use adaptive bit rate HLS (or DASH). Adaptive bit rate media delivery requires transferring control to the end users media player in order to optimize available bandwidth. Once control has been handed to the media player, the server for the player is fixed (static), enabling the player to optimize available bandwidth.

If viewers are streaming live media from all the gateways or towers, it would be very efficient to use point-to-multipoint communications protocols like IP Multicast and start an HLS (or DASH) server on each tower. However, television viewing habits are largely dynamic.

The requisite is to create dynamic adaptive bit rate servers while leaving the adaptive bit rate players in control to optimize bandwidth. Therefore, any solution must be implemented on the server side.

The media players decide where to request playlists getting their initial base level information from a discoverable host; usually a web page pointing to the playlist file. Modern systems use geographic location to find the closest adaptive-bit-rate servers. Once this determination has been made, the media player continues to make additional requests from the same playlist server until the user is finished watching the content.

The dependency of adaptive-bit-rate on this discovery mechanism presents a challenge to applying a distributed model to adaptive-servers. The end user's player has no way to find the closest playlist server in mid-stream. For example, in the case where a cellular operator had implemented an efficient IP Multicast to distribute to towers and a cellular end user had initiated the playing of a popular live sporting event, when the handover to a second tower occurred the system would continue to request from the first tower, creating back haul congestion. Consequently, instantiating adaptive bit rate servers at towers or gateways, even the ideal situation (where every tower or gateway has a user viewing the same content), yields an imperfect result. Without a solution, network engineers simply decided to throw bandwidth at the live video streaming problem.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred and alternative examples of the present invention are described in detail below with reference to the following drawings.

FIG. **1**A illustrates a system including a representative user and emulated server.

FIG. **1**B illustrates the system of FIG. **1**A, indicating the service of initial frames by the emulated server.

FIG. **1**C illustrates the system of FIG. **1**A, indicating service of subsequent frames in a dynamic fashion.

FIG. **2** is a block diagram of a system in accordance with the present invention.

FIG. **3**A is a representative illustration of a wireless handover of steam that is currently running on two dynamically instantiated adaptive bit rate servers, and with reference to FIGS. **3**B-**3**E for clarity of illustration

FIG. **3**B is a representative illustration of an adaptive HLS playlist to be returned by an emulated HLS server.

FIG. **3**C is a representative illustration of an emulated HLS server.

FIG. **3**D is a representative illustration of an adaptive HLS playlist to be returned by an emulated HLS server.

FIG. **3**E is a representative illustration of a plurality of dynamic servers and broadband towers in communication with a user, and indicating a handover.

FIG. **4** is a flow diagram of a preferred method of operation of an embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is a method of using HLS (or DASH) server emulation to implement dynamic server capacity using point-to-multipoint or point-to-point Internet communication protocols. In a wireless handover setting, this system utilizes network address translators running on distributed gateways or tower infrastructure. The system uses adaptive bit rate emulated servers to effectively update and resynthesize m3u8 playlist files for dynamic adaptive-bit-rate HLS playback.

In preferred versions, the present invention incorporates emulated adaptive-bit-rate playlist servers (HLS or DASH) which detect the end user's player identification and Internet protocol address, as indicated in FIG. **1**A. The emulated server's first playlist request, or requests where the players location has changed, are served by the emulated server itself, as indicated in FIG. **1**B, and then in subsequent requests by tracking each individual playlist request, sequencing customized playlist responses, and dynamically updating the playlists with geographically located adaptive-bit-rate segment servers. The system operator is thus able to implement dynamic downstream, geographically optimized adaptive-bit-rate server capacity, which also responds dynamically to outages, increased/decreased system load, and/or wireless (tower) handovers, as indicated in FIG. **1**C. Because the end-users media player is unknowing of the playlist updates, it is able to play video seamlessly without interruption during the entire process.

The invention preferably incorporates the coding of an efficient http server which is designed to emulate an adaptive bit rate server. The end user player is not aware it is communicating with an emulated server which is incorporated to allow the updating of the adaptive bit rate playlist. End user media players are standard features of devices such as those using IOS and Android, and desktop implementations commonly follow the lead of the mobile devices as the installed base is far greater.

The end user media players request a playlist of transport stream (ts) segments. Then after considering the bandwidth the adaptive bit rate media player requests a size of ts segment that fits the end users final mile connectivity. For this invention to function at peak efficiency, it preferably uses a secure, reliable, quality of service and audience accountable point-to-multipoint communication protocol.

Turning to FIG. **2**, and with further reference to the handover illustrated in FIGS. **3**A-E, the process begins when an end user's browser queries a web site which preforms geographic location and an emulated adaptive bit rate server is assigned **100**. The player makes an http "get" request to the emulated adaptive bit rate server **200**. The emulated server to responds to HLS adaptive bit rate playlists requests recording the Internet Protocol address, time stamp, sequence (sort), and calculates this situational data to make informed updates to the adaptive bit rate playlist. The emulated adaptive bit rate server tracks and updates the content of the playlist for successive playlist requests. Emulated adaptive bit rate servers use lookup to find Internet addresses of downstream dynamic servers, or to create them if necessary. First the emulated adaptive bit rate server returns an adaptive-bit-rate playlist pointing to its own adaptive bit rate segments. The emulated adaptive bit rate server has the transport stream segments on hand and, unless the media is available according to a list of instantiated servers in a geographic area, an accelerated buffering command is sent to the localized server to instantiate a downstream server **300**, and the first 10 seconds of ts segment data is dispatched directly from the emulated adaptive bit rate server. While the first 10 seconds of ts segment data is being sent to the player by the emulated adaptive bit rate server, a downstream dynamic emulated server is instantiated by the accelerated buffering command previously described **400**. On subsequent playlist requests, the playlists are updated to substitute the dynamic server running on tower or gateway with a geographic location closer to the end user. Further http adaptive bit rate get requests are assigned via the updated dynamic server lookup, and a playlist is dispatched pointing the end user's media player to the dynamically instantiated server in the geographic area of the end user. The media player is completely unaware of any changes and continues to connect for playlists to the emulated adaptive bit rate server, for which the playlist data is very small, but the data intensive ts segments are pulled from the locally instantiated adaptive bit rate server which continues to serve the ts segments uninterrupted.

If a dynamically instantiated adaptive bit rate server should fail, the media player will itself seek the original source and a new server will be instantiated or assigned. This happens without interruption in the media player.

In wireless operation playlist requests from media players go through network address translators in the tower. In wireless handovers, the adaptive bit rate playlist requests are routed through network address translation (NAT) on towers or gateways **500** to discover the geographic locations of dynamic servers close to the end users. The NAT reveals the source of the request, which will have a server associated with it. A lookup is preformed to see if the requested channel is flowing at the tower or gateway. If so, the playlist file is immediately updated with the address (url) of the gateway or tower. In the case where the media is already running and a channel change occurs to a channel which also has the media running, the end user media player is immediately directed to the local geographic server.

In the event that the player is mobile and switches from one tower to another, due to a change in physical location during playback, the emulated HLS server reevaluates the best dynamic server with each playlist request. The player may retain its original IP address, but due to the use of a NAT in the dynamic server the emulated HLS server can determine which tower the player is currently connected. The emulated HLS server can then update the playlist to point to the new tower while starting the stream on that tower if necessary as described above. Certain players, such as on Mac/iOS are sensitive to a change in server for segment files which have already been presented in earlier playlist requests. For this reason the emulated HLS server tracks individual player sessions using a combination of request ID, user agent string and other identifiers. The emulated HLS server then uses this information to provide a smooth transition from one dynamic server to another by changing the source of segments slowly over the course of multiple playlist requests. If the new tower currently does not have the stream running and needs time to start the stream before providing the required segments then this transition happens multiple times. First the source of segments transitions to the emulated HLS server, which will always have the segments available. Then once the dynamic server on the new tower is ready to handle segment requests, the source of segments is smoothly transitioned from the emulated HLS server to the new dynamic server **550**.

Turning to FIG. **4**, and with further reference to the handover illustrated in FIGS. **3**A-E, the process begins when a user starts a video stream by loading a webpage with the video embedded **600**. The video points to a playlist on the Emulated HLS server. The player then requests the playlist containing transport stream segment files from the Emulated HLS Server using a HTTP GET request. The request is forwarded to the Emulated HLS Server via NAT in the cell tower that the player is connected to.

The media player is able to hop to different towers based on the best signal, such as in a moving vehicle. The IP address of the player may be static and not change after the hop so the Emulated HLS Server uses the NATed address of the request as a lookup to determine which tower the player is currently connected on **610**.

The Emulated HLS Server contains a table of cell towers that are capable of instantiating dynamic servers **620**. The Emulated HLS Server performs a lookup of the tower using the NAT address to determine if the player is connected to a tower that supports instantiating dynamic servers.

The Emulated HLS Server uses the session ID provided in the HTTP GET request to determine the next playlist it should send for smooth playback. HLS playlists are updated every few seconds with new segment files. These playlists should be sent consecutively to the player without gaps or playback can skip. The Emulated HLS Server tracks sessions using the session ID to ensure it can send the next playlist in sequence **630**.

The Emulated HLS Server sends the playlist without modification **640**. An unmodified playlist contains segment files with no source address specified, known as a relative path. This causes the player to request the segment files from the same server as the playlist is located on, which in this case is the Emulated HLS server. This allows the player to receive the stream even from a tower that does not support dynamic servers.

Using the lookup done in **620** the Emulated HLS Server is able to determine if the stream requested by the player is currently running on the dynamic server. Streams that are running on a dynamic server are left running as long as there are media players actively requesting media files from that server. After a short timeout period of inactivity streams can be removed from the dynamic server and this is tracked by the Emulated HLS Server **650**.

If it was determined that the stream was not available at the dynamic server a command is pushed to the server which tells the dynamic server to start receiving the stream to make it available locally on the tower **550**. A server with no streams running takes little or no resources and merely waits for commands from the Emulated HLS Server. Once the 'stream start' command is received it wakes up the dynamic server and begins receiving the stream **660**.

The Emulated HLS Server uses the session ID provided in the HTTP GET request to lookup the next playlist it should send for smooth playback. HLS playlists are updated every few seconds with new segment files. These playlists must be sent consecutively to the player without gaps or playback can skip. The Emulated HLS Server tracks sessions using the session ID to ensure it can send the next playlist in sequence **670**.

It can take a few seconds for the dynamic server to receive the necessary stream files before it is able to take segment requests from the player. While the dynamic server instantiates and becomes ready, the Emulated HLS Server will handle segment requests. It will send the requested playlist file unmodified to the player. An unmodified playlist contains segment files with no source address specified, known as a relative path. This causes the player to request the segment files from the same server as the playlist is located on, which in this case is the Emulated HLS server **680**.

The Emulated HLS Server uses the session ID provided in the HTTP GET request to determine the next playlist it should send for smooth playback. HLS playlists are updated every few seconds with new segment files. These playlists must be sent consecutively to the player without gaps or playback can skip. The Emulated HLS Server tracks sessions using the session ID to ensure it can send the next playlist in sequence **690**.

The Emulated HLS Server will take the original playlist file and scan it, searching for the segment file URLs. The segment file URLs are relative paths with no specific server or port identified. The playlist files contain multiple segment URLs with numbered files. The player will use the URLs to request these segments and playback the stream **700**.

For each segment file found in the playlist the Emulated HLS Server will prepend the URL with the dynamic server IP and port of the tower the player is currently connected on, as determined in step **710**.

The Emulated HLS Server will send the modified playlist with the updated segment URLs back to the player that requested it. This will cause the player to request the segment files from the dynamic server on the tower that the player is currently connected on **720**.

While the preferred embodiment of the invention has been illustrated and described, as noted above, many changes can be made without departing from the spirit and scope of the invention. Accordingly, the scope of the invention is not limited by the disclosure of the preferred embodiment.

Instead, the invention should be determined entirely by reference to the claims that follow.

I claim:

1. A method for delivering adaptive bit rate media over a broadband network comprising multiple towers and gateways, the method comprising:

providing an emulated adaptive bit rate server;

intercepting an adaptive bit rate playlist get request by the emulated adaptive bit rate server;

accessing, from the intercepted adaptive bit rate playlist get request, a media player identification (ID) and Internet Protocol (IP) address of a media player associated with the request;

determining, via network address translation at a tower, a geographic location of a dynamic adaptive bit rate server close to the media player;

when a requested video segment is flowing at the tower, providing a modified adaptive bit rate playlist response to the adaptive bit rate playlist get request, wherein the modified adaptive bit rate playlist response identifies the tower as a source for the requested video segment;

providing, on an optimized geographic basis and in response to one or more wireless handovers, a plurality of dynamic downstream adaptive bit rate servers;

instantiating the plurality of dynamic downstream adaptive bit rate servers to serve the modified adaptive bit rate playlist response; and

accelerating the step of instantiating the plurality of dynamic downstream adaptive bit rate servers by:

transmitting, by the emulated adaptive bit rate server to the tower, an accelerated buffering command to instantiate one of the dynamic downstream adaptive bit rate servers; and

while the one dynamic downstream adaptive bitrate server is being instantiated, transmitting, by the emulated adaptive bit rate server, a predetermined amount of transport stream segment data to the media player.

2. The method of claim **1**, further comprising:

determining a server outage for one or more of the plurality of dynamic downstream adaptive bit rate servers; and

providing one or more additional adaptive bit rate servers on an optimized geographic basis.

3. The method of claim **1**, further comprising:

determining a server overload status for one or more of the plurality of dynamic downstream adaptive bit rate servers; and

providing one or more additional adaptive bit rate servers on an optimized geographic basis.

4. The method of claim **1**, wherein the step of providing a plurality of dynamic downstream adaptive bit rate servers is performed in response to one or more wireless handovers.

5. The method of claim **4**, further comprising sensing the one or more wireless handovers by the address change of a NAT translation in a tower or a gateway.

6. The method of claim **1**, wherein the emulated adaptive bit rate server sends an initial modified adaptive bit rate playlist response pointing to an adaptive bit rate segment server residing on the same Internet Protocol address substantially simultaneously with the step of instantiating the plurality of dynamic downstream adaptive bit rate servers.

7. The method of claim **1**, further comprising translating, via a network address translator, the adaptive bit rate playlist get request to obtain the source of the get request.

8. A method for delivering adaptive bit rate media over a broadband network comprising multiple towers and gateways, the method comprising:

by an emulated adaptive bit rate server,

receiving an adaptive bit rate playlist request from a media player executing on a mobile device;

determining, based on a network address translated IP address of the mobile device, a tower to which the mobile device is currently connected;

determining, based on a lookup of the network address translated IP address, whether the tower supports instantiating a dynamic adaptive bit rate server, by:

storing a table of cell towers that are capable of instantiating dynamic adaptive bit rate servers; and

performing in the table a lookup of the tower using the network address translated IP address to determine if the media player is connected to a tower that supports instantiating dynamic servers;

determining, based on the lookup of the network address translated IP address, whether a requested video stream is currently running on the dynamic adaptive bit rate server; and

when the requested video stream is not currently running on the dynamic adaptive bit rate server,

transmitting a command to instantiate the dynamic adaptive bit rate server to make the requested video stream available on the tower;

while the dynamic adaptive bit rate server is being instantiated, transmitting an unmodified playlist to the media player, wherein the unmodified playlist identifies the emulated adaptive bit rate server as the source of the requested stream; and

once the dynamic adaptive bit rate server is instantiated, transmitting a modified playlist to the media player, wherein the modified playlist identifies the dynamic adaptive bit rate server as the source of the requested media stream.

9. The method of claim **8** wherein the adaptive bit rate playlist request is an HTTP get request.

10. The method of claim **8**, further comprising:

when the tower does not support instantiating a dynamic adaptive bit rate server, transmitting an unmodified playlist to the media player, wherein the unmodified playlist identifies the emulated adaptive bit rate server as the source of the requested stream.

11. The method of claim **10**, further comprising:

determining a next unmodified playlist to transmit based on a session ID found in the adaptive bit rate playlist request.

12. The method of claim **8**, further comprising:

when the requested video stream is currently running on the dynamic adaptive bit rate server,

determining a next playlist to send to the media player;

scanning the requested playlist for video segment source identifiers;

updating each video segment source identifier to identify the tower as the source of the video segment; and

transmitting to the media player a modified playlist that includes the updated video segment source identifiers.

13. The method of claim **12**, wherein the scanned video segment source identifiers are URLs.

14. The method of claim **13**, wherein the scanned URLs are relative paths with no specific server or port identified.

15. The method of claim **12**, wherein the updated videos segment source identifiers are URLs that include the IP address and port of the tower.

16. A system for delivering adaptive bit rate media over a broadband network comprising multiple towers and gateways, the system comprising:

a mobile computing device executing a media player; and

an emulated adaptive bit rate server computing system, configured to:

receive an adaptive bit rate playlist request from the media player;

determine, based on a network address translated IP address of the mobile device, a tower to which the mobile device is currently connected;

determine, based on a lookup of the network address translated IP address, whether the tower supports instantiating a dynamic adaptive bit rate server;

determine, based on the lookup of the network address translated IP address, whether a requested video stream is currently running on the dynamic adaptive bit rate server;

when the requested video stream is not currently running on the dynamic adaptive bit rate server,

transmit a command to instantiate the dynamic adaptive bit rate server to make the requested video stream available on the tower;

while the dynamic adaptive bit rate server is being instantiated, transmit an unmodified playlist to the media player, wherein the unmodified playlist identifies the emulated adaptive bit rate server as the source of the requested stream; and

once the dynamic adaptive bit rate server is instantiated, transmit a modified playlist to the media player, wherein the modified playlist identifies the dynamic adaptive bit rate server as the source of the requested media stream; and

when the requested video stream is currently running on the dynamic adaptive bit rate server,

determine a next playlist to send to the media player;

scan the requested playlist for video segment source identifiers;

update each video segment source identifier to identify the tower as the source of the video segment; and

transmit to the media player a modified playlist that includes the updated video segment source identifiers.

17. The system of claim **16**, wherein the media player executing on the mobile computing device receives a sequence of multiple playlists from the emulated adaptive bit rate server while receiving video transport stream segments from one or more dynamic adaptive bit rate severs based on the geographic location of the mobile computing device.

18. The system of claim **16**, wherein the modified playlist includes the IP address of the dynamic adaptive bit rate server prepended to one or more video transport stream URLs.

19. The system of claim **16**, wherein the video segment source identifiers are segment file URLs that are relative paths with no specific server or port identified, wherein the playlist contains multiple segment file URLs identifying numbered files, and wherein the emulated adaptive bit rate server computing system is further configured to prepend each URL with a dynamic server IP and port of the tower to which the player is currently connected.

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