

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

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims benefit of United States Provisional Patent Application Number 60/566,831 entitled "APPARATUS, SYSTEM, AND METHOD FOR DYNAMIC RATE SHIFTING OF STREAMING CONTENT" and filed on April 30, 2004 for R. Drew Major and Mark B. Hurst, which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0002] The invention relates to video streaming over packet switched networks such as the Internet, and more particularly relates to adaptive-rate shifting of streaming content over such networks.

DESCRIPTION OF THE RELATED ART

[0003] The Internet is fast becoming a preferred method for distributing media files to end users. It is currently possible to download music or video to computers, cell phones, or practically any network capable device. Many portable media players are equipped with network connections and enabled to play music or videos. The music or video files (hereinafter "media files") can be stored locally on the media player or computer, or streamed or downloaded from a server.

[0004] "Streaming media" refers to technology that delivers content at a rate sufficient for presenting the media to a user in real time as the data is received. The data may be stored in memory temporarily until played and then subsequently deleted. The user has the immediate satisfaction of viewing the requested content without waiting for the media file to completely download. Unfortunately, the audio/video quality that can be received for real time presentation is constrained by the available bandwidth of the user's network

connection. Streaming may be used to deliver content on demand (previously recorded) or from live broadcasts.

[0005] Alternatively, media files may be downloaded and stored on persistent storage devices, such as hard drives or optical storage, for later presentation. Downloading complete media files can take large amounts of time depending on the network connection. Once downloaded, however, the content can be viewed repeatedly anytime or anywhere. Media files prepared for downloading usually are encoded with a higher quality audio/video than can be delivered in real time. Users generally dislike this option, as they tend to want to see or hear the media file instantaneously.

[0006] Streaming offers the advantage of immediate access to the content but currently sacrifices quality compared with downloading a file of the same content. Streaming also provides the opportunity for a user to select different content for viewing on an ad hoc basis, while downloading is by definition restricted to receiving a specific content selection in its entirety or not at all. Downloading also supports rewind, fast forward, and direct seek operations, while streaming is unable to fully support these functions. Streaming is also vulnerable to network failures or congestion.

[0007] Another technology, known as "progressive downloads," attempts to combine the strengths of the above two technologies. When a progressive download is initiated, the media file download begins, and the media player waits to begin playback until there is enough of the file downloaded that playback can begin with the hope that the remainder of the file will be completely downloaded before playback "catches up." This waiting period before playback can be substantial depending on network conditions, and therefore is not a complete or fully acceptable solution to the problem of media presentation over a network.

[0008] Generally, three basic challenges exist with regard to data transport streaming over a network such as the Internet that has a varying amount of data loss. The first challenge is reliability. Most streaming solutions use a TCP connection, or "virtual circuit," for transmitting data. A TCP connection provides a guaranteed delivery mechanism

so that data sent from one endpoint will be delivered to the destination, even if portions are lost and retransmitted. A break in the continuity of a TCP connection can have serious consequences when the data must be delivered in real-time. When a network adapter detects delays or losses in a TCP connection, the adapter "backs off" from transmission attempts for a moment and then slowly resumes the original transmission pace. This behavior is an attempt to alleviate the perceived congestion. Such a slowdown is detrimental to the viewing or listening experience of the user and therefore is not acceptable.

[0009] The second challenge to data transport is efficiency. Efficiency refers to how well the user's available bandwidth is used for delivery of the content stream. This measure is directly related to the reliability of the TCP connection. When the TCP connection is suffering reliability problems, a loss of bandwidth utilization results. The measure of efficiency sometimes varies suddenly, and can greatly impact the viewing experience.

[0010] The third challenge is latency. Latency is the time measure from the client's point-of-view, of the interval between when a request is issued and the response data begins to arrive. This value is affected by the network connection's reliability and efficiency, and the processing time required by the origin to prepare the response. A busy or overloaded server, for example, will take more time to process a request. As well as affecting the start time of a particular request, latency has a significant impact on the network throughput of TCP.

[0011] From the foregoing discussion, it should be apparent that a need exists for an apparatus, system, and method that alleviate the problems of reliability, efficiency, and latency. Additionally, such an apparatus, system, and method would offer instantaneous viewing along with the ability to fast forward, rewind, direct seek, and browse multiple streams. Beneficially, such an apparatus, system, and method would utilize multiple connections between a source and destination, requesting varying bitrate streams depending upon network conditions.

SUMMARY OF THE INVENTION

[0012] The present invention has been developed in response to the present state of the art, and in particular, in response to the problems and needs in the art that have not yet been fully solved by currently available content streaming systems. Accordingly, the present invention has been developed to provide an apparatus, system, and method for adaptive-rate content streaming that overcome many or all of the above-discussed shortcomings in the art.

[0013] The apparatus for adaptive-rate content streaming is provided with a logic unit containing a plurality of modules configured to functionally execute the necessary steps. These modules in the described embodiments include an agent controller module configured to simultaneously request a plurality of streamlets, the agent controller module further configured to continuously monitor streamlet requests and subsequent responses, and accordingly request higher or lower quality streamlets, and a staging module configured to stage the streamlets and arrange the streamlets for playback on a content player.

[0014] The apparatus is further configured, in one embodiment, to establish multiple Transmission Control Protocol (TCP) connections with a content server, and request streamlets of varying bitrates. Each streamlet may further comprise a portion of a content file. Additionally, the agent controller module may be configured to generate a performance factor according to responses from streamlet requests.

[0015] In a further embodiment, the agent controller module is configured to upshift to a higher quality streamlet when the performance factor is greater than a threshold, and the agent controller module determines the higher quality playback can be sustained according to a combination of factors. The factors may include an amount of contiguously available streamlets stored in the staging module, a minimum safety margin, and a current read ahead margin.

[0016] The agent controller module may be configured to downshift to a lower quality streamlet when the performance factor is less than a second threshold. Also, the agent controller module is further configured to anticipate streamlet requests and pre-request

streamlets to enable fast-forward, skip randomly, and rewind functionality. In one embodiment, the agent controller module is configured to initially request low quality streamlets to enable instant playback of the content file, and subsequent upshifting according to the performance factor.

[0017] A system of the present invention is also presented to adaptive-rate content streaming. In particular, the system, in one embodiment, includes a data communications network, and a content server coupled to the data communications network and having a content module configured to process content and generate a plurality of high and low quality streams. In one embodiment, each of the high and low quality streams may include a plurality of streamlets.

[0018] In a further embodiment, the system also includes an agent controller module configured to simultaneously request a plurality of streamlets, the agent controller module further configured to continuously monitor streamlet requests and subsequent responses, and accordingly request higher or lower quality streamlets, and a staging module configured to stage the streamlets and arrange the streamlets for playback on a content player.

[0019] A method of the present invention is also presented for adaptive-rate content streaming. The method in the disclosed embodiments substantially includes the steps necessary to carry out the functions presented above with respect to the operation of the described apparatus and system. In one embodiment, the method includes simultaneously requesting a plurality of streamlets, continuously monitoring streamlet requests and subsequent responses, and accordingly requesting higher or lower quality streamlets, and staging the streamlets and arranging the streamlets for playback on a content player.

[0020] In a further embodiment, the method may include establishing multiple Transmission Control Protocol (TCP) connections with a content server, and requesting streamlets of varying bitrates. Also, the method may include generating a performance factor according to responses from streamlet requests, upshifting to a higher quality streamlet when the performance factor is greater than a threshold, and determining if the higher quality

playback can be sustained. Furthermore, the method may include downshifting to a lower quality streamlet when the performance factor is less than a second threshold.

[0021] In one embodiment, the method includes anticipating streamlet requests and pre-requesting streamlets to enable fast-forward, skip randomly, and rewind functionality. The method may also comprise initially requesting low quality streamlets to enable instant playback of a content file, and subsequent upshifting according to the performance factor.

[0022] Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present invention should be or are in any single embodiment of the invention. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present invention. Thus, discussion of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same embodiment.

[0023] Furthermore, the described features, advantages, and characteristics of the invention may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the invention may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the invention.

[0024] These features and advantages of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] In order that the advantages of the invention will be readily understood, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which:

[0026] Figure 1 is a schematic block diagram illustrating one embodiment of a system for adaptive rate shifting of streaming content in accordance with the present invention;

[0027] Figure 2a is a schematic block diagram graphically illustrating one embodiment of a content file in accordance with the present invention;

[0028] Figure 2b is a schematic block diagram illustrating one embodiment of a plurality of streams having varying degrees of quality and bandwidth in accordance with the present invention;

[0029] Figure 2c is a schematic block diagram illustrating one embodiment of a stream divided into a plurality of streamlets in accordance with the present invention;

[0030] Figure 3 is a schematic block diagram illustrating one embodiment of a content module in accordance with the present invention;

[0031] Figure 4 is a schematic block diagram graphically illustrating one embodiment of a client module in accordance with the present invention;

[0032] Figure 5 is a schematic flow chart diagram illustrating one embodiment of a method for processing content in accordance with the present invention;

[0033] Figure 6 is a schematic flow chart diagram illustrating one embodiment of a method for playback of a plurality of streamlets in accordance with the present invention; and

[0034] Figure 7 is a schematic flow chart diagram illustrating one embodiment of a method for requesting streamlets within an adaptive-rate content streaming environment in accordance with the present invention.

FIG. 7 is a schematic flow chart diagram illustrating one embodiment of a method for requesting streamlets within an adaptive-rate content streaming environment in accordance with the present invention. The method begins at block 700, where a client device receives a request for content. The request may be received from a user or a server. The client device then proceeds to block 710, where it determines the current playback rate of the content. This determination may be based on the current network bandwidth, the current buffer level, or the current playback rate of the content. The client device then proceeds to block 720, where it determines the requested playback rate of the content. This determination may be based on the current network bandwidth, the current buffer level, or the current playback rate of the content. The client device then proceeds to block 730, where it requests the requested streamlets from the server. The requested streamlets may be requested at the requested playback rate. The client device then proceeds to block 740, where it receives the requested streamlets from the server. The client device then proceeds to block 750, where it plays the requested streamlets. The client device then proceeds to block 760, where it determines if the playback rate is to be updated. If the playback rate is to be updated, the client device proceeds to block 770, where it updates the playback rate. If the playback rate is not to be updated, the client device proceeds to block 780, where it continues to play the requested streamlets. The client device then proceeds to block 790, where it ends the method.

DETAILED DESCRIPTION OF THE INVENTION

[0035] Many of the functional units described in this specification have been labeled as modules, in order to more particularly emphasize their implementation independence. For example, a module may be implemented as a hardware circuit comprising custom VLSI circuits or gate arrays, off-the-shelf semiconductors such as logic chips, transistors, or other discrete components. A module may also be implemented in programmable hardware devices such as field programmable gate arrays, programmable array logic, programmable logic devices or the like.

[0036] Modules may also be implemented in software for execution by various types of processors. An identified module of executable code may, for instance, comprise one or more physical or logical blocks of computer instructions which may, for instance, be organized as an object, procedure, or function. Nevertheless, the executables of an identified module need not be physically located together, but may comprise disparate instructions stored in different locations which, when joined logically together, comprise the module and achieve the stated purpose for the module.

[0037] Indeed, a module of executable code may be a single instruction, or many instructions, and may even be distributed over several different code segments, among different programs, and across several memory devices. Similarly, operational data may be identified and illustrated herein within modules, and may be embodied in any suitable form and organized within any suitable type of data structure. The operational data may be collected as a single data set, or may be distributed over different locations including over different storage devices, and may exist, at least partially, merely as electronic signals on a system or network.

[0038] Reference throughout this specification to "one embodiment," "an embodiment," or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment," "in an

embodiment," and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment.

[0039] Reference to a signal bearing medium may take any form capable of generating a signal, causing a signal to be generated, or causing execution of a program of machine-readable instructions on a digital processing apparatus. A signal bearing medium may be embodied by a transmission line, a compact disk, digital-video disk, a magnetic tape, a Bernoulli drive, a magnetic disk, a punch card, flash memory, integrated circuits, or other digital processing apparatus memory device.

[0040] Furthermore, the described features, structures, or characteristics of the invention may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of programming, software modules, user selections, network transactions, database queries, database structures, hardware modules, hardware circuits, hardware chips, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention may be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

[0041] Figure 1 is a schematic block diagram illustrating one embodiment of a system 100 for dynamic rate shifting of streaming content in accordance with the present invention. In one embodiment, the system 100 comprises a content server 102 and an end user 104. The content server 102 and the end user station 104 may be coupled by a data communications network. The data communications network may include the Internet 106 and connections 108 to the Internet 106. Alternatively, the content server 102 and the end user 104 may be located on a common local area network, wireless area network, cellular network, virtual local area network, or the like. The end user station 104 may comprise a

personal computer (PC), an entertainment system configured to communicate over a network, or a portable electronic device configured to present content.

[0042] In the depicted embodiment, the system 100 also includes a publisher 110, and a web server 116. The publisher 110 may be a creator or distributor of content. For example, if the content to be streamed were a broadcast of a television program, the publisher 110 may be a television or cable network channel such as NBC®, or MTV®. Content may be transferred over the Internet 106 to the content server 102, where the content is received by a content module 112. The content module 112 may be configured to receive, process, and store content. In one embodiment, processed content is accessed by a client module 114 configured to play the content on the end user station 104. In a further embodiment, the client module 114 is configured to receive different portions of a content stream from a plurality of locations simultaneously. For example, the client module 114 may request and receive content from any of the plurality of web servers 116.

[0043] Figure 2a is a schematic block diagram graphically illustrating one embodiment of a content file 200. In one embodiment, the content file 200 is distributed by the publisher 110. The content file 200 may comprise a television broadcast, sports event, movie, music, concert, etc. The content file 200 may also be live or archived content. The content file 200 may comprise uncompressed video and audio, or alternatively, video or audio. Additionally, the content file 200 may be compressed. Examples of a compressed content file 200 include, but are not limited to, DivX®, Windows Media Video 9®, Quicktime 6.5 Sorenson 3®, or Quicktime 6.5/ MPEG-4® encoded content.

[0044] Figure 2b is a schematic block diagram illustrating one embodiment of a plurality of streams 202 having varying degrees of quality and bandwidth. In one embodiment, the plurality of streams 202 comprises a low quality stream 204, a medium quality stream 206, and a high quality stream 208. Each of the streams 204, 206, 208 is a copy of the content file 200 encoded and compressed to varying bit rates. For example, the low quality stream 204 may be encoded and compressed to a bit rate of 100 kilobits per

second (kbps), the medium quality stream 206 may be encoded and compressed to a bit rate of 200 kbps, and the high quality stream 208 may be encoded and compressed to 600 kbps.

[0045] Figure 2c is a schematic block diagram illustrating one embodiment of a stream 210 divided into a plurality of streamlets 212. As used herein, streamlet refers to any sized portion of the content file 200. Each streamlet 212 may comprise a portion of the content contained in stream 210, encapsulated as an independent media object. The content in a streamlet 212 may have a unique time index in relation to the beginning of the content contained in stream 210. In one embodiment, the content contained in each streamlet 212 has a duration of two seconds. For example, streamlet 0 may have a time index of 00:00 representing the beginning of content playback, and streamlet 1 may have a time index of 00:02, and so on. Alternatively, the time duration of the streamlets 212 may be any duration smaller than the entire playback duration of the content in stream 210. In a further embodiment, the streamlets 212 may be divided according to file size instead of a time index.

[0046] Figure 3 is a schematic block diagram illustrating in greater detail one embodiment of the content module 112 in accordance with the present invention. The content module 112 may comprise a stream module 302, a streamlet module 304, an encoder module 306, a streamlet database 308, and the web server 116. In one embodiment, the stream module 302 is configured to receive the content file 200 from the publisher 110 and generate the plurality of streams 202 of varying qualities. The original content file 200 from the publisher may be digital in form and may comprise content having a high bit rate such as, for example, 2mbps. The content may be transferred from the publisher 110 to the content module 112 over the Internet 106. Such transfers of data are well known in the art and do not require further discussion herein. Alternatively, the content may comprise a captured broadcast.

[0047] In the depicted embodiment, the plurality of streams 202 may comprise the low quality stream 204, the medium quality stream 206, and the high quality stream 208. Alternatively, the plurality of streams 202 may comprise any number of streams deemed

necessary to accommodate end user bandwidth. The streamlet module 304 may be configured to receive the plurality of streams 202 from the stream module and generate a plurality of streams 312, each stream comprising a plurality of streamlets 212. As described with reference to Figure 2c, each streamlet 212 may comprise a pre-defined portion of the stream. The encoder module 306 is configured to encode each streamlet from the plurality of streams 312 and store the streamlets in the streamlet database 308. The encoding module 306 may utilize encoding schemes such as DivX®, Windows Media Video 9®, Quicktime 6.5 Sorenson 3®, or Quicktime 6.5/MPEG-4®. Alternatively, a custom encoding scheme may be employed.

[0048] The content module 112 may also include a metadata module 312 and a metadata database 314. In one embodiment, metadata comprises static searchable content information. For example, metadata includes, but is not limited to, air date of the content, title, actresses, actors, length, and episode name. Metadata is generated by the publisher 110, and may be configured to define an end user environment. In one embodiment, the publisher 100 may define an end user navigational environment for the content including menus, thumbnails, sidebars, advertising, etc. Additionally, the publisher 110 may define functions such as fast forward, rewind, pause, and play that may be used with the content file 200. The metadata module 312 is configured to receive the metadata from the publisher 110 and store the metadata in the metadata database 314. In a further embodiment, the metadata module 312 is configured to interface with the client module 114, allowing the client module 114 to search for content based upon at least one of a plurality of metadata criteria. Additionally, metadata may be generated by the content module 112 through automated process(es) or manual definition.

[0049] Once the streamlets 212 have been received and processed, the client module 114 may request streamlets 212 using HTTP from the web server 116. Such use of client side initiated requests requires no additional configuration of firewalls. Additionally, since the client module 114 initiates the request, the web server 116 is only required to retrieve and

serve the requested streamlet. In a further embodiment, the client module 114 may be configured to retrieve streamlets 212 from a plurality of web servers 310. Each web server 116 may be located in various locations across the Internet 106. The streamlets 212 are essentially static files. As such, no specialized media server or server-side intelligence is required for a client module 114 to retrieve streamlets 212. Streamlets 212 may be served by the web server 116 or cached by cache servers of Internet Service Providers (ISPs), or any other network infrastructure operators, and served by the cache server. Use of cache servers is well known to those skilled in the art, and will not be discussed further herein. Thus, a highly scalable solution is provided that is not hindered by massive amounts of client module 114 requests to the web server 116 at any specific location.

[0050] Figure 4 is a schematic block diagram graphically illustrating one embodiment of a client module 114 in accordance with the present invention. The client module 114 may comprise an agent controller module 402, a streamlet cache module 404, and a network controller module 406. In one embodiment, the agent controller module 402 is configured to interface with a viewer 408, and transmit streamlets 212 to the viewer 408. In a further embodiment, the client module 114 may comprise a plurality of agent controller modules 402. Each agent controller module 402 may be configured to interface with one viewer 408. Alternatively, the agent controller module 402 may be configured to interface with a plurality of viewers 408. The viewer 408 may be a media player (not shown) operating on a PC or handheld electronic device.

[0051] The agent controller module 402 is configured to select a quality level of streamlets to transmit to the viewer 408. The agent controller module 402 requests lower or higher quality streams based upon continuous observation of time intervals between successive receive times of each requested streamlet. The method of requesting higher or lower quality streams will be discussed in greater detail below with reference to Figure 7.

[0052] The agent controller module 402 may be configured to receive user commands from the viewer 408. Such commands may include play, fast forward, rewind,

pause, and stop. In one embodiment, the agent controller module 402 requests streamlets 212 from the streamlet cache module 404 and arranges the received streamlets 212 in a staging module 409. The staging module 409 may be configured to arrange the streamlets 212 in order of ascending playback time. In the depicted embodiment, the streamlets 212 are numbered 0, 1, 2, 3, 4, etc. However, each streamlet 212 may be identified with a unique filename.

[0053] Additionally, the agent controller module 402 may be configured to anticipate streamlet 212 requests and pre-request streamlets 212. By pre-requesting streamlets 212, the user may fast-forward, skip randomly, or rewind through the content and experience no buffering delay. In a further embodiment, the agent controller module 402 may request the streamlets 212 that correspond to time index intervals of 30 seconds within the total play time of the content. Alternatively, the agent controller module 402 may request streamlets at any interval less than the length of the time index. This enables a "fast-start" capability with no buffering wait when starting or fast-forwarding through content file 200. In a further embodiment, the agent controller module 402 may be configured to pre-request streamlets 212 corresponding to specified index points within the content or within other content in anticipation of the end user 104 selecting new content to view.

[0054] In one embodiment, the streamlet cache module 404 is configured to receive streamlet 212 requests from the agent controller module 402. Upon receiving a request, the streamlet cache module 404 first checks a streamlet cache 410 to verify if the streamlet 212 is present. In a further embodiment, the streamlet cache module 404 handles streamlet 212 requests from a plurality of agent controller modules 402. Alternatively, a streamlet cache module 404 may be provided for each agent controller module 402. If the requested streamlet 212 is not present in the streamlet cache 410, the request is passed to the network controller module 406. In order to enable fast forward and rewind capabilities, the streamlet cache module 404 is configured to store the plurality of streamlets 212 in the streamlet cache

410 for a specified time period after the streamlet 212 has been viewed. However, once the streamlets 212 have been deleted, they may be requested again from the web server 116.

[0055] The network controller module 406 may be configured to receive streamlet requests from the streamlet cache module 404 and open a connection to the web server 116 or other remote streamlet 212 database (not shown). In one embodiment, the network controller module 406 opens a TCP/IP connection to the web server 116 and generates a standard HTTP GET request for the requested streamlet 212. Upon receiving the requested streamlet 212, the network controller module 406 passes the streamlet 212 to the streamlet cache module 404 where it is stored in the streamlet cache 410. In a further embodiment, the network controller module 406 is configured to process and request a plurality of streamlets 212 simultaneously. The network controller module 406 may also be configured to request a plurality of streamlets, where each streamlet 212 is subsequently requested in multiple parts.

[0056] In a further embodiment, streamlet requests may comprise requesting pieces of any streamlet file. Splitting the streamlet 212 into smaller pieces or portions beneficially allows for an increased efficiency potential, and also eliminates problems associated with multiple full-streamlet requests sharing the bandwidth at any given moment. This is achieved by using parallel TCP/IP connections for pieces of the streamlets 212. Consequently, efficiency and network loss problems are overcome, and the streamlets arrive with more useful and predictable timing.

[0057] In one embodiment, the client module 114 is configured to use multiple TCP connections between the client module 114 and the web server 116 or web cache. The intervention of a cache may be transparent to the client or configured by the client as a forward cache. By requesting more than one streamlet 212 at a time in a manner referred to as "parallel retrieval," or more than one part of a streamlet 212 at a time, efficiency is raised significantly and latency is virtually eliminated. In a further embodiment, the client module allows a maximum of three outstanding streamlet 212 requests. The client module 114 may maintain additional open TCP connections as spares to be available should another

connection fail. Streamlet 212 requests are rotated among all open connections to keep the TCP flow logic for any particular connection from falling into a slow-start or close mode. If the network controller module 406 has requested a streamlet 212 in multiple parts, with each part requested on mutually independent TCP/IP connections, the network controller module 406 reassembles the parts to present a complete streamlet 212 for use by all other components of the client module 114.

[0058] When a TCP connection fails completely, a new request may be sent on a different connection for the same streamlet 212. In a further embodiment, if a request is not being satisfied in a timely manner, a redundant request may be sent on a different connection for the same streamlet 212. If the first streamlet request's response arrives before the redundant request response, the redundant request can be aborted. If the redundant request response arrives before the first request response, the first request may be aborted.

[0059] Several streamlet 212 requests may be sent on a single TCP connection, and the responses are caused to flow back in matching order along the same connection. This eliminates all but the first request latency. Because multiple responses are always being transmitted, the processing latency of each new streamlet 212 response after the first is not a factor in performance. This technique is known in the industry as "pipelining." Pipelining offers efficiency in request-response processing by eliminating most of the effects of request latency. However, pipelining has serious vulnerabilities. Transmission delays affect all of the responses. If the single TCP connection fails, *all* of the outstanding requests and responses are lost. Pipelining causes a serial dependency between the requests.

[0060] Multiple TCP connections may be opened between the client module 114 and the web server 116 to achieve the latency-reduction efficiency benefits of pipelining while maintaining the independence of each streamlet 212 request. Several streamlet 212 requests may be sent concurrently, with each request being sent on a mutually distinct TCP connection. This technique is labeled "virtual pipelining" and is an innovation of the present invention. Multiple responses may be in transit concurrently, assuring that communication

bandwidth between the client module 114 and the web server 116 is always being utilized. Virtual pipelining eliminates the vulnerabilities of traditional pipelining. A delay in or complete failure of one response does not affect the transmission of other responses because each response occupies an independent TCP connection. Any transmission bandwidth not in use by one of multiple responses (whether due to delays or TCP connection failure) may be utilized by other outstanding responses.

[0061] A single streamlet 212 request may be issued for an entire streamlet 212, or multiple requests may be issued, each for a different part or portion of the streamlet. If the streamlet is requested in several parts, the parts may be recombined by the client module 114 streamlet.

[0062] In order to maintain a proper balance between maximized bandwidth utilization and response time, the issuance of new streamlet requests must be timed such that the web server 116 does not transmit the response before the client module 114 has fully received a response to one of the previously outstanding streamlet requests. For example, if three streamlet 212 requests are outstanding, the client module 114 should issue the next request slightly before one of the three responses is fully received and "out of the pipe." In other words, request timing is adjusted to keep three responses in transit. Sharing of bandwidth among four responses diminishes the net response time of the other three responses. The timing adjustment may be calculated dynamically by observation, and the request timing adjusted accordingly to maintain the proper balance of efficiency and response times.

[0063] The schematic flow chart diagrams that follow are generally set forth as logical flow chart diagrams. As such, the depicted order and labeled steps are indicative of one embodiment of the presented method. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more steps, or portions thereof, of the illustrated method. Additionally, the format and symbols employed are provided to explain the logical steps of the method and are understood not to limit the scope of the method.

Although various arrow types and line types may be employed in the flow chart diagrams, they are understood not to limit the scope of the corresponding method. Indeed, some arrows or other connectors may be used to indicate only the logical flow of the method. For instance, an arrow may indicate a waiting or monitoring period of unspecified duration between enumerated steps of the depicted method. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

[0064] Figure 5 is a schematic flow chart diagram illustrating one embodiment of a method 500 for processing content in accordance with the present invention. In one embodiment the method 500 starts 502, and the content module 112 receives 504 content from the publisher 110. Receiving content 504 may comprise receiving 504 a digital copy of the content file 200, or digitizing a physical copy of the content file 200. Alternatively, receiving 504 content may comprise capturing a radio or television broadcast. Once received 504, the stream module 302 generates 506 a plurality of streams 202, each stream 202 having a different quality. The quality may be predefined, or automatically set according to end user bandwidth, or in response to pre-designated publisher guidelines

[0065] The streamlet module 304 receives the streams 202 and generates 508 a plurality of streamlets 212. In one embodiment, generating 508 streamlets comprises dividing the stream 202 into a plurality of two second streamlets 212. Alternatively, the streamlets may have any length less than or equal to the length of the stream 202. The encoder module 306 then encodes 510 the streamlets according to a compression algorithm. In a further embodiment, the algorithm comprises a proprietary codec such as WMV9®. The encoder module 306 then stores 512 the encoded streamlets in the streamlet database 308. Once stored 512, the web server 116 may then serve 514 the streamlets. In one embodiment, serving 514 the streamlets comprises receiving streamlet requests from the client module 114, retrieving the requested streamlet from the streamlet database 308, and subsequently transmitting the streamlet to the client module 114. The method 500 then ends 516.

[0066] Figure 6 is a schematic flow chart diagram illustrating one embodiment of a method 600 for viewing a plurality of streamlets in accordance with the present invention. The method 600 starts and an agent control module 402 is provided 604 and associated with a viewer 408 and provided with a staging module 409. The agent controller module 402 then requests 606 a streamlet from the streamlet cache module 404. Alternatively, the agent controller module 402 may simultaneously request 606 a plurality of streamlets from the streamlet cache module 404. If the streamlet is stored 608 locally in the streamlet cache 410, the streamlet cache module 404 retrieves 610 the streamlet and sends the streamlet to the agent controller module 402. Upon retrieving 610 or receiving a streamlet, the agent controller module 402 makes 611 a determination of whether or not to shift to a higher or lower quality stream 202. This determination will be described below in greater detail with reference to Figure 7.

[0067] In one embodiment, the staging module 409 then arranges 612 the streamlets into the proper order, and the agent controller module 402 delivers 614 the streamlets to the viewer 408. In a further embodiment, delivering 614 streamlets to the end user comprises playing video and or audio streamlets on the viewer 408. If the streamlets are not stored 608 locally, the streamlet request is passed to the network controller module 406. The network controller module 406 then requests 616 the streamlet from the web server 116. Once the streamlet is received, the network controller module 406 passes the streamlet to the streamlet cache module 404. The streamlet cache module 404 archives 618 the streamlet. Alternatively, the streamlet cache module 404 then archives 618 the streamlet and passes the streamlet to the agent controller module 402, and the method 600 then continues from operation 610 as described above.

[0068] Referring now to Figure 7, shown therein is a schematic flow chart diagram illustrating one embodiment of a method 700 for requesting streamlets within a adaptive-rate shifting content streaming environment in accordance with the present invention. The method 700 may be used in one embodiment as the operation 611 of Figure 6. The method

700 starts and the agent controller module 402 receives 704 a streamlet as described above with reference to Figure 6. The agent controller module 402 then monitors 706 the receive time of the requested streamlet. In one embodiment, the agent controller module 402 monitors the time intervals Δ between successive receive times for each streamlet response. Ordering of the responses in relation to the order of their corresponding requests is not relevant.

[0069] Because network behavioral characteristics fluctuate, sometimes quite suddenly, any given Δ may vary substantially from another. In order to compensate for this fluctuation, the agent controller module 402 calculates 708 a performance ratio r across a window of n samples for streamlets of playback length S . In one embodiment, the performance ratio r is calculated using the equation

$$r = S \frac{n}{\sum_{i=1}^n \Delta_i}$$

[0070] Due to multiple simultaneous streamlet processing, and in order to better judge the central tendency of the performance ratio r , the agent control module 402 may calculate a geometric mean, or alternatively an equivalent averaging algorithm, across a window of size m , and obtain a performance factor ϕ :

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

[0071] The policy determination about whether or not to upshift 710 playback quality begins by comparing $\phi_{current}$ with a trigger threshold Θ_{up} . If $\phi_{current} \geq \Theta_{up}$, then an up shift to the next higher quality stream may be considered 716. In one embodiment, the trigger threshold Θ_{up} is determined by a combination of factors relating to the current read ahead margin (i.e. the amount of contiguously available streamlets that have been sequentially arranged by the staging module 409 for presentation at the current playback time index), and

a minimum safety margin. In one embodiment, the minimum safety margin may be 24 seconds. The smaller the read ahead margin, the larger Θ_{up} is to discourage upshifting until a larger read ahead margin may be established to withstand network disruptions. If the agent controller module 402 is able to sustain 716 upshift quality, then the agent controller module 402 will upshift 717 the quality and subsequently request higher quality streams. The determination of whether use of the higher quality stream is sustainable 716 is made by comparing an estimate of the higher quality stream's performance factor, φ_{higher} , with Θ_{up} . If $\varphi_{higher} \geq \Theta_{up}$ then use of the higher quality stream is considered sustainable. If the decision of whether or not the higher stream rate is sustainable 716 is "no," the agent control module 402 will not attempt to upshift 717 stream quality. If the end of the stream has been reached 714, the method 618 ends 716.

[0072] If the decision on whether or not to attempt upshift 710 is "no", a decision about whether or not to downshift 712 is made. In one embodiment, a trigger threshold Θ_{down} is defined in a manner analogous to Θ_{up} . If $\varphi_{current} > \Theta_{down}$ then the stream quality may be adequate, and the agent controller module 402 does not downshift 718 stream quality. However, if $\varphi_{current} \leq \Theta_{down}$, the agent controller module 402 does downshift 718 the stream quality. If the end of the stream has not been reached 714, the agent controller module 402 begins to request and receive 704 lower quality streamlets and the method 618 starts again. Of course, the above described equations and algorithms are illustrative only, and may be replaced by alternative streamlet monitoring solutions.

[0073] The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

[0074] What is claimed is:

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

Title of Invention: **APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE
SHIFTING OF STREAMING CONTENT**

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 _____ filed on _____
(I hereby authorize the subsequent insertion of the United States application or PCT international application number and corresponding filing date).

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 application, including the claims, as amended by any amendment.

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 USC §1001 by fine or imprisonment of not more than five (5) years, or both.

LEGAL NAME OF INVENTOR

Inventor: Robert Drew Major Date (Optional): 10/3/14

Signature: Robert Drew Major

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

Title of Invention: **APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE
SHIFTING OF STREAMING CONTENT**

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 _____ filed on _____
(I hereby authorize the subsequent insertion of the United States application or PCT
international application number and corresponding filing date).

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.

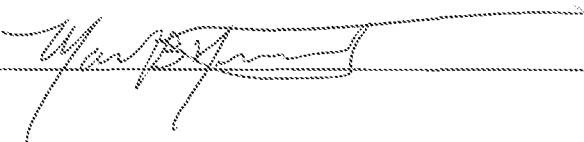
I have reviewed and understand the contents of the application, including the claims, as amended
by any amendment.

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 USC §1001 by fine or imprisonment of not more than five (5) years, or both.

LEGAL NAME OF INVENTOR

Inventor: Mark B. Hurst Date (Optional): 10/3/2014

Signature: 

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

ABSTRACT OF THE DISCLOSURE

An apparatus for adaptive-rate shifting of streaming content includes an agent controller module configured to simultaneously request at least portions of a plurality of streamlets. The agent controller module is further configured to continuously monitor streamlet requests and subsequent responses, and accordingly request higher or lower quality streamlets. A staging module is configured to stage the streamlets and arrange the streamlets for playback on a content player. A system includes a data communications network, a content server coupled to the data communications network and having a content module configured to process content and generate a plurality of high and low quality streams, and the apparatus. A method includes simultaneously requesting at least portions of a plurality of streamlets, continuously monitoring streamlet requests and subsequent responses, and accordingly requesting higher or lower quality streamlets, and staging the streamlets and arranging the streamlets for playback on a content player.

100

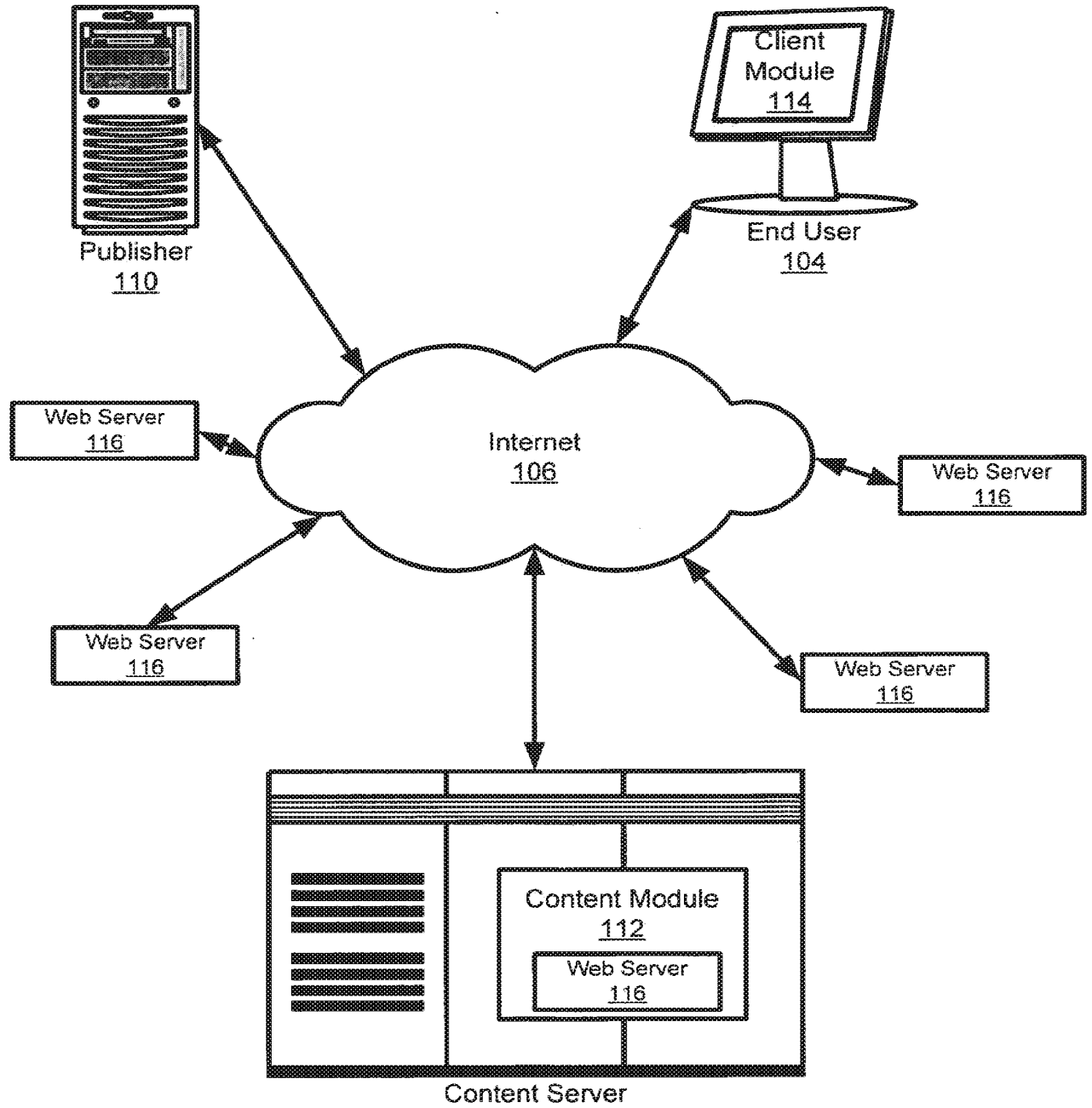


FIG. 1

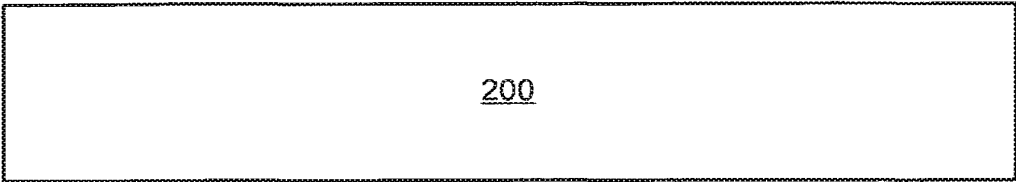


FIG. 2a
Playback Time Duration

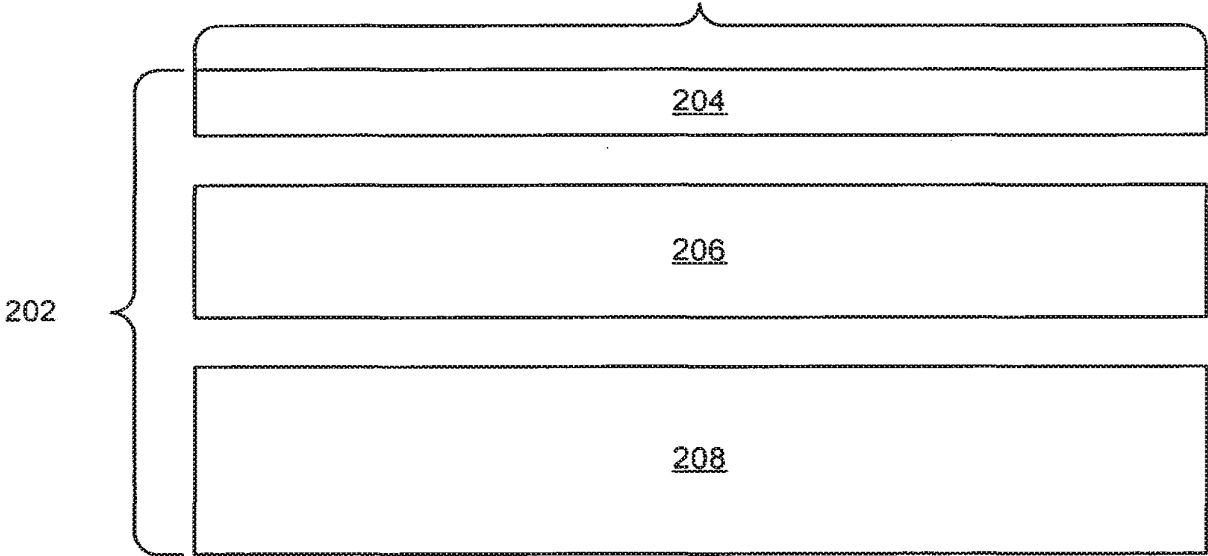


FIG. 2b

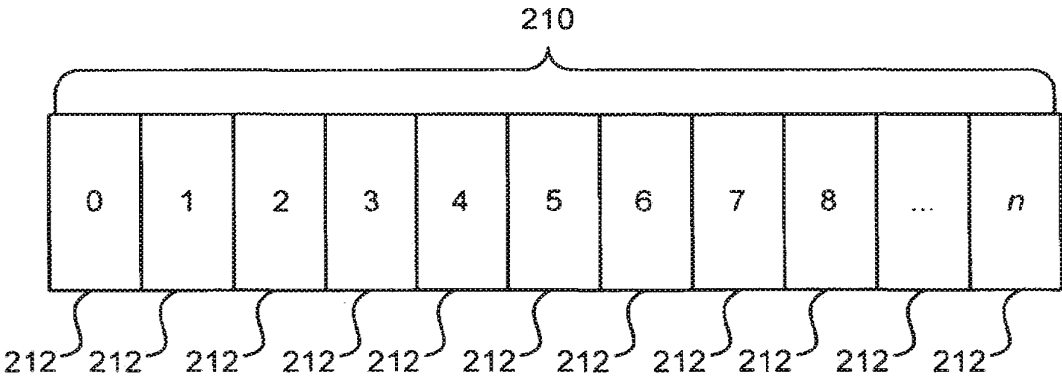
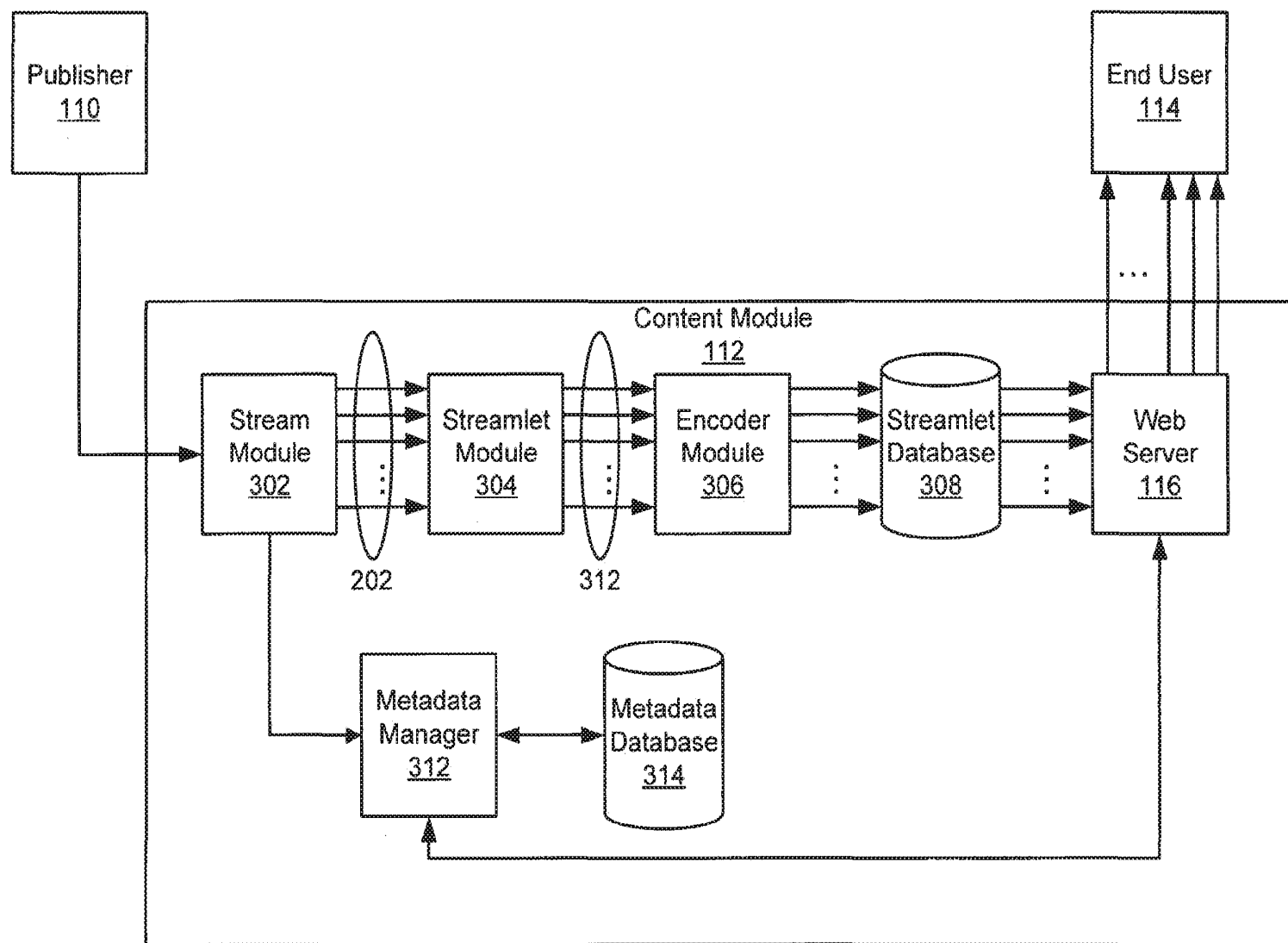


FIG. 2c



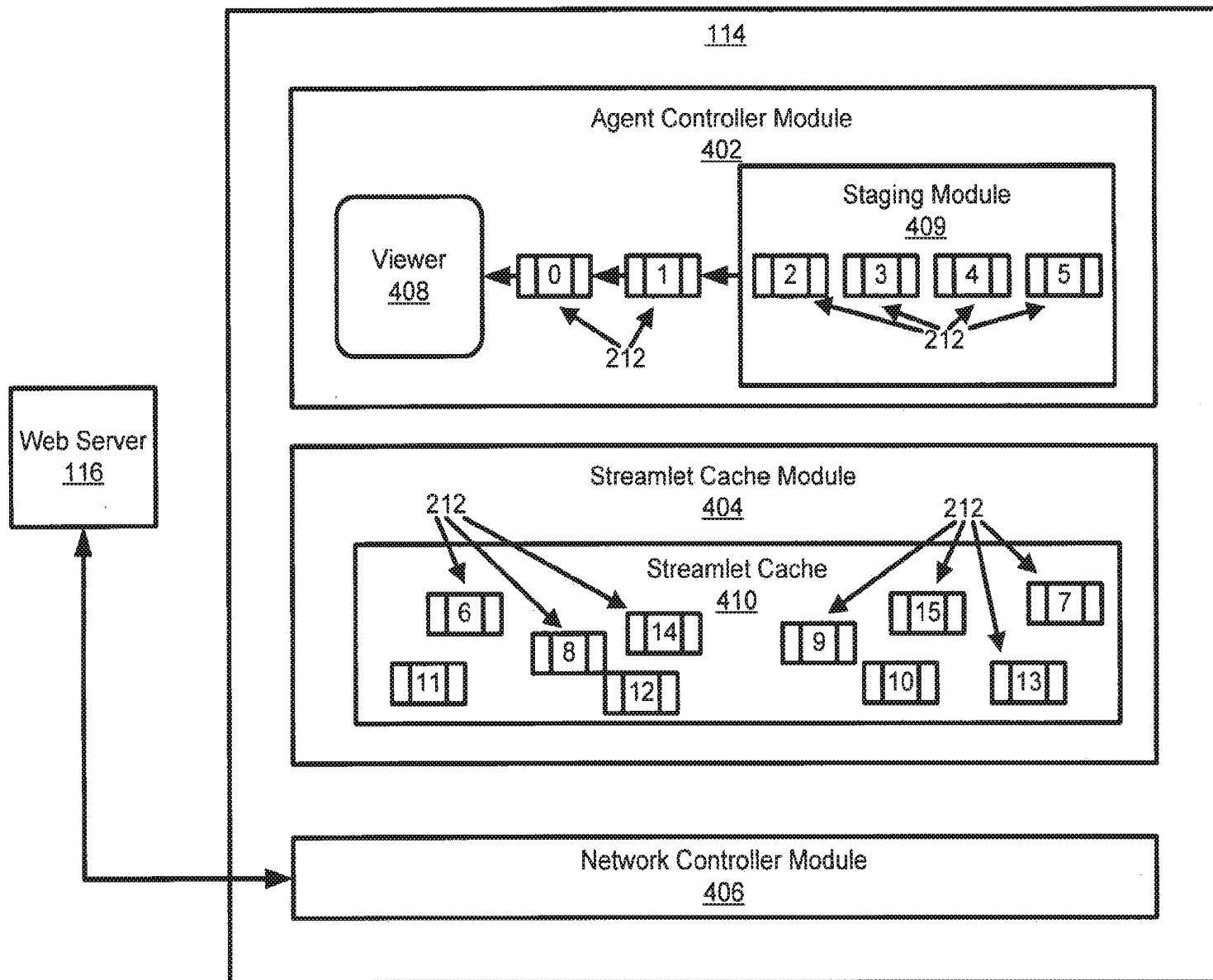


FIG. 4

500 ↘

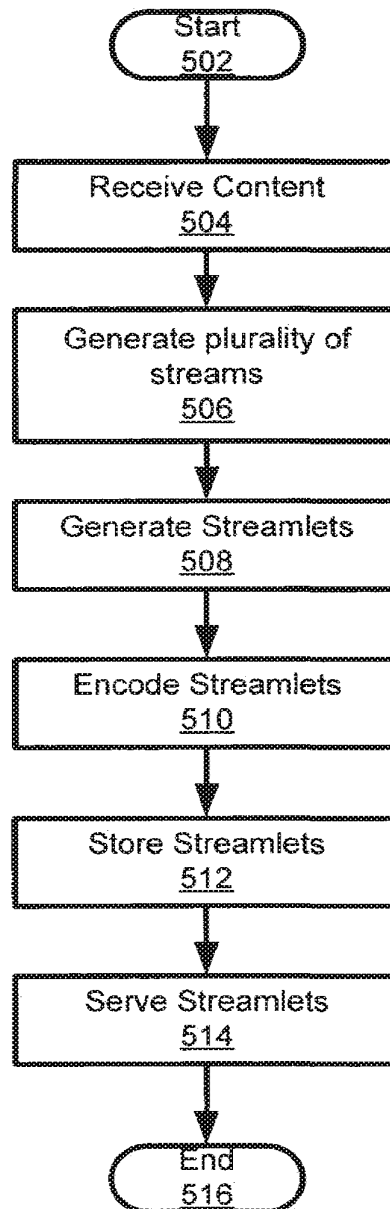


FIG. 5

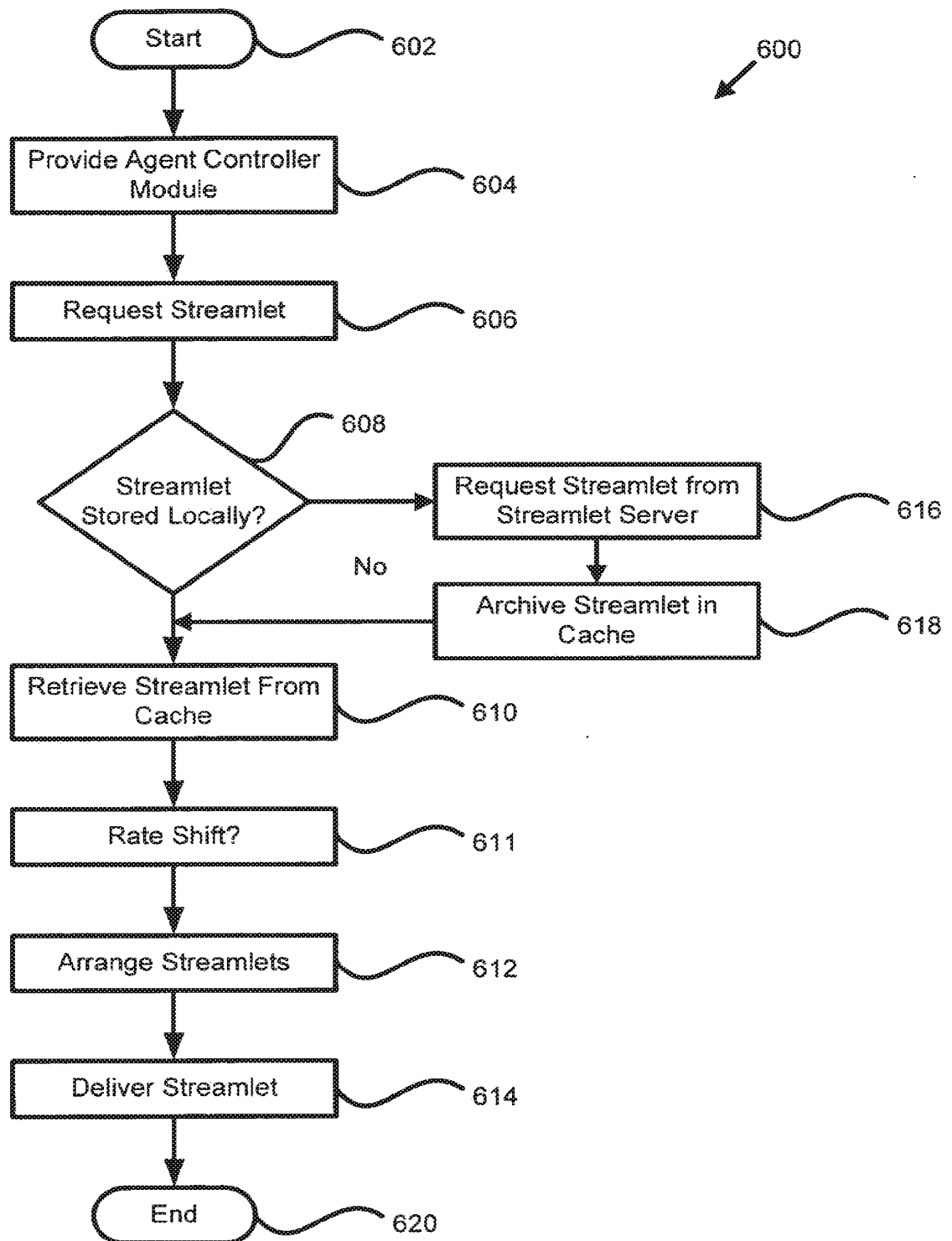


FIG. 6

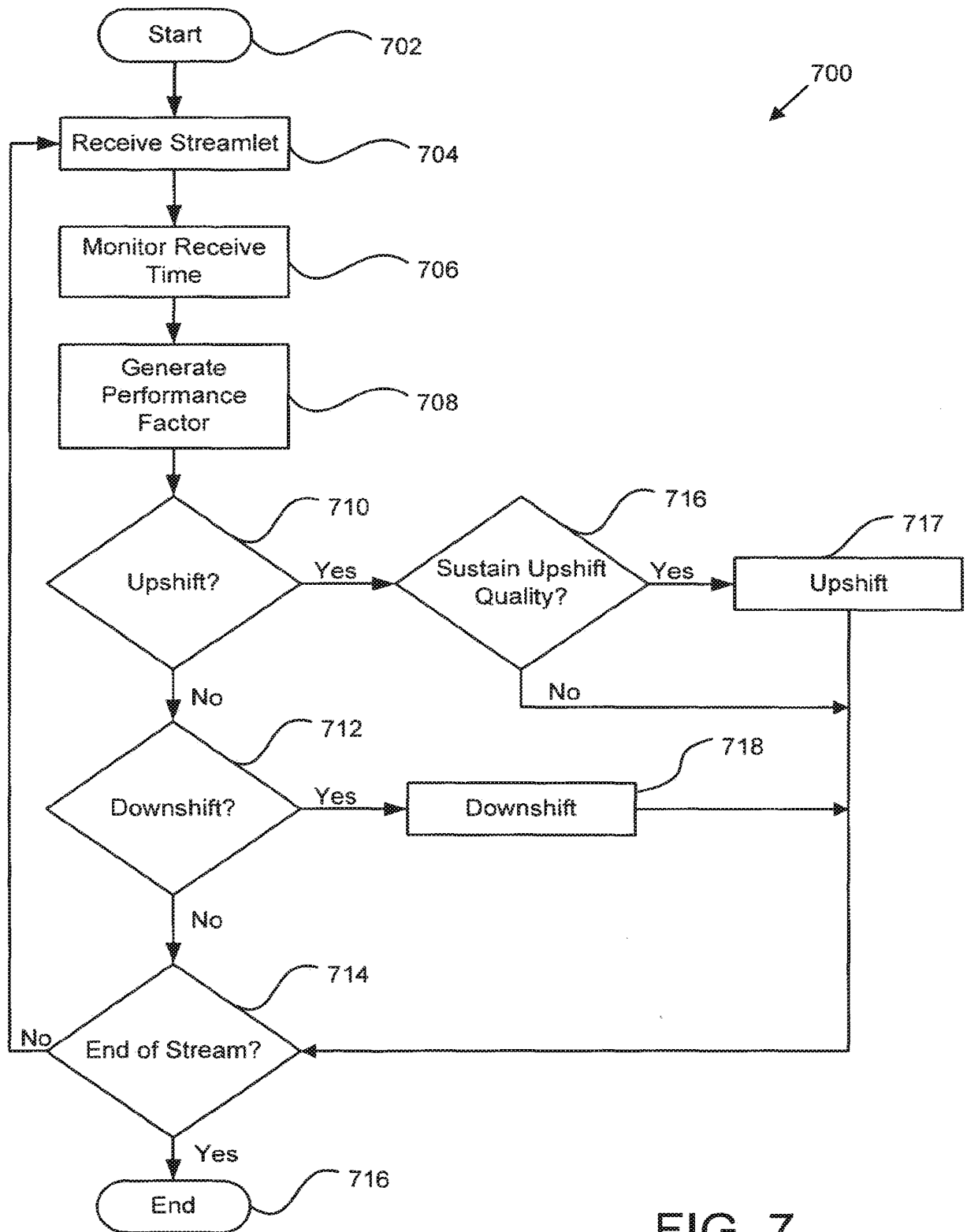


FIG. 7

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	066.0141C3
		Application Number	
Title of Invention	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		
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	
	Robert	Drew	Major		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
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Address 2					
City	Orem	State/Province	UT		
Postal Code	84058	Country i	US		
Inventor	2	Remove			
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Mark	B.	Hurst		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
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Address 2					
City	Cedar Hills	State/Province	UT		
Postal Code	84062	Country i	US		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	066.0141C3
		Application Number	
Title of Invention	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		

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

Customer Number	70560		
Email Address	docketing@lkglobal.com	Add Email	Remove Email

Application Information:

Title of the Invention	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		
Attorney Docket Number	066.0141C3	Small Entity Status Claimed ☐	
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	7	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.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	70560		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	066.0141C3
		Application Number	
Title of Invention	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		

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		15207172	2016-07-11	
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15207172	Continuation of	14516303	2014-10-16	9407564	2016-08-02
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14516303	Continuation of	11116783	2005-04-28	8868772	2014-10-21
Prior Application Status	Expired				Remove
Application Number	Continuity Type		Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)	
11116783	Claims benefit of provisional		60566831	2004-04-30	
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).

			Remove
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	066.0141C3
		Application Number	
Title of Invention	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		

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	066.0141C3
		Application Number	
Title of Invention	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		

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.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	066.0141C3
		Application Number	
Title of Invention	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		

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	DISH Technologies L.L.C.		
Mailing Address Information For Applicant:			
Address 1	9601 S. Meridian Blvd.		
Address 2			
City	Englewood	State/Province	CO
Country	US	Postal Code	80112
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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	066.0141C3
		Application Number	
Title of Invention	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		

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.			☒
Organization Name	DISH Technologies L.L.C.		
Mailing Address Information For Assignee including Non-Applicant Assignee:			
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Address 2			
City	Englewood	State/Province	CO
Country ⁱ	US	Postal Code	80112
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	/BRETT A. CARLSON/		Date (YYYY-MM-DD)	2019-03-04
First Name	Brett A.	Last Name	Carlson	Registration Number
				39,928
Additional Signature may be generated within this form by selecting the Add button.				Add

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	066.0141C3
		Application Number	
Title of Invention	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		

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.**

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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.
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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.
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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.

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		
First Named Inventor/Applicant Name:		Robert Drew Major		
Filer:		Brett Carlson/Julie Graf		
Attorney Docket Number:		066.0141C3		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1720

1. An apparatus for adaptive-rate content streaming, the apparatus comprising:
 - an agent controller module configured to simultaneously request at least portions of a plurality of streamlets;
 - the agent controller module further configured to continuously monitor the progress of subsequent responses to streamlet requests, and in accordance with the progress of the responses, request higher or lower quality streamlets; and
 - a staging module configured to stage the streamlets and arrange the streamlets for playback on a content player.
2. The apparatus of claim 1, wherein the agent controller module is configured to establish multiple Transmission Control Protocol (TCP) connections with a content server, and request streamlets of varying bitrates.
3. The apparatus of claim 1, wherein each streamlet further comprises a portion of a content file.
4. The apparatus of claim 1, wherein the streamlet comprises a Hyper Text Transfer Protocol file.
5. The apparatus of claim 3, wherein the agent controller module is configured to generate a performance factor according to the responses to streamlet requests.
6. The apparatus of claim 4, wherein the agent controller module is configured to upshift to a higher quality streamlet when the performance factor is greater than a selected threshold and the agent controller module determines the higher quality playback can be sustained according to a combination of factors.

7. The apparatus of claim 5, wherein the combination of factors is selected from the group consisting of an amount of contiguously available streamlets stored in the staging module, a minimum safety margin, and a current read ahead margin.

8. The apparatus of claim 4, wherein the agent controller module is configured to downshift to a lower quality streamlet when the performance factor is less than a second selected threshold.

9. The apparatus of claim 1, wherein the agent controller module is further configured to anticipate streamlet requests and pre-request streamlets to enable fast-forward, skip randomly, and rewind functionality.

10. The apparatus of claim 1, wherein the agent controller module is configured to initially request low quality streamlets to enable instant playback of the content file, and subsequent upshifting according to the performance factor.

11. A system for adaptive-rate content streaming, the system comprising:
 - a data communications network;
 - a content server coupled to the data communications network and having a content module configured to process content and generate a plurality of high and low quality streams;
 - each of the high and low quality streams comprising a plurality of streamlets;
 - an agent controller module configured to simultaneously request at least portions of a plurality of streamlets;
 - the agent controller module further configured to continuously monitor the progress of subsequent responses to streamlet requests, and in accordance with the progress of the responses, request higher or lower quality streamlets; and
 - a staging module configured to stage the streamlets and arrange the streamlets for playback on a content player.
12. The system of claim 11, wherein the agent controller module is configured to establish multiple Transmission Control Protocol (TCP) connections with the content server, and request streamlets of varying bitrates.
13. The system of claim 11, wherein each streamlet further comprises a portion of a content file.
14. The apparatus of claim 13, wherein the agent controller module is configured to generate a performance factor according to the responses to streamlet requests.

15. The system of claim 14, wherein the agent controller module is configured to upshift to a higher quality streamlet when the performance factor is greater than a selected threshold and the agent controller module determines the higher quality playback can be sustained according to a combination of factors.

16. The system of claim 15, wherein the combination of factors is selected from the group consisting of an amount of contiguously available streamlets stored in the staging module, a minimum safety margin, and a current read ahead margin.

17. The system of claim 14, wherein the agent controller module is configured to downshift to a lower quality streamlet when the performance factor is less than a second selected threshold.

18. The system of claim 11, wherein the agent controller module is further configured to anticipate streamlet requests and pre-request streamlets to enable fast-forward, skip randomly, and rewind functionality.

19. The system of claim 11, wherein the agent controller module is configured to initially request low quality streamlets to enable instant playback of the content file, and subsequent upshifting according to the performance factor.

20. A method for presenting rate-adaptive streams, the method comprising:
- simultaneously requesting at least portions of a plurality of streamlets;
 - continuously monitoring the progress of subsequent responses to streamlet requests, and in accordance with the progress of the responses, requesting higher or lower quality streamlets; and
 - staging the streamlets and arranging the streamlets for playback on a content player.

Electronic Acknowledgement Receipt

EFS ID:	35313002
Application Number:	16291343
International Application Number:	
Confirmation Number:	4634
Title of Invention:	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT
First Named Inventor/Applicant Name:	Robert Drew Major
Customer Number:	70560
Filer:	Brett Carlson/Julie Graf
Filer Authorized By:	Brett Carlson
Attorney Docket Number:	066.0141C3
Receipt Date:	04-MAR-2019
Filing Date:	
Time Stamp:	14:14:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1720
RAM confirmation Number	030519INTEFSW14144600
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	20190304_ADS_066-0141C3.pdf	1823414	no	9
			39cdf284bf3ea708320d90a3d3b3d402b0619974		
Warnings:					
Information:					
2		20190304_Application_066-0141C3.pdf	9086201	yes	28
			97740e27d1b57431b26b06fea911e722f8647cb6		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	22	
	Claims		23	27	
	Abstract		28	28	
Warnings:					
Information:					
3	Oath or Declaration filed	20190304_Declaration_066-0141C3.pdf	139903	no	2
			ddc28bb6951b7f8fddc5923272acebe7294d161f		
Warnings:					
Information:					
4	Drawings-only black and white line drawings	20190304_Drawings_066-0141C3.pdf	3440182	no	7
			4e18d7575db1645f68bbafb6862674628438e9d2		
Warnings:					
Information:					
5	Power of Attorney	20190304_POA_066-0141C3.pdf	808618	no	2
			42cf9b0f707b751e7d56551d7567d543b492be77		

Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	35010	no	2
			f8c0472e4cd03a397e8aa3acac04fcef1d1658d2		
Warnings:					
Information:					
Total Files Size (in bytes):			15333328		
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.					

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 or equivalent) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

Application Number	Herewith		
Filing Date	Herewith		
First Named Inventor	Robert Drew Major		
Title	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		
Art Unit	Unassigned		
Examiner Name			
Attorney Docket Number	066.0141C3		
SIGNATURE of Applicant or Patent Practitioner			
Signature	/BRETT A. CARLSON/	Date	2019-03-04
Name	Brett A. Carlson	Telephone	480.385.5060
Registration Number	39,928		
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications.			
☒ *Total of <u>1</u> forms are submitted.			

This collection of information is required by 37 CFR 1.31, 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:

70560

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:



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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):

DISH Technologies L.L.C.



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 1.48(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

Max S. Gratton

Date (Optional)

7/6/2010

Name

Max S. Gratton

Title

Director & Senior Corporate Counsel of DISH Technologies L.L.C.

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 1.151, 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 1480, Alexandria, VA 22313-1480. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1480, Alexandria, VA 22313-1480.

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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
16/291,343	03/04/2019	2447	1720	066.0141C3	20	3

CONFIRMATION NO. 4634

FILING RECEIPT



0000000106728268

70560
LKGLOBAL (Dish Technologies L.L.C.)
7010 E. COCHISE ROAD
SCOTTSDALE, AZ 85253

Date Mailed: 03/21/2019

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)

Robert Drew Major, Orem, UT;
Mark B. Hurst, Cedar Hills, UT;

Applicant(s)

DISH Technologies L.L.C., Englewood, CO

Assignment For Published Patent Application

DISH Technologies L.L.C., Englewood, CO

Power of Attorney: The patent practitioners associated with Customer Number 70560

Domestic Priority data as claimed by applicant

This application is a CON of 15/207,172 07/11/2016 PAT 10225304
which is a CON of 14/516,303 10/16/2014 PAT 9407564
which is a CON of 11/116,783 04/28/2005 PAT 8868772
which claims benefit of 60/566,831 04/30/2004

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

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.

If Required, Foreign Filing License Granted: 03/20/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/291,343**

Projected Publication Date: 06/27/2019

Non-Publication Request: No

Early Publication Request: No

Title

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

Preliminary Class

709

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

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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.

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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).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/291,343			
APPLICATION AS FILED - PART I									
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA		RATE(\$)	FEE(\$)		RATE(\$)		
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A			N/A		
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A			N/A		
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A			N/A		
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 =	*			OR	x 100 =		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 =	*				x 460 =		
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 1720		
APPLICATION AS AMENDED - PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	MINUS	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	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	MINUS	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.									



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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/291,343	03/04/2019	Robert Drew Major	066.0141C3

CONFIRMATION NO. 4634

PUBLICATION NOTICE



0000000109235197

70560
LKGLOBAL (Dish Technologies L.L.C.)
7010 E. COCHISE ROAD
SCOTTSDALE, AZ 85253

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

Publication No. US-2019-0199768-A1

Publication Date: 06/27/2019

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.

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Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PLUS Search Results for S/N 16291343, Searched Mon Aug 19 17:33:11 EDT 2019
 The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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9716856 71	
10075744 71	
10356358 71	

<i>Notice of References Cited</i>	Application/Control No. 16/291,343		Applicant(s)/Patent Under Reexamination Major et al.	
	Examiner NINOS DONABED		Art Unit 2444	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-6880017-B1	04-2005	Marce; Jean-Pierre	H04L69/32	709/232
*	B	US-20020159457-A1	10-2002	Zhang, Ji	H04M11/062	370/391
*	C	US-20030055995-A1	03-2003	Ala-Honkola, Pekka	H04N21/23406	709/231
*	D	US-5953506-A	09-1999	Kalra; Devendra	G06T3/4092	345/428
*	E	US-20020103938-A1	08-2002	Brooks, Leslie M.	H03M7/30	709/247
*	F	US-20040073934-A1	04-2004	Deshpande, Sachin Govind	H04N7/17318	725/87
*	G	US-7526565-B2	04-2009	Amini; Lisa	H04L29/06027	709/231
*	H	US-7363228-B2	04-2008	Wyss; Felix I.	G10L15/30	379/88.03
*	I	US-20020144276-A1	10-2002	Radford, Jim	H04N7/17318	725/87
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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
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	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
L1	1399	adaptive near6 stream\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:10
L2	18854	adaptive near6 stream\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:10
L3	82	adaptive near6 stream\$5 same upshif\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:11
L4	78	adaptive near6 stream\$5 same upshif\$5 same downshift\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:11
L5	141	adaptive near6 stream\$5 same (upshif\$5 upgrade downgrade downshift\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:11
L6	158	((("DISH") near3 ("TECHNOLOGIES") near3 ("L.L.C"))).AS,AANM.	USPAT	OR	ON	2019/08/19 16:11
L7	195	((("MAJOR") near3 ("Robert")) OR ((("HURST") near3 ("Mark"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/08/19 16:11
L8	315	((("MAJOR") near3 ("Robert")) OR ((("HURST") near3 ("Mark"))).INV.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:11
L9	220	((("DISH") near3 ("TECHNOLOGIES")	US-PGPUB;	OR	ON	2019/08/19

		near3 ("L.L.C"))).AS,AANM.	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			16:12
L10	50	(8 9) and streamlet.clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:12
L11	9	(8 9) and (streamlet and tcp).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:12
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L14	0	adaptive near6 stream\$5 same upshif\$5 and @ad< "20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:17
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L16	2	"6880017".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:22
L17	0	"6880017".pn. and http	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2019/08/19 16:24

			IBM_TDB			
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L19	1	"20020144276" and http	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:24
L20	0	"20020144276" and hypertext	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:25
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L24	751	adaptive near6 stream\$5 with resolution	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:25
L25	0	adaptive near6 stream\$5 with resolution with (hypertext http) and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:27
L26	0	adaptive near6 stream\$5 with resolution same (hypertext http) and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2019/08/19 16:27

			JPO; DERWENT; IBM_TDB			
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L28	72	2002/0144276	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:28
L29	2	"20020144276"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:28
L30	15	22 AND ((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:29
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EAST Search History (I nterference)

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<i>Index of Claims</i> 	Application/Control No. 16/291,343	Applicant(s)/Patent Under Reexamination Major et al.
	Examiner NINOS DONABED	Art Unit 2444

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

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	08/19/2019								
	1	✓								
	2	✓								
	3	✓								
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	16	✓								
	17	✓								
	18	✓								
	19	✓								
	20	✓								

Bibliographic Data

Application No: 16/291,343

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged: /NINOS DONABED/

Examiner's Signature

Initials

Title:

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

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
03/04/2019	709	2444	066.0141C3
RULE			

APPLICANTS

DISH Technologies L.L.C., Englewood, CO, UNITED STATES

INVENTORS

Robert Drew Major Orem, UT, UNITED STATES

Mark B. Hurst Cedar Hills, UT, UNITED STATES

CONTINUING DATA

This application is a CON of 15207172 07/11/2016 PAT 10225304

15207172 is a CON of 14516303 10/16/2014 PAT 9407564

14516303 is a CON of 11116783 04/28/2005 PAT 8868772

11116783 has PRO of 60566831 04/30/2004

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

03/20/2019

STATE OR COUNTRY

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/291,343	03/04/2019	Robert Drew Major	066.0141C3	4634
70560	7590	08/23/2019		
LKGLOBAL (Dish Technologies L.L.C.)			EXAMINER	
7010 E. COCHISE ROAD			DONABED, NINOS	
SCOTTSDALE, AZ 85253				
			ART UNIT	PAPER NUMBER
			2444	
			NOTIFICATION DATE	DELIVERY MODE
			08/23/2019	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):

dish@lkglobal.com
ipdept@dish.com

DETAILED ACTION

This communication office action is in response to the filing of Patent Application 16291343 on 3/4/2019.

Claim Rejections - 35 USC § 112

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

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

2. Claims 1-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 1, 11, 20, the phrase “an agent controller module configured to simultaneously request at least portions of a plurality of streamlets” is vague and unclear. The reason for this is that the claim does not state what the request is being done simultaneously with.

Claims 2-10, 12-19, are rejected for being dependent on claims 1, 11, 20, respectively.

Regarding Claims 7 and 16 the phrase “a minimum safety margin, and a current read ahead margin” is vague and unclear.

Regarding claim 9, the term “pre-request streamlets” is vague and unclear and it is unknown what a "pre-request" is.

Claim element “an agent controller (claims 1-2, 5-6, 8-10) , a staging module (1)” is a limitation that invokes 35 U.S.C. 112, sixth paragraph. However, the written description fails to disclose the corresponding structure, material, or acts for the claimed function. Applicant’s specification does not contain sufficient structure because the function in question is not evident in Applicant’s disclosure.

Applicant may:

- (a) Amend the claim so that the claim limitation will no longer be interpreted as a limitation under 35 U.S.C. 112, sixth paragraph; or
- (b) Amend the written description of the specification such that it expressly recites what structure, material, or acts perform the claimed function without introducing any new matter (35 U.S.C. 132(a)).

If applicant is of the opinion that the written description of the specification already implicitly or inherently discloses the corresponding structure, material, or acts so that one of ordinary skill in the art would recognize what structure, material, or acts perform the claimed function, applicant should clarify the record by either:

- (a) Amending the written description of the specification such that it expressly recites the corresponding structure, material, or acts for performing the claimed function and clearly links or associates the structure, material, or acts to the claimed function, without introducing any new matter (35 U.S.C. 132(a)); or
- (b) Stating on the record what the corresponding structure, material, or acts, which are implicitly or inherently set forth in the written description of the

specification, perform the claimed function. For more information, see 37 CFR 1.75(d) and MPEP §§ 608.01(o) and 2181.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3, 5, 7, 9-11, 13-20, are rejected under 35 U.S.C. 102(b) as being anticipated by Radford (United States Patent Application Publication Number 2002/0144276.).

Regarding **Claim 1**,

Radford teaches apparatus for adaptive-rate content streaming, the apparatus comprising: an agent controller module configured to simultaneously request at least portions of a plurality of streamlets; **(See figure 1 and paragraph [0018] – [0020], Radford teaches a request from a client.)**

the agent controller module further configured to continuously monitor the progress of subsequent responses to streamlet requests, and in accordance with the progress of the responses, request higher or lower quality streamlets; and **(See figure 2 and paragraphs [0029] – [0031], Radford teaches monitoring**

of progress of streamlets and requesting a change in the quality of the stream.)

a staging module configured to stage the streamlets and arrange the streamlets for playback on a content player. **(See figure 2 and paragraphs [0029] – [0031], Radford teaches a media player which plays the stream.)**

Regarding **Claim 3**,

Radford teaches the apparatus of claim 1, wherein each streamlet further comprises a portion of a content file. **(See paragraphs [0008] – [0011], Radford.)**

Regarding **Claim 5**,

Radford teaches the apparatus of claim 3, wherein the agent controller module is configured to generate a performance factor according to the responses to streamlet requests. **(See paragraphs [0008] – [0011], Radford.)**

Regarding **Claim 7**,

Radford teaches the apparatus of claim 5, wherein the combination of factors is selected from the group consisting of an amount of contiguously available streamlets stored in the staging module, a minimum safety margin, and a current read ahead margin. **(See figure 1 and paragraphs [0022] – [0026], Radford.)**

Regarding **Claim 9**,

Radford teaches the apparatus of claim 1, wherein the agent controller module is further configured to anticipate streamlet requests and pre-request streamlets to enable fast-forward, skip randomly, and rewind functionality. **(See figure 2 and paragraphs [0030] - [0033], Radford.)**

Regarding **Claim 10**,

Radford teaches the apparatus of claim 1, wherein the agent controller module is configured to initially request low quality streamlets to enable instant playback of the content file, and subsequent upshifting according to the performance factor. **(See figure 1 and paragraphs [0008] – [0012], Radford.)**

Regarding **Claim 11**,

Radford teaches a system for adaptive-rate content streaming, the system comprising: a data communications network;

a content server coupled to the data communications network and having a content module configured to process content and generate a plurality of high and low quality streams; **(See figure 1 and paragraphs [0017] – [0020],**

Radford teaches a content sever able to process content and generate different quality streams.)

each of the high and low quality streams comprising a plurality of streamlets; **(See figure 1 and and paragraphs [0017] – [0020], Radford teaches high and low quality streams.)**

an agent controller module configured to simultaneously request at least portions of a plurality of streamlets; **(See figure 1 and paragraph [0018] – [0020], Radford teaches a request from a client.)**

the agent controller module further configured to continuously monitor the progress of subsequent responses to streamlet requests, and in accordance with the progress of the responses, request higher or lower quality streamlets; and **(See figure 2 and paragraphs [0029] – [0031], Radford teaches monitoring of progress of streamlets and requesting a change in the quality of the stream.)**

a staging module configured to stage the streamlets and arrange the streamlets for playback on a content player. **(See figure 2 and paragraphs [0029] – [0031], Radford teaches a media player which plays the stream.)**

Regarding **Claim 13**,

Radford teaches the system of claim 11, wherein each streamlet further comprises a portion of a content file. **(See paragraphs [0008] – [0011], Radford.)**

Regarding **Claim 14**,

Radford teaches the apparatus of claim 13, wherein the agent controller module is configured to generate a performance factor according to the responses to streamlet requests. **(See paragraphs [0008] – [0011], Radford.)**

Regarding **Claim 15**,

Radford teaches the system of claim 14, wherein the agent controller module is configured to upshift to a higher quality streamlet when the performance factor is greater than a selected threshold and the agent controller module determines the higher quality playback can be sustained according to a combination of factors. **(See figure 1 and paragraphs [0024] – [0027], Radford.)**

Regarding **Claim 16**,

Radford teaches the system of claim 15, wherein the combination of factors is selected from the group consisting of an amount of contiguously available streamlets stored in the staging module, a minimum safety margin, and a current read ahead margin. **(See figure 1 and paragraphs [0022] – [0026], Radford.)**

Regarding **Claim 17**,

Radford teaches the system of claim 14, wherein the agent controller module is configured to downshift to a lower quality streamlet when the performance factor is less than a second selected threshold. **(See figure 1 and paragraphs [0024] – [0027], Radford.)**

Regarding **Claim 18**,

Radford teaches the system of claim 11, wherein the agent controller module is further configured to anticipate streamlet requests and pre-request streamlets to enable fast-forward, skip randomly, and rewind functionality. **(See figure 2 and paragraphs [0030] - [0033], Radford.)**

Regarding **Claim 19**,

Radford teaches the system of claim 11, wherein the agent controller module is configured to initially request low quality streamlets to enable instant playback of the content file, and subsequent upshifting according to the performance factor. **(See figure 1 and paragraphs [0008] – [0012], Radford.)**

Regarding **Claim 20**,

Radford teaches a method for presenting rate-adaptive streams, the method comprising: simultaneously requesting at least portions of a plurality of streamlets; **(See figure 1 and paragraph [0018] – [0020], Radford teaches a request from a client.)**

continuously monitoring the progress of subsequent responses to streamlet requests, and in accordance with the progress of the responses, requesting higher or lower quality streamlets; and **(See figure 2 and paragraphs [0029] – [0031], Radford teaches monitoring of progress of streamlets and requesting a change in the quality of the stream.)**

staging the streamlets and arranging the streamlets for playback on a content player. **(See figure 2 and paragraphs [0029] – [0031], Radford teaches a media player which plays the stream.)**

Claim Rejections - 35 USC § 103

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

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

6. Claims 2, 12, are rejected under 35 U.S.C. 103(a) as being unpatentable over Radford (United States Patent Application Publication Number 2002/0144276.) in view of Marce (U.S. Patent 6880017).

Regarding **Claim 2**,

Radford teaches the apparatus of claim 1,

Radford further teaches connecting to the internet to download the stream to the media player on the client. **(See paragraphs [0018] - [0019], Radford.)**

Radford does not explicitly teach but Marce teaches wherein the agent controller module is configured to establish multiple Transmission Control Protocol (TCP) connections with a content server, and request streamlets of varying bitrates. **(See claims 1,5 , column 4 lines 12-43, Marce)**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have known to combine the teachings of Marce with

Radford because both deal with adaptive streaming. The advantage of incorporating the above limitation(s) of Marce into Radford is that Marce adds a rate-based transmission mechanism for handling congestion and flow control in TCP/IP networks on top of the sliding window concept, so as to enhance higher-speed communication. Significantly reduces the burstiness of the flow control TCP mechanism, therefore making the overall system more robust and efficient. **(See column 1, Marce)**

Regarding **Claim 12**,

Radford further teaches the system of claim 11, connecting to the internet to download the stream to the media player on the client. **(See paragraphs [0018] - [0019], Radford.)**

Radford does not explicitly teach but Marce teaches wherein the agent controller module is configured to establish multiple Transmission Control Protocol (TCP) connections with a content server, and request streamlets of varying bitrates. **(See claims 1,5 , column 4 lines 12-43, Marce)**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have known to combine the teachings of Marce with Radford because both deal with adaptive streaming. The advantage of incorporating the above limitation(s) of Marce into Radford is that Marce adds a rate-based transmission mechanism for handling congestion and flow control in TCP/IP networks on top of the sliding window concept, so as to enhance higher-speed communication. Significantly reduces the burstiness of the flow control

TCP mechanism, therefore making the overall system more robust and efficient.

(See column 1, Marce)

7. Claims 4, 6, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Radford (United States Patent Application Publication Number 2002/0144276.) in view of Ala-Honkola (U.S. Patent pub app 20030055995).

Regarding **Claim 4**,

Radford teaches the apparatus of claim 1,

Radford further teaches RTSP and RTP protocols. **(See paragraphs [0025] - [0026], Radford.)**

Radford does not explicitly teach but Ala-Honkola teaches wherein the streamlet comprises a Hyper Text Transfer Protocol file. **(See paragraphs 10, 11, 39, 43, Ala-Honkola)**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have known to combine the teachings of Ala-Honkola with Radford because both deal with adaptive streaming. The advantage of incorporating the above limitation(s) of Ala-Honkola into Radford is that Ala-Honkola teaches selecting a suitable transmission speed rate for the media stream and correspondingly a suitable data source, the need of special media stream server is avoided. Thus remarkable cost savings are achieved and the reliability of the transmission is increased, therefore making the overall system more robust and efficient. **(See paragragphs 5-7, Ala-Honkola)**

Regarding **Claim 6**,

Radford and Ala-Honkola teach the apparatus of claim 4, wherein the agent controller module is configured to upshift to a higher quality streamlet when the performance factor is greater than a selected threshold and the agent controller module determines the higher quality playback can be sustained according to a combination of factors. **(See figure 1 and paragraphs [0024] – [0027], Radford.)**

Regarding **Claim 8**,

Radford and Ala-Honkola teach the apparatus of claim 4, wherein the agent controller module is configured to downshift to a lower quality streamlet when the performance factor is less than a second selected threshold. **(See figure 1 and paragraphs [0024] – [0026], Radford.)**

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure and located in the PTO-892 form.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NINOS DONABED whose telephone number is (571)272-8757. The examiner can normally be reached on Monday - Friday 8:00pm - 4:00pm.

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, John FOLLANSBEE can be reached on (571)272-3964. 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.

/NINOS DONABED/
Primary Examiner, Art Unit 2444

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Quality-adaptive media streaming by priority drop [PDF] psu.edu

C Krasic, J Walpole, W Feng - ... of the 13th international workshop on ..., 2003 - dl.acm.org

Quality-Adaptive Media Streaming by Priority Drop ... Categories and Subject Descriptors: C.2.2 [Computer Systems Organization]: Network Protocols General Terms: Algorithms, Measurement, Experimentation Keywords: Quality Adaptive Streaming, Priority Mapping, Internet ...

Cited by 143 Related articles All 13 versions

Architectural considerations for playback of quality adaptive video over the internet [PDF] researchgate.net

R Rejaie, M Handley, D Estrin - Proceedings IEEE International ..., 2000 - ieeeexplore.ieee.org

... [131] R. Networks. Http versus realaudio client-server streaming. http://www.realaudio.com/help/content/http-vs-ra.html ... [15] C. Perkins. Options for repair of streaming media ... H. Schulzrinne. Adaptive playout mechanisms for packetized audio applications in wide-area networks ...

Cited by 110 Related articles All 22 versions

Advances in channel-adaptive video streaming [PDF] wiley.com

R Girid, M Kaimari, YJ Liang - ... and Mobile Computing, 2002 - Wiley Online Library

... Advances in channel-adaptive video streaming ... In our opinion, the most interesting recent advances in video streaming technology are those that involve several system components jointly and react to the packet loss and delay, thus performing channel-adaptive streaming ...

Cited by 166 Related articles All 16 versions

Adaptive live video streaming by priority drop [PDF] pdx.edu

J Huang, C Krasic, J Walpole - 2003 - pdxscholar.library.pdx.edu

... Another critical component is an adaptive streaming mechanism for detecting the network conditions and choosing the appropriate scalable video components to send in order to achieve the best possible video quality given those network conditions ...

Cited by 50 Related articles All 16 versions

Mocha: A quality adaptive multimedia proxy cache for internet streaming [PDF] researchgate.net

R Rejaie, J Kangashanji - ... of the 11th international workshop on ..., 2001 - dl.acm.org

... of Squid[2]. Mocha's key contribution is its ability to perform quality adaptive caching ... of similarity in message processing between HTTP and RTSP, and simply replace HTTP routines with ... Another key requirement for efficient handling of streaming objects is management of disk ...

Cited by 136 Related articles All 17 versions

Method for adaptive ad insertion in streaming multimedia content [PDF] googleapis.com

VK Bhagavath, JT O'neil - US Patent 6,505,169, 2003 - Google Patents

... XML, for example, is discussed at http://www.xml.org. DESCRIPTION OF THE DRAWING FIG ... FIG. 6 is a flowchart describing operation of a Streaming Media Cache Server; FIG. 7 is a graph of an adaptive ad pricing spec for an IP unicast program; FIG ...

Cited by 500 Related articles All 2 versions

A survey of application layer techniques for adaptive streaming of multimedia [PDF] psu.edu

B Vandalore, W Feng, R Jain, S Fahmy - Real-Time Imaging, 2001 - Elsevier

... 1077-2014/01/060221+15 \$35.00/0 © 2001 Academic Press Real-Time Imaging 7, 221-235 (2001) doi:10.1006/rtim.2001.0224, available online at http://www.idealibrary.com on Page 2 ...

The next section discusses the application level adaptive streaming techniques ...

Cited by 124 Related articles All 11 versions

PALS: peer-to-peer adaptive layered streaming [PDF] usc.edu

R Rejaie, A Ortega - Proceedings of the 13th international workshop on ..., 2003 - dl.acm.org

Page 1. PALS: Peer-to-Peer Adaptive Layered Streaming Reza Rejaie Antonio Ortega

https://scholar.google.com/scholar?q=adaptive+streaming+http&hl=en&as_sdt=0%2C47&as_ylo=1998&as_yhi=2004[8/19/2019 4:31:25 PM]

Aylo Exhibit 1002
Page 84 of 184

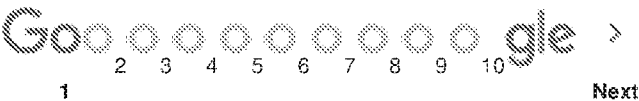
Department of Computer Science ... ortega@sipi.usc.edu ABSTRACT This paper presents a new framework for Peer-to-Peer **Adaptive** Layered **Streaming**, called PALS ...
Cited by 275 Related articles All 18 versions

Adaptive media stream [PDF] googleapis.com
P Aia-Honkola - US Patent App. 09/974,589, 2003 - Google Patents
... ie to be an **adaptive** media stream, a special software or protocol must be used, instead of the **HTTP** protocol ... use special protocols, such as RTP (Real-Time Transport Protocol) and RTSP (Real Time **Streaming** Protocol), which are designed for the **adaptive** media streams ...
Cited by 53 Related articles All 2 versions

MPEG-L/MRP: Adaptive streaming of MPEG videos for [PDF] uni-ulm.de
interactive internet applications
S.Boll, C Heinlein, W Klas, J Wandel - 2000 - dbis.eprints.uni-ulm.de
... Augustin. For details see also URL <http://www.informatik.uni-ulm.de/dbis/Cardio-OP> ... 2 Related Work
Related work, concerned with the delivery of multimedia content over the Internet, covers several research approaches dealing with the **adaptive streaming** of MPEG videos ...
Cited by 9 Related articles All 7 versions

Related searches

- dynamic** adaptive streaming http
- adaptive streaming **of multimedia**
- adaptive **video** streaming **rate distortion**
- adaptive **video** streaming **mobile clients**
- interactive internet applications** adaptive streaming
- multiuser video** streaming
- wireless video** streaming
- packet interleaving video** streaming
- stored video streamed delivery**
- application layer techniques** adaptive streaming
- mpeg videos** adaptive streaming
- delay distortion video** streaming
- mpeg videos interactive** streaming



<i>Search Notes</i> 	Application/Control No. 16/291,343	Applicant(s)/Patent Under Reexamination Major et al.
	Examiner NINOS DONABED	Art Unit 2444

CPC - Searched*		
Symbol	Date	Examiner
((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844). CPC.)	08/19/2019	nd

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.

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<i>Search Notes</i> 	Application/Control No. 16/291,343	Applicant(s)/Patent Under Reexamination Major et al.
	Examiner NINOS DONABED	Art Unit 2444

Search Notes		
Search Notes	Date	Examiner
Conducted 101 claim analysis	08/19/2019	nd
Conducted 112 1st and 2nd paragraph analysis	08/19/2019	nd
Conducted 112 6th paragraph claim analysis	08/19/2019	nd
Conducted double patenting search (EAST, Pe2e, PALM) *Inventor ** Assignee	08/19/2019	nd
East Search	08/19/2019	nd
Plus Search	08/19/2019	nd
NPL Search (Google, Google Scholar)	08/19/2019	nd
((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844).CPC .)	08/19/2019	nd

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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Electronic Patent Application Fee Transmittal				
Application Number:		16291343		
Filing Date:		04-Mar-2019		
Title of Invention:		APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		
First Named Inventor/Applicant Name:		Robert Drew Major		
Filer:		Brett Carlson/Julie Graf		
Attorney Docket Number:		066.0141C3		
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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 3 months with \$0 paid	1253	1	1400	1400
Miscellaneous:				
Total in USD (\$)				1400

AMENDMENTS TO THE SPECIFICATION

PLEASE AMEND PARAGRAPH 0001 OF THE SPECIFICATION AS FOLLOWS:

[0001] This application is a continuation of US Patent Application Serial No. 15/207,172 (now US Patent No. 10,225,304), which is a continuation of US Patent Application Serial No. 14/516,303 (now US Patent No. 9,407,564), which is a continuation of US Patent Application No. 11/116,783 (now US Patent No. 8,868,772), which claims benefit of United States Provisional Patent Application 60/566,831 entitled "APPARATUS, SYSTEM, AND METHOD FOR DYNAMIC RATE SHIFTING OF STREAMING CONTENT" and filed on April 30, 2004 for R. Drew Major and Mark B. Hurst, which is incorporated herein by reference.

REMARKS

Please enter the foregoing amendments and consider the following remarks under Rule 111. No new matter has been added, and support for all of the amendments can be found in the originally-filed application.

Section 112 Rejections

The Office Action points to several linguistic issues in the originally-filed claims. Without consenting to the rejections, the relevant claims have been amended, so the rejections are now believed to be moot. We respectfully request reconsideration of the amended claims.

Prior Art Rejections

The Office Action requests clarification of the differences between our claims and US Patent Publication No. 2002/0144276 (“Radford”), which is cited under Section 102 against claims 1, 3, 5, 7, 9-11 and 13-20 and under Section 103 (in combination with various other references) against the remaining dependent claims. Without consenting to the rejections, we have amended our claims, and we respectfully request reconsideration after entry of the foregoing amendments.

The present claims are consistent with the prosecution of related applications, and clearly distinguish the prior art in many different ways. At the very least, Radford lacks any teaching (or fair suggestion) that the video server stores multiple different copies of the video encoded at different bit rates as multiple sets of streamlets, wherein each of the streamlets yields a different portion of the video on playback, wherein the streamlets across the different copies yield the same portions of the video on playback, and wherein the streamlets in the different copies are aligned in time such that the streamlets that play back the same portion of the video for the different copies each begin at the same playback time in relation to the beginning of the video.

The additional art is not cited for related features of our claims, and in fact the additional references do not teach the features that are now present in our amended claims. Even if Radford were combined with the additional art of record, then, the combination would still lack the full extent of our current claim language.

We therefore respectfully request reconsideration of our application after entry of the foregoing amendments.

Conclusion

Should the Examiner have any suggestions that would advance prosecution, Applicant's counsel would welcome a telephone call at (480) 385-5069. Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and other practitioners of record in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03). Without limiting the foregoing, we specifically consent to the use of email to exchange proposed amendments or other draft documents.

No official fee is believed to be due in connection with this Response, other than any fees that may be addressed elsewhere in this submittal. If, however, any time extension or additional fee is required to consider this response or to otherwise prevent abandonment of this application, please consider this as a request for an extension of time and as authorization to charge Deposit Account No. 50-2091 for any fees that may be due.

Respectfully submitted,
LORENZ & KOPF, LLC

Dated: Monday, February 24, 2020

By: /Brett A. Carlson /
Brett A. Carlson
Reg. No. 39,928

bcarlson@lkglobal.com
480-385-5069
LORENZ & KOPF, LLC
Customer No. 70560

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial. No.:	16/291,343	Conf. No.:	4634
Examiner:	Ninos Donabed	Art Unit:	2444
Inventor:	R. Drew Major	Filed:	March 4, 2019
Docket No.:	066.0141C3	Cust. No.:	70560
Title:	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		

RESPONSE AND AMENDMENT
FILED UNDER 37 C.F.R. § 1.111

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

*****FILED ELECTRONICALLY USING THE PTO-EFS SYSTEM***

Commissioner:

In response to the Office Action mailed on August 23, 2019, please amend the above-referenced application as set forth below and consider the remarks that follow.

Amendments to the Specification begin on the following page (page 2).

Amendments to the Claims begin on page 3.

Remarks begin on page 9 of this paper.

Electronic Acknowledgement Receipt

EFS ID:	38665123
Application Number:	16291343
International Application Number:	
Confirmation Number:	4634
Title of Invention:	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT
First Named Inventor/Applicant Name:	Robert Drew Major
Customer Number:	70560
Filer:	Brett Carlson/Julie Graf
Filer Authorized By:	Brett Carlson
Attorney Docket Number:	066.0141C3
Receipt Date:	24-FEB-2020
Filing Date:	04-MAR-2019
Time Stamp:	15:00:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1400
RAM confirmation Number	E20202NF00336380
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		20200224_Response_066-0141 C3.pdf	156001	yes	10
			cf7c324dad58b59a68dc2ea56f978889b5b8e4f		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment/Req. Reconsideration-After Non-Final Reject		1	1	
	Specification		2	2	
	Claims		3	8	
	Applicant Arguments/Remarks Made in an Amendment		9	10	
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	31098	no	2
			40c129e2db98c50d1a0895103815d2d1f1f42246		
Warnings:					
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

AMENDMENTS TO THE CLAIMS

***PLEASE AMEND THE CLAIMS WITHOUT PREJUDICE OR DISCLAIMER
TO READ AS FOLLOWS:***

1. (Currently Amended) An apparatus for adaptive rate content streaming rendering a video that is adaptively received as a digital stream from a video server over a network, the apparatus comprising;
 ~~an agent controller module configured to simultaneously request at least portions of a plurality of streamlets;~~
 ~~the agent controller module further configured to continuously monitor the progress of subsequent responses to streamlet requests, and in accordance with the progress of the responses, request higher or lower quality streamlets;~~
 ~~and~~
 ~~a staging module configured to stage the streamlets and arrange the streamlets for playback on a content player~~
 a media player operating on the apparatus, wherein the media player is configured to stream the video from the video server via at least one transmission control protocol (TCP) connection over the network, wherein the video server stores multiple different copies of the video encoded at different bit rates as multiple sets of streamlets, wherein each of the streamlets yields a different portion of the video on playback, wherein the streamlets across the different copies yield the same portions of the video on playback, and wherein the streamlets in the different copies are aligned in time such that the streamlets that play back the same portion of the video for the different copies each begin at the same playback time in relation to the beginning of the video, and wherein the media player streams the video by:
 requesting sequential streamlets of one of the copies from the video server according to the playback times of the streamlets, wherein the sequential streamlets are selected by the media player from the based upon successive determinations to shift the playback quality to a higher or lower quality one of the different copies of the video;

repeatedly generating, by the media player, a factor relating to the performance of the network that is indicative of an ability to sustain the streaming of the video;

adapting the successive determinations to shift the playback quality based on the factor to achieve continuous playback of the video using the streamlets of the highest quality copy of the video that is determined to be sustainable at that time; and

presenting the video for playback by providing the requested streamlets in order of ascending start time.

2. (Currently Amended) The apparatus of claim 1, wherein the ~~agent controller module~~ apparatus is configured to establish multiple Transmission Control Protocol (TCP) connections with a content server, and request streamlets of varying bitrates.
3. (Currently Amended) The apparatus of claim 1, wherein each streamlet further comprises a portion of a content file provided by the server.
4. (Currently Amended) The apparatus of claim 1, ~~wherein the streamlet comprises a Hyper Text Transfer Protocol file~~ wherein the requesting the sequential streamlets comprises the apparatus transmitting hypertext transport protocol (HTTP) GET requests for selected streamlets, wherein each of the HTTP GET requests identifies the separate file stored by the video server that corresponds to the requested streamlet.
5. (Currently Amended) The apparatus of ~~claim 3, wherein the agent controller module is configured to generate a performance factor according to the responses to streamlet requests~~ claim 1 wherein each of the streamlets of each of the different copies is independently requestable and playable by the apparatus.
6. (Currently Amended) The apparatus of claim 4, ~~wherein the agent controller module is configured to upshift to a higher quality streamlet when the~~

performance factor is greater than a selected threshold and the agent controller module determines the higher quality playback can be sustained according to a combination of factors wherein the requesting of the sequential streamlets comprises the end user device transmitting hypertext transport protocol (HTTP) GET requests for selected streamlets.

7. (Currently Amended) The apparatus of ~~claim 5, wherein the combination of factors is selected from the group consisting of an amount of contiguously available streamlets stored in the staging module, a minimum safety margin, and a current read-ahead margin~~ claim 1 wherein each of the streamlets in each of the plurality of different copies is a separate file stored by the video server.
8. (Currently Amended) The apparatus of ~~claim 1 claim 4, wherein the agent controller module is configured to downshift to a lower quality streamlet when the performance factor is less than a second selected threshold~~ wherein the media player upshifts to a higher quality one of the different copies when the factor is greater than a first threshold and downshifts to a lower quality one of the different copies when the factor is less than a second threshold.
9. (Currently Amended) The apparatus of claim 1, ~~wherein the agent controller module is further configured to anticipate streamlet requests and pre-request streamlets to enable fast forward, skip randomly, and rewind functionality~~ wherein the requesting the sequential streamlets comprises the apparatus transmitting hypertext transport protocol (HTTP) GET requests for selected streamlets, and wherein each of the HTTP GET requests identifies a separately-identifiable portion of the one or more files that corresponds to the requested streamlet.
10. (Currently Amended) The apparatus of claim 1, wherein the ~~agent controller module~~ apparatus is configured to initially request low quality streamlets to enable instant playback of the content file, and subsequent upshifting according to the performance factor.

11. (Currently Amended) The end user device of claim 1 wherein each of the streamlets in each of the plurality of different copies is a separately-identifiable portion of one or more files stored by the video server ~~A system for adaptive rate content streaming, the system comprising:~~
- ~~a data communications network;~~
 - ~~a content server coupled to the data communications network and having a content module configured to process content and generate a plurality of high and low quality streams;~~
 - ~~each of the high and low quality streams comprising a plurality of streamlets;~~
 - ~~an agent controller module configured to simultaneously request at least portions of a plurality of streamlets;~~
 - ~~the agent controller module further configured to continuously monitor the progress of subsequent responses to streamlet requests, and in accordance with the progress of the responses, request higher or lower quality streamlets;~~
 - ~~and~~
 - ~~a staging module configured to stage the streamlets and arrange the streamlets for playback on a content player.~~
12. (Currently amended) The apparatus of claim 1 wherein the apparatus is a mobile computing device comprising a processor and a non-transitory data storage ~~The system of claim 11, wherein the agent controller module is configured to establish multiple Transmission Control Protocol (TCP) connections with the content server, and request streamlets of varying bitrates.~~

Claims 13-19 (**Cancelled**).

20. (Currently Amended) A method for presenting rate adaptive streams executable by an end user device to stream a video received via a connection with a server over a network, the method comprising:
- ~~simultaneously requesting at least portions of a plurality of streamlets;~~

~~continuously monitoring the progress of subsequent responses to streamlet requests, and in accordance with the progress of the responses, requesting higher or lower quality streamlets; and~~

~~staging the streamlets and arranging the streamlets for playback on a content player~~

requesting, by the end user device, a plurality of sequential streamlets of one of the copies from the server based on playback times of the streamlets wherein multiple different copies of the video encoded at different bit rates are stored as multiple sets of streamlets on the server, wherein each of the streamlets yields a different portion of the video on playback, wherein the streamlets across the different copies yield the same portions of the video on playback, and wherein each of the streamlets comprises a playback time such that each of the streamlets for each of the different copies that encode the same portion of the video begins at the same playback time in relation to the beginning of the video;

repeatedly generating, by the end user device, a factor that is indicative of an ability to sustain the streaming of the video;

making successive determinations by the end user device to shift the playback quality based on the factor to achieve continuous playback of the video using the streamlets of the highest quality copy determined sustainable at that time; and

presenting the video by playing back the requested media streamlets on the end user device in order of ascending playback time.

21. (New) The method of claim 20 wherein the making of the successive determinations to shift comprises upshifting to a higher quality one of the different copies when the at least one factor is greater than a first threshold and downshifting to a lower quality one of the different copies when the at least one factor is less than a second threshold.
22. (New) The method of claim 21 wherein each of the streamlets of each of the different copies is independently requestable and playable by the end user device.

23. (New) The method of claim 20 wherein each of the streamlets in each of the plurality of different copies is a separately-identifiable portion of one or more files stored by the video server.
24. (New) The method of claim 23 wherein the requesting of the sequential streamlets comprises the end user device transmitting hypertext transport protocol (HTTP) GET requests for selected streamlets, and wherein each of the HTTP GET requests identifies the separately-identifiable portion of the one or more files that corresponds to the requested streamlet.
25. (New) The method of claim 20, wherein the video captures a live event, and wherein the streamlets of the different copies are available to the end user device while the live event is occurring.

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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/291,343		Filing Date 03/04/2019		☐ To be Mailed			
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO											
APPLICATION AS FILED - PART I											
		(Column 1)	(Column 2)								
FOR		NUMBER FILED	NUMBER EXTRA		RATE (\$)		FEE (\$)				
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A		N/A						
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A	N/A		N/A						
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A		N/A						
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *		x \$100 =							
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *		x \$460 =							
☐ 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).									
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))											
* If the difference in column 1 is less than zero, enter "0" in column 2.					TOTAL						
APPLICATION AS AMENDED - PART II											
		(Column 1)	(Column 2)		(Column 3)						
AMENDMENT	02/24/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)				
	Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0	x \$100 =	0				
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	x \$460 =	0				
	☐ Application Size Fee (37 CFR 1.16(s))										
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
							TOTAL ADD'L FEE		0		
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)				
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$0 =					
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =					
	☐ Application Size Fee (37 CFR 1.16(s))										
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
							TOTAL ADD'L FEE				
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.							LIE				
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".							/NICOLE L NICHOLSON/				
*** 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 number found in the appropriate box in column 1.											

This collection of information is required by 37 CFR 1.16. 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, 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.

PLUS Search Results for S/N 16291343, Searched Mon Mar 09 13:47:04 EDT 2020
The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

8868772 99	9716856 71
9407564 99	
10225304 99	
20050262257 99	
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7197570 74	
20010034736 74	
20010037399 74	
20020087717 74	
20020087963 74	
9510029 71	

IDS CERTIFICATION STATEMENTS

I. THIS IDS IS BEING FILED UNDER 37 C.F.R. 1.97(b): (check one box)

- ☐ Within three months of the filing date of a national application other than a continued prosecution application under 1.53(d).
- ☐ Within three months of the date of entry of the national stage as set forth in 1.491 in an international application.
- ☐ Before the mailing date of a first Office Action on the merits. In the event that a first Office Action on the merits has been mailed, please consider this IDS under 37 C.F.R. 1.97(c) and see the statement under 1.97(e) or charge deposit account 50-2091 the fee specified by 37 C.F.R. 1.17(p) if such statement is not selected in Section IV.
- ☐ Before the mailing of a first Office Action after the filing of a request for continued examination under 1.114.

II. THIS IDS IS BEING FILED UNDER 37 C.F.R. 1.97(c):

- After the period specified in 37 C.F.R. 1.97(b) and before the mailing date of any of a final action under 1.113, a notice of allowance under 1.311 or an action that otherwise closes prosecution in the application, and accompanied by:
- ☒ a statement specified in 1.97(e) as subsequently provided in this IDS; or
- ☒ the fee set forth in 1.17(p).

III. THIS IDS IS BEING FILED UNDER 37 C.F.R. 1.97(d):

- After the period specified in 37 C.F.R. 1.97(c) and on or after the mailing date of any of a final action under 1.113, a notice of allowance under 1.311 or an action that otherwise closes prosecution in the application, but before or simultaneous with
- ☐ payment of the issue fee, and accompanied by a statement specified in 1.97(e) as subsequently provided in this IDS and the fee set forth in 1.17(p).

IV. Statement under 37 C.F.R. 1.97(e) (check only one box)

The undersigned hereby states that:

- ☐ Each item of information contained in the IDS was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS.
- ☐ No item of information contained in the IDS was cited in a communication from a foreign patent office in a counterpart foreign application, and, to knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the IDS was known to any individual designated in 37 C.F.R. 1.56(c) more than three months prior to the filing of this IDS.

V. Statement under 37 C.F.R. §1.704(d):

- The undersigned hereby states that each item of information contained in the information disclosure statement: (i) was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and
- ☐ this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the information disclosure statement; or (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the information disclosure statement..

VI. CONCLUSION

It is respectfully submitted that the claims presently on file patently distinguish the present invention from each of the references cited in this IDS. The references cited in this IDS are being cited only in the interest of candor and without any admission that they constitute statutory prior art or contain matter which anticipates the invention or which would render the same obvious, either singly or in a combination, to a person of ordinary skill in the art. Furthermore the filing of this IDS should not be construed to be an admission that the information cited in this IDS is, or is considered to be, material to patentability as defined in 1.56(b). In addition, the filing of this IDS should not be construed as a representation that a search has been made.

If the Examiner has any questions concerning this IDS, the Examiner is requested to contact the undersigned at the telephone number associated with Customer No. 70560. If it is determined that this IDS has been filed under the wrong rule, the PTO is requested to consider this IDS under the proper rule, with a petition if necessary, and charge the appropriate fee to Deposit Account No. 50-2091.

Electronic Patent Application Fee Transmittal				
Application Number:		16291343		
Filing Date:		04-Mar-2019		
Title of Invention:		APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		
First Named Inventor/Applicant Name:		Robert Drew Major		
Filer:		Brett Carlson/Julie Graf		
Attorney Docket Number:		066.0141C3		
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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt

EFS ID:	38835328
Application Number:	16291343
International Application Number:	
Confirmation Number:	4634
Title of Invention:	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT
First Named Inventor/Applicant Name:	Robert Drew Major
Customer Number:	70560
Filer:	Brett Carlson/Julie Graf
Filer Authorized By:	Brett Carlson
Attorney Docket Number:	066.0141C3
Receipt Date:	11-MAR-2020
Filing Date:	04-MAR-2019
Time Stamp:	16:46:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 240
RAM confirmation Number	E20203AG46312860
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	20200311_IDS_066-0141C3.pdf	614356	no	4
			478e4e5e22f3ef4bfd7bf375f35502257c399235		
Warnings:					
Information:					
2	Transmittal Letter	20200311_IDSCert_066-0141C3.pdf	227725	no	1
			cd608b451c969b2626f3a845d56706a4c9385855		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30704	no	2
			c4fb94f5e19664bb10d36f10abd6ac1e2e8a4fcbe		
Warnings:					
Information:					
Total Files Size (in bytes):			872785		
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.					

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	16291343
Filing Date	2019-03-04
First Named Inventor	R. Drew Major
Art Unit	2444
Examiner Name	Ninos Donabed
Attorney Docket Number	066.0141C3

U.S.PATENTS							Remove	
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1	7308487	B1	2007-12-11	Dansie et al.			
If you wish to add additional U.S. Patent citation information please click the Add button.							Add	
U.S.PATENT APPLICATION PUBLICATIONS							Remove	
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1							
If you wish to add additional U.S. Published Application citation information please click the Add button.							Add	
FOREIGN PATENT DOCUMENTS							Remove	
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							
If you wish to add additional Foreign Patent Document citation information please click the Add button								Add
NON-PATENT LITERATURE DOCUMENTS								Remove
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.						T ⁵

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16291343
Filing Date	2019-03-04
First Named Inventor	R. Drew Major
Art Unit	2444
Examiner Name	Ninos Donabed
Attorney Docket Number	066.0141C3

1	
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If you wish to add additional non-patent literature document citation information please click the Add button

Add

EXAMINER SIGNATURE

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

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16291343
Filing Date	2019-03-04
First Named Inventor	R. Drew Major
Art Unit	2444
Examiner Name	Ninos Donabed
Attorney Docket Number	066.0141C3

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☒ See attached certification statement.

Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/BRETT A. CARLSON/	Date (YYYY-MM-DD)	2020-03-11
Name/Print	Brett A. Carlson	Registration Number	39,928

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour 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.**

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.

Electronic Acknowledgement Receipt

EFS ID:	38764496
Application Number:	16291343
International Application Number:	
Confirmation Number:	4634
Title of Invention:	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT
First Named Inventor/Applicant Name:	Robert Drew Major
Customer Number:	70560
Filer:	Brett Carlson/Julie Graf
Filer Authorized By:	Brett Carlson
Attorney Docket Number:	066.0141C3
Receipt Date:	11-MAR-2020
Filing Date:	04-MAR-2019
Time Stamp:	10:01:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 160
RAM confirmation Number	E20203AA01284157
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	33851	no	2
			88447105deab7bdfa0d856831b8e65b4db87d741		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30684	no	2
			0c2caaf474e68eea69967fed015ce086a2470b5f		
Warnings:					
Information:					
Total Files Size (in bytes):			64535		
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.					

Electronic Patent Application Fee Transmittal

Application Number:	16291343			
Filing Date:	04-Mar-2019			
Title of Invention:	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT			
First Named Inventor/Applicant Name:	Robert Drew Major			
Filer:	Brett Carlson/Julie Graf			
Attorney Docket Number:	066.0141C3			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				160

Doc Code: DISQ.E.FILE

Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 16291343

Filing Date: 04-Mar-2019

Applicant/Patent under Reexamination: Major

Electronic Terminal Disclaimer filed on March 11, 2020

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Doc Code: DIST.E.FILE Document Description: Electronic Terminal Disclaimer - Filed		PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce
Electronic Petition Request	TERMINAL DISCLAIMER TO OBTAIN A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	
Application Number	16291343	
Filing Date	04-Mar-2019	
First Named Inventor	Robert Major	
Attorney Docket Number	066.0141C3	
Title of Invention	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT	
☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action ☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.		
Owner	Percent Interest	
DISH TECHNOLOGIES LLC	100%	
The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s) 10225304 9407564 8868772 as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns. In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later: - expires for failure to pay a maintenance fee; - is held unenforceable; - is found invalid by a court of competent jurisdiction; - is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321; - has all claims canceled by a reexamination certificate; - is reissued; or - is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.		

☒ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

☐ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.

Applicant claims the following fee status:

☐ Small Entity

☐ Micro Entity

☒ Regular Undiscounted

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

☒ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

Registration Number 39928

☐ A sole inventor

☐ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application

☐ A joint inventor; all of whom are signing this request

Signature

/BRETT A. CARLSON/

Name

/BRETT A. CARLSON/

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

PLUS Search Results for S/N 16291343, Searched Mon Mar 23 14:38:43 EDT 2020

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

8868772 99	9716856 71
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<i>Examiner-Initiated Interview Summary</i>	Application No. 16/291,343	Applicant(s) Major et al.	
	Examiner NINOS DONABED	Art Unit 2444	AIA (FITF) Status No

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

(1) NINOS DONABED. (3) Brett Carlson.

(2) _____. (4) _____.

Date of Interview: 23 April 2020.

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.

Identification of prior art discussed: _____.

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...)

Examiner contacted the Applicant to try and expedite the case. Examiner asked if Applicant would be willing make all independent claims parallel to claim 1. The Applicant agreed to these changes. The changes can be seen in the Examiner's Amendment..

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

/NINOS DONABED/ Primary Examiner, Art Unit 2444	
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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

70560 7590 04/30/2020
LKGLOBAL (Dish Technologies L.L.C.)
7010 E. COCHISE ROAD
SCOTTSDALE, AZ 85253

EXAMINER	
DONABED, NINOS	
ART UNIT	PAPER NUMBER

2444

DATE MAILED: 04/30/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/291,343	03/04/2019	Robert Drew Major	066.0141C3	4634

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

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	07/30/2020

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: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

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.

70560 7590 04/30/2020
LKGLOBAL (Dish Technologies L.L.C.)
7010 E. COCHISE ROAD
SCOTTSDALE, AZ 85253

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/291,343	03/04/2019	Robert Drew Major	066.0141C3	4634

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

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	07/30/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
DONABED, NINOS	2444	709-231000

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 03-09 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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/291,343	03/04/2019	Robert Drew Major	066.0141C3	4634
70560	7590	04/30/2020	EXAMINER	
LKGLOBAL (Dish Technologies L.L.C.) 7010 E. COCHISE ROAD SCOTTSDALE, AZ 85253			DONABED, NINOS	
			ART UNIT	PAPER NUMBER
			2444	
DATE MAILED: 04/30/2020				

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 30 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. 16/291,343	Applicant(s) Major et al.	
	Examiner NINOS DONABED	Art Unit 2444	AIA (FITF) 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 dated 2/24/2020 and interview 4/23/2020.
☐ 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 1-12 and 20-25. 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) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☒ Interview Summary (PTO-413), Paper No./Mail Date. <u>4/23/2020</u> .	5. ☒ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
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/NINOS DONABED/
Primary Examiner, Art Unit 2444

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

EXAMINER'S AMENDMENT

1. 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.

Authorization for this examiner's amendment was given in a telephone interview with Brett Carlson #39928 on 4/23/2020.

The application has been amended as follows:

1. (Currently Amended) An apparatus for rendering a video that is adaptively received as a digital stream from a video server over a network, the apparatus comprising;

a media player operating on the apparatus, wherein the media player is configured to stream the video from the video server via at least one transmission control protocol (TCP) connection over the network, wherein the video server stores multiple different copies of the video encoded at different bit rates as multiple sets of streamlets, wherein each of the streamlets yields a different portion of the video on playback, wherein the streamlets across the different copies yield the same portions of the video on playback, and wherein the streamlets in the different copies are aligned in time such that the streamlets

that play back the same portion of the video for the different copies each begin at the same playback time in relation to the beginning of the video, and wherein the media player streams the video by:

requesting sequential streamlets of one of the copies from the video server according to the playback times of the streamlets by transmitting hypertext transport protocol (HTTP) GET requests that identify the selected streamlets stored by the video server, wherein the sequential streamlets are selected by the media player from the based upon successive determinations to shift the playback quality to a higher or lower quality one of the different copies of the video;

repeatedly generating, by the media player, a factor relating to the performance of the network that is indicative of an ability to sustain the streaming of the video;

adapting the successive determinations to shift the playback quality based on the factor to achieve continuous playback of the video using the streamlets of the highest quality copy of the video that is determined to be sustainable at that time; and

presenting the video for playback by providing the requested streamlets in order of ascending start time.

2. (Previously Presented) The apparatus of claim 1, wherein the apparatus is configured to establish multiple Transmission Control Protocol (TCP) connections with a content server, and request streamlets of varying bitrates.

3. (Previously Presented) The apparatus of claim 1, wherein each streamlet further comprises a portion of a content file provided by the server.
4. (Previously Presented) The apparatus of claim 1, wherein the requesting the sequential streamlets comprises the apparatus transmitting hypertext transport protocol (HTTP) GET requests for selected streamlets, wherein each of the HTTP GET requests identifies the separate file stored by the video server that corresponds to the requested streamlet.
5. (Previously Presented) The apparatus of claim 1 wherein each of the streamlets of each of the different copies is independently requestable and playable by the apparatus.
6. (Previously Presented) The apparatus of claim 4, wherein the requesting of the sequential streamlets comprises the end user device transmitting hypertext transport protocol (HTTP) GET requests for selected streamlets.
7. (Previously Presented) The apparatus of claim 1 wherein each of the streamlets in each of the plurality of different copies is a separate file stored by the video server.

8. (Previously Presented) The apparatus of claim 1 wherein the media player upshifts to a higher quality one of the different copies when the factor is greater than a first threshold and downshifts to a lower quality one of the different copies when the factor is less than a second threshold.
9. (Previously Presented) The apparatus of claim 1, wherein the requesting the sequential streamlets comprises the apparatus transmitting hypertext transport protocol (HTTP) GET requests for selected streamlets, and wherein each of the HTTP GET requests identifies a separately-identifiable portion of the one or more files that corresponds to the requested streamlet.
10. (Previously Presented) The apparatus of claim 1, wherein the apparatus is configured to initially request low quality streamlets to enable instant playback of the content file, and subsequent upshifting according to the performance factor.
11. (Previously Presented) The end user device of claim 1 wherein each of the streamlets in each of the plurality of different copies is a separately-identifiable portion of one or more files stored by the video server.

.
12. (Previously Presented) The apparatus of claim 1 wherein the apparatus is a mobile computing device comprising a processor and a non-transitory data storage.

Claims 13-19 (**Cancelled**).

20. (Currently Amended) A method executable by an end user device to stream a video received via a connection with a server over a network, the method comprising:

requesting, by the end user device, wherein the end user device streams the video from the video server via at least one transmission control protocol (TCP) connection over the network, a plurality of sequential streamlets of one of the copies from the server based on playback times of the streamlets wherein multiple different copies of the video encoded at different bit rates are stored as multiple sets of streamlets on the server, wherein each of the streamlets yields a different portion of the video on playback, wherein the streamlets across the different copies yield the same portions of the video on playback, and wherein each of the streamlets comprises a playback time such that each of the streamlets for each of the different copies that encode the same portion of the video begins at the same playback time in relation to the beginning of the video, wherein the end user device requests the streamlets by transmitting hypertext transport protocol (HTTP) GET requests that each identify one of the requested streamlets stored by the server; and wherein the end user device streams the video by:

repeatedly generating, by the end user device, a factor that is indicative of an ability to sustain the streaming of the video;

making successive determinations by the end user device to shift the playback quality based on the factor to achieve continuous playback of the video using the streamlets of the highest quality copy determined sustainable at that time; and

presenting the video by playing back the requested media streamlets on the end user device in order of ascending playback time.

21. (Previously Presented) The method of claim 20 wherein the making of the successive determinations to shift comprises upshifting to a higher quality one of the different copies when the at least one factor is greater than a first threshold and downshifting to a lower quality one of the different copies when the at least one factor is less than a second threshold.
22. (Previously Presented) The method of claim 21 wherein each of the streamlets of each of the different copies is independently requestable and playable by the end user device.
23. (Previously Presented) The method of claim 20 wherein each of the streamlets in each of the plurality of different copies is a separately-identifiable portion of one or more files stored by the video server.
24. (Previously Presented) The method of claim 23 wherein the requesting of the sequential streamlets comprises the end user device transmitting hypertext

transport protocol (HTTP) GET requests for selected streamlets, and wherein each of the HTTP GET requests identifies the separately-identifiable portion of the one or more files that corresponds to the requested streamlet.

- 25 . (Previously Presented) The method of claim 20, wherein the video captures a live event, and wherein the streamlets of the different copies are available to the end user device while the live event is occurring.

Please cancel claims 13-19

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance: Claims 1-12, 20-25 are allowable over the prior art of record: the closest prior art of record (Radford et al. U.S. patent application publication 20020144276) does not teach or suggest in detail "requesting, by the end user device, wherein the end user device streams the video from the video server via at least one transmission control protocol (TCP) connection over the network, a plurality of sequential streamlets of one of the copies from the server based on playback times of the streamlets wherein multiple different copies of the video encoded at different bit rates are stored as multiple sets of streamlets on the server, wherein each of the streamlets yields a different portion of the video on playback, wherein the streamlets across the different copies yield the same portions of the video on playback, and wherein each of the streamlets comprises a playback time such that each of the streamlets for each of the different copies that

encode the same portion of the video begins at the same playback time in relation to the beginning of the video, wherein the end user device requests the streamlets by transmitting hypertext transport protocol (HTTP) GET requests that each identify one of the requested streamlets stored by the server; and wherein the end user device streams the video by: repeatedly generating, by the end user device, a factor that is indicative of an ability to sustain the streaming of the video; making successive determinations by the end user device to shift the playback quality based on the factor to achieve continuous playback of the video using the streamlets of the highest quality copy determined sustainable at that time; and presenting the video by playing back the requested media streamlets on the end user device in order of ascending playback time" in combination with all the elements of the independent claim as argued by the Applicant.

Radford teaches an initial streamed data content to be displayed at client device, is delivered from host servers to client device. An user interface program is implemented to allow the user to adjust the quality of streamed data content to be displayed. Whereas, stated above, Applicant's claimed invention states "requesting, by the end user device, wherein the end user device streams the video from the video server via at least one transmission control protocol (TCP) connection over the network, a plurality of sequential streamlets of one of the copies from the server based on playback times of the streamlets wherein multiple different copies of the video encoded at different bit rates are stored as multiple sets of streamlets on the server, wherein each of the streamlets yields a different portion of the video on playback, wherein the streamlets across the different copies yield the same portions of the video on playback,

and wherein each of the streamlets comprises a playback time such that each of the streamlets for each of the different copies that encode the same portion of the video begins at the same playback time in relation to the beginning of the video, wherein the end user device requests the streamlets by transmitting hypertext transport protocol (HTTP) GET requests that each identify one of the requested streamlets stored by the server; and wherein the end user device streams the video by: repeatedly generating, by the end user device, a factor that is indicative of an ability to sustain the streaming of the video; making successive determinations by the end user device to shift the playback quality based on the factor to achieve continuous playback of the video using the streamlets of the highest quality copy determined sustainable at that time; and presenting the video by playing back the requested media streamlets on the end user device in order of ascending playback time." So as indicated in the above statements. Applicant's arguments have been considered persuasive, in light of the claims limitation as well as the enabling portions of the specification.

Examiner has also reviewed current independent claim language against the allowed and patented independent claim languages of parent cases 10225304, 9407564, 8868772. Examiner has reviewed the search strategies and results of parent cases. Examiner finds those search strategies and results are still applicable to current claimed invention. Examiner has performed further text and interference searches on current independent claim language. Examiner has found that there is no sufficient evidence to suggest or indicate how to combine elements of prior arts as searched and identified in fully mapping into applicant's current independent claims. Applicant's claimed inventions are thus allowed.

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."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NINOS DONABED whose telephone number is (571)272-8757. The examiner can normally be reached on Monday - Friday 8:00pm - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John FOLLANSBEE can be reached on (571)272-3964. 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.

Application/Control Number: 16/291,343
Art Unit: 2444

Page 12

/NINOS DONABED/
Primary Examiner, Art Unit 2444


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Dynamic adaptive streaming over HTTP-- standards and design principles

[PDF] acm.org

I. Stockhammer - Proceedings of the second annual ACM conference on ..., 2011 - dl.acm.org

In this paper, we provide some insight and background into the **Dynamic Adaptive**
Streaming over HTTP (DASH) specifications as available from 3GPP and in draft version also from MPEG. Specifically, the 3GPP version provides a normative description of a Media ...

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Dynamic adaptive streaming over HTTP dataset

[PDF] acm.org

S. Lederer, C. Müller, C. Timmerer - Proceedings of the 3rd multimedia ..., 2012 - dl.acm.org

The delivery of audio-visual content over the Hypertext Transfer Protocol (**HTTP**) got lot of attention in recent years and with **dynamic adaptive streaming over HTTP** (DASH) a standard is now available. Many papers cover this topic and present their research results ...

Cited by 426 Related articles All 9 versions

An evaluation of dynamic adaptive streaming over HTTP in vehicular environments

[PDF] acm.org

C. Müller, S. Lederer, C. Timmerer - Proceedings of the 4th Workshop on ..., 2012 - dl.acm.org

ABSTRACT MPEGs' **Dynamic Adaptive Streaming over HTTP** (MPEG-DASH) is an emerging standard designed for media delivery over the top of existing infrastructures and able to handle varying bandwidth conditions during a **streaming** session. This requirement is very ...

Cited by 293 Related articles All 3 versions

A VLC media player plugin enabling dynamic adaptive streaming over HTTP

[PDF] acm.org

C. Müller, C. Timmerer - Proceedings of the 19th ACM international ..., 2011 - dl.acm.org

This paper describes the implementation of a VLC media player plugin enabling **Dynamic Adaptive Streaming over HTTP** (DASH). DASH is an emerging ISO/IEC MPEG and 3GPP standard for **HTTP streaming**. It aims to standardize formats enabling segmented ...

Cited by 137 Related articles All 3 versions

Elastic: a client-side controller for dynamic adaptive streaming over http (dash)

[PDF] ieee.org

Full-Text @ USPTO-STIC

L. De Cicco, V. Cakiralo, V. Palmisano... - 2013 20th ..., 2013 - ieeexplore.ieee.org

Today, video distribution platforms use **adaptive video streaming** to deliver the maximum Quality of Experience to a wide range of devices connected to the Internet through different access networks. Among the techniques employed to implement video adaptivity, the stream ...

Cited by 176 Related articles All 7 versions

[PDF] Dynamic adaptive streaming over HTTP-design principles and standards

[PDF] researchgate.net

I. Stockhammer - Proceedings of the second annual ACM ..., 2011 - researchgate.net

In this paper, we provide some insight and background into the **Dynamic Adaptive Streaming over HTTP** (DASH) specifications as available from 3GPP and in draft version also from MPEG. Specifically, the 3GPP version provides a normative description of a Media ...

Cited by 134 Related articles All 8 versions

iDASH: improved dynamic adaptive streaming over HTTP using scalable video coding

[PDF] acm.org

Y. Sánchez de la Fuente, I. Schierl, C. Hellas... - Proceedings of the ..., 2011 - dl.acm.org

ABSTRACT **HTTP**-based delivery for Video on Demand (VoD) has been gaining popularity within recent years. Progressive Download over **HTTP**, typically used in VoD, takes advantage of the widely deployed network caches to relieve video servers from sending the ...

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A survey of rate adaptation techniques for dynamic adaptive

[PDF] ieee.org

streaming over HTTP

Full-Text @ USPTO-STIC

J.Kua, G.Amitage, P.Branch - IEEE Communications Surveys & ... 2017 -
ieeexplore.ieee.org

With companies such as Netflix and YouTube accounting for more than 50% of the peak download traffic on North American fixed networks in 2015, video **streaming** represents a significant source of Internet traffic. Multimedia delivery over the Internet has evolved rapidly ...
Cited by 138 Related articles All 2 versions

SARA: Segment aware rate adaptation algorithm for **dynamic adaptive streaming over HTTP**

[PDF] ieee.org
Full-Text @ USPTO-STIC

P.Juluri, V.Tamaraiah, D.Medhi - 2015 IEEE International ... 2015 -
ieeexplore.ieee.org

Dynamic adaptive HTTP (DASH) based **streaming** is steadily becoming the most popular online video **streaming** technique. DASH **streaming** provides seamless playback by adapting the video quality to the network conditions during the video playback. A DASH ...
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Using scalable video coding for **dynamic adaptive streaming over HTTP** in mobile environments

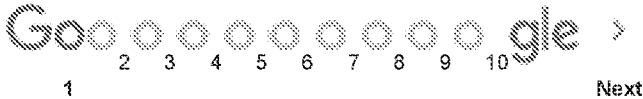
[PDF] ieee.org

C.Müller, D.Renzi, S.Lederer, S.Battista... - 2012 Proceedings of ..., 2012 - ieeexplore.ieee.org

Dynamic Adaptive Streaming over HTTP (DASH) is a convenient approach to transfer videos in an **adaptive** and **dynamic** way to the user. As a consequence, this system provides high bandwidth flexibility and is especially suitable for mobile use cases where the bandwidth ...
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Related searches

- dynamic adaptive streaming http **dash**
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- video** streaming **rate**
- video** streaming **control systems**
- internet video** streaming
- video adaptation** dynamic http streaming
- dynamic adaptive streaming **quality selection**
- dynamic adaptive streaming **client side**



Issue Classification 	Application/Control No. 16/291,343	Applicant(s)/Patent Under Reexamination Major et al.	
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CPC						
Symbol					Type	Version
H04L	/	65	/	601	F	2013-01-01
H04N	/	21	/	25808	I	2013-01-01
H04N	/	21	/	2662	I	2013-01-01
H04N	/	21	/	643	I	2013-01-01
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H04N	/	21	/	64792	I	2013-01-01
H04N	/	21	/	845	I	2013-01-01
H04N	/	21	/	84	I	2013-01-01
H04L	/	47	/	25	I	2013-01-01
H04L	/	65	/	60	I	2013-01-01
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NONE (Assistant Examiner)		Total Claims Allowed: 18	
/NINOS DONABED/ Primary Examiner, Art Unit 2444 (Primary Examiner)		23 April 2020 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 5

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INTERNATIONAL CLASSIFICATION				
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H04L29/06	/	29	/	06
H04N21/258	/	21	/	258
H04N21/2662	/	21	/	2662
H04N21/643	/	21	/	643
H04N21/647	/	21	/	647
H04N21/845	/	21	/	845
H04N21/84	/	21	/	84
H04L12/825	/	12	/	825
H04L12/26	/	12	/	26
H04L29/08	/	29	/	08
NON-CLAIMED				
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US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
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/NINOS DONABED/ Primary Examiner, Art Unit 2444	23 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5

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☐ 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	10	10	-	19										
2	2	11	11	13	20										
3	3	12	12	14	21										
4	4	-	13	15	22										
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6	6	-	15	17	24										
7	7	-	16	18	25										
8	8	-	17												
9	9	-	18												

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<i>Notice of References Cited</i>	Application/Control No. 16/291,343		Applicant(s)/Patent Under Reexamination Major et al.	
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U.S. PATENT DOCUMENTS						
*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
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Multimedia proxy caching mechanism for quality **adaptive streaming** applications in the internet [PDF] [ieee.org](#)
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[R.Rejaie](#), [H.Yu](#), [M.Handley](#)... - IEEE INFOCOM 2000 ..., 2000 - [ieeexplore.ieee.org](#)
The Internet has witnessed a rapid growth in deployment of Web-based **streaming** applications during recent years. In these applications, the server should be able to perform end-to-end congestion control and quality adaptation to match the delivered stream quality ...
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Global messaging with distributed **adaptive streaming** control [PDF] [googleapis.com](#)
[YJ Lee](#), [CA Chao](#), [R Ngai](#), [MC Chiang](#)... - US Patent App. 09 ..., 2002 - Google Patents
A software implementable approach capable of creating, delivering, reassembling, rendering, and storing asynchronous and synchronous multimedia message. This approach integrates video/audio **streaming** with existing Internet/Intranet e-mail messaging and ...
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Method and system for indexing and content-based **adaptive streaming** of digital video content [PDF] [googleapis.com](#)
[SE Chang](#), [D Zhong](#), [R Kumar](#)... - US Patent App. 10 ..., 2004 - Google Patents
The present invention discloses systems and methods for automatically parsing digital video content into segments corresponding to fundamental semantic units, events, and camera views, and **streaming** parsed digital video content to users for display and browsing. The ...
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System and method for **adaptive streaming** of predictive coded video data [PDF] [googleapis.com](#)
[C Anantharamu](#), [D Manoranjan](#) - US Patent App. 09/761,770, 2002 - Google Patents
This invention provides an **adaptive** transcoder which streams predictive coded video data over variable bandwidth networks and to devices having varying processing capabilities. The invention dynamically and continuously determines an available network bandwidth ...
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- [http adaptive streaming](#)
- [dynamic adaptive streaming](#)
- [adaptive streaming dash](#)
- [adaptive streaming video](#)
- [adaptive streaming content](#)
- [adaptive streaming quality of experience](#)
- [adaptive streaming buffer](#)
- [adaptive streaming segment](#)

Layer-encoded video in scalable **adaptive streaming** [PDF] [ieee.org](#)
Full-Text @ [USPTO-STIC](#)
[M.Zink](#), [J.Schmitt](#), [R.Steinmetz](#) - IEEE Transactions on ..., 2005 - [ieeexplore.ieee.org](#)
Combining the concepts of caching and transmission control protocol (TCP)-friendly **streaming** of layer-encoded video bears the problem that those videos might not be cached in full quality. Therefore, we focus in this work on the scheduling of retransmissions of ...
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A survey of application layer techniques for **adaptive streaming** of multimedia [PDF] [psu.edu](#)
Full-Text @ [USPTO-STIC](#)
[B Vandalore](#), [W.Feng](#), [R.Jain](#), [S.Fahmy](#) - Real-Time Imaging, 2001 - Elsevier
Though the integrated services model and resource reservation protocol (RSVP) provide

support for quality of service, in the current Internet only best-effort traffic is widely supported. New high-speed technologies such as ATM (asynchronous transfer mode), gigabit Ethernet ...
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Real-time content-based **adaptive streaming** of sports videos [PDF] [ieee.org](#)
S.F.Chang, D Zhong, R Kumar - Proceedings IEEE Workshop ..., 2001 -
[ieeexplore.ieee.org](#)

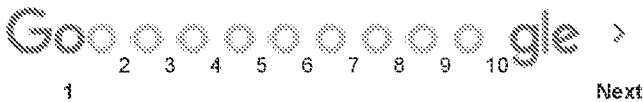
We present a real-time software system for filtering live video content and then adoptively **streaming** the video over resource limited networks or devices. The rate adaptation is content-based and dynamically varied according to the event structure and the video ...
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On performance bounds for the integration of elastic and **adaptive streaming** flows [PDF] [acm.org](#)
Full-Text @ USPTO-STIC
I.Bouaki, A.Proutière - ACM SIGMETRICS Performance Evaluation ..., 2004 -
[dl.acm.org](#)

We consider a network model where bandwidth is fairly shared by a dynamic number of elastic and **adaptive streaming** flows. Elastic flows correspond to data transfers while **adaptive streaming** flows correspond to audio/video applications with variable rate codecs ...
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Adaptive multisource streaming in heterogeneous peer-to-peer networks [PDF] [psu.edu](#)
V Agarwal, R.Reale - Multimedia Computing and Networking ..., 2006 - [spiedigitallibrary.org](#)
This paper presents design and evaluation of an **adaptive streaming** mechanism from multiple senders to a single receiver in Peer-to-Peer (P2P) networks, called P2P **Adaptive Layered Streaming**, or PALS. PALS is a receiver-driven mechanism. It enables a receiver ...
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Quality-adaptive media **streaming** by priority drop [PDF] [acm.org](#)
C Krasic, J Walpole, W.Feng - ... of the 13th international workshop on ..., 2003 -
[dl.acm.org](#)
This paper presents a general design strategy for **streaming** media applications in best effort computing and networking environments. Our target application is video on demand using personal computers and the Internet. In this scenario, where resource reservations and ...
Cited by 147 Related articles All 15 versions



EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	172	stream\$5 same upshif\$5 same downshift\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:46
L2	48	stream\$5 same upshif\$5 same downshift\$5 same start\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:46
L3	6	stream\$5 same upshif\$5 same downshift\$5 same start\$5 same play\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:46
L4	0	stream\$5 same upshif\$5 same downshift\$5 same start\$5 same play\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:47
L5	7	stream\$5 same upshif\$5 same downshift\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:47
L6	10	adaptive near6 stream\$5 with resolution and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:47
L7	10	(movie) near6 stream\$5 with resolution and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:48
L8	48	(movie) near6 stream\$5 with quality	US-PGPUB;	OR	ON	2020/03/23

		and @ad<"20040430"	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			13:48
L9	1400	adaptive near6 stream\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L10	20578	adaptive near6 stream\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L11	85	adaptive near6 stream\$5 same upshif\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L12	81	adaptive near6 stream\$5 same upshif\$5 same downshift\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L13	152	adaptive near6 stream\$5 same (upshif\$5 upgrade downgrade downshift\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L14	222	((("DISH") near3 ("TECHNOLOGIES") near3 ("L.L.C"))).AS,AANM.	USPAT	OR	ON	2020/03/23 13:51
L15	207	((("MAJOR") near3 ("Robert")) OR (("HURST") near3 ("Mark"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/23 13:51
L16	334	((("MAJOR") near3 ("Robert")) OR (("HURST") near3 ("Mark"))).INV.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L17	317	((("DISH") near3 ("TECHNOLOGIES") near3 ("L.L.C"))).AS,AANM.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2020/03/23 13:51

			IBM_TDB			
L18	55	(L16 L17) and streamlet.clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L19	10	(L16 L17) and (streamlet and tcp).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L20	0	adaptive near6 stream\$5 same upshif\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L21	6	adaptive near6 stream\$5 same (tcp)and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L22	0	adaptive near6 stream\$5 same upshif\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L23	16	adaptive near6 stream\$5 with shift\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L24	2	"6880017".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L25	0	"6880017".pn. and http	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L26	0	"6880017".pn. and hypertext	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	2020/03/23 13:51

			JPO; DERWENT; IBM_TDB			
L27	1	"20020144276" and http	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L28	0	"20020144276" and hypertext	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L29	10	(L16 L17) and (streamlet and tcp).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L30	24	adaptive near6 stream\$5 same resolution and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L31	850	adaptive near6 stream\$5 with resolution	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L32	0	adaptive near6 stream\$5 with resolution with (hypertext http) and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L33	0	adaptive near6 stream\$5 with resolution same (hypertext http) and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L34	13	adaptive near6 stream\$5 same (hypertext http) and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L35	77	2002/0144276	US-PGPUB; USPAT;	OR	ON	2020/03/23 13:51

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
L36	2	"20020144276"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L37	15	L30 AND ((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L38	184	L31 AND ((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L39	0	L13 AND ((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L40	214095	((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51
L41	8	"20030055995"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/03/23 13:51

S1	1399	adaptive near6 stream\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:10
S2	18854	adaptive near6 stream\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:10
S3	82	adaptive near6 stream\$5 same upshif\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:11
S4	78	adaptive near6 stream\$5 same upshif\$5 same downshift\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:11
S5	141	adaptive near6 stream\$5 same (upshif\$5 upgrade downgrade downshift\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:11
S6	158	((("DISH") near3 ("TECHNOLOGIES") near3 ("L.L.C"))).AS,AANM.	USPAT	OR	ON	2019/08/19 16:11
S7	195	((("MAJOR") near3 ("Robert")) OR ((("HURST") near3 ("Mark")))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/08/19 16:11
S8	315	((("MAJOR") near3 ("Robert")) OR ((("HURST") near3 ("Mark")))).INV.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:11
S9	220	((("DISH") near3 ("TECHNOLOGIES") near3 ("L.L.C"))).AS,AANM.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:12
S10	50	(S8 S9) and streamlet.clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2019/08/19 16:12

			DERWENT; IBM_TDB			
S11	9	(S8 S9) and (streamlet and tcp).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:12
S12	0	adaptive near6 stream\$5 same upshif\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:15
S13	6	adaptive near6 stream\$5 same (tcp)and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:16
S14	0	adaptive near6 stream\$5 same upshif\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:17
S15	16	adaptive near6 stream\$5 with shift\$5 and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:18
S16	2	"6880017".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:22
S17	0	"6880017".pn. and http	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:24
S18	0	"6880017".pn. and hypertext	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:24
S19	1	"20020144276" and http	US-PGPUB; USPAT; USOCR;	OR	ON	2019/08/19 16:24

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S20	0	"20020144276" and hypertext	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:25
S21	9	(S8 S9) and (streamlet and tcp).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:25
S22	24	adaptive near6 stream\$5 same resolution and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:25
S24	751	adaptive near6 stream\$5 with resolution	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:25
S25	0	adaptive near6 stream\$5 with resolution with (hypertext http) and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:27
S26	0	adaptive near6 stream\$5 with resolution same (hypertext http) and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:27
S27	14	adaptive near6 stream\$5 same (hypertext http) and @ad<"20040430"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:27
S28	72	2002/0144276	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:28
S29	2	"20020144276"	US-PGPUB;	OR	ON	2019/08/19

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			16:28
S30	15	S22 AND ((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:29
S31	171	S24 AND ((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:29
S32	0	S5 AND ((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:30
S33	201601	((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:30
S34	7	"20030055995"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/19 16:40

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L43	12	(media player streamlet video playback portion).clm.	US-PGPUB; USPAT	AND	ON	2020/03/23 13:51

L44	4	(media player streamlet yield video playback portion).clm.	US-PGPUB; USPAT	AND	ON	2020/03/23 13:51
L45	4	(media player streamlet adaptive yield video playback portion).clm.	US-PGPUB; USPAT	AND	ON	2020/03/23 13:52
L46	6	(media player stream\$5 adaptive yield video playback portion).clm.	US-PGPUB; USPAT	AND	ON	2020/03/23 13:52

3/23/2020 1:56:35 PM
C:\Users\ndonabed\Documents\EAST\Workspaces\16291343.wsp

Bibliographic Data

Application No: 16/291,343

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged: /NINOS DONABED/

Examiner's Signature

Initials

Title:

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

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
03/04/2019	709	2444	066.0141C3
RULE			

APPLICANTS

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INVENTORS

Robert Drew Major Orem, UT, UNITED STATES

Mark B. Hurst Cedar Hills, UT, UNITED STATES

CONTINUING DATA

This application is a CON of 15207172 07/11/2016 PAT 10225304

15207172 is a CON of 14516303 10/16/2014 PAT 9407564

14516303 is a CON of 11116783 04/28/2005 PAT 8868772

11116783 has PRO of 60566831 04/30/2004

FOREIGN APPLICATIONS

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R.Rajais - 2000 - dl.acm.org
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C Fung, [SC Liew](#) - Proceedings IEEE International Conference ..., 1999 - ieeexplore.ieee.org
We propose a best-effort video delivery scheme that can be deployed on networks in use today, including Ethernet LANs or the Internet. This scheme detects congestion by measuring the buffer occupancy and loss rate and estimates available channel bandwidth ...
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[J Chakareski](#), [P Frossard](#) - 2005 IEEE 7th Workshop on ..., 2005 - ieeexplore.ieee.org
Source pruning is performed whenever the data rate of the compressed source exceeds the available communication or storage resources. In this paper, we propose a framework for rate-distortion optimized pruning of a video source. The framework selects which packets, if ...
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D Ye, Q Wu, Z Zhang - Electronics Letters, 2002 - ieeexplore.ieee.org
While existing **adaptive** video **streaming** schemes are mainly designed for particular congestion control algorithms, a receiver-buffer-driven **adaptive streaming** scheme is proposed which can be applied in combination with different congestion control algorithms ...
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[A Lie](#), [QM Aamo](#), LA Rønningen - Proc. of 17th Nordic Teletraffic ..., 2004 - researchgate.net
This paper presents an Active Queue Management (AQM) design based on a Proportional control system, which is shown to provide good conditions for rate **adaptive** real-time applications. Simulation results show that rate **adaptive** media sources over RTP/UDP ...
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D McNamee, C Krasic, [K Li](#), [A Goel](#) ... - Proceedings of the ..., 2000 - ieeexplore.ieee.org
Streaming video is one of the fastest-growing applications of the Internet. The Internet's diversity and dynamism demands that video streams adapt to ensure maximum quality at all times. This paper describes the control challenges we have encountered in the Quasar ...
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[B Girod](#), M Kalman, YJ Liang... - ... and Mobile Computing, 2002 - Wiley Online Library
Despite the well-known challenges of variations in throughput, delay, and packet loss over the Internet, video **streaming** has experienced phenomenal growth, owing to the extensive research in video coding and transmission. In this paper, we review several recent advances ...
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IEEE 802.11 a WLAN using frame-based prioritized packetization

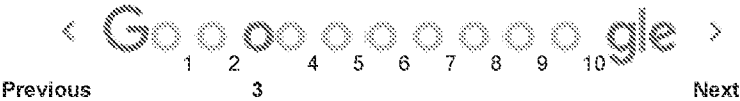
[SH.Park](#), [S Lee](#), [JW.Kim](#) - Proceedings of the 3rd ACM international ..., 2005 - [dl.acm.org](#)
In this paper, we propose a practical implementation of network-**adaptive** HD (high definition) MPEG-2 **streaming** using frame-based prioritized packetization over the IEEE 802.11 a WLAN (wireless local area network). The proposed **adaptive streaming** system ...
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[AF.Da.Cunha](#), [F.Kon](#) - Signal, 2005 - [pdfs.semanticscholar.org](#)
In order to transmit over wireless networks, **streaming** applications must provide **adaptive** strategies for problems such as mobility and handoffs. This work presents an algorithm for **adaptive streaming** over IEEE 802.11 networks that adapts the transmission in function of ...
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PALS: peer-to-peer adaptive layered streaming [\[PDF\]](#) [acm.org](#)

[R.Rejaie](#), [A.Ortega](#) - Proceedings of the 13th international workshop on ..., 2003 - [dl.acm.org](#)
This paper presents a new framework for Peer-to-Peer **Adaptive Layered Streaming**, called PALS. PALS is a receiver-driven approach for quality **adaptive** playback of layer encoded **streaming** media from a group of congestion controlled sender peers to a single receiver ...
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Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)

Approved for use through 07/31/2012. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16291343	
	Filing Date		2019-03-04	
	First Named Inventor		R. Drew Major	
	Art Unit		2444	
	Examiner Name		Ninos Donabed	
	Attorney Docket Number		066.0141C3	

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(Not for submission under 37 CFR 1.99)

Application Number	16291343
Filing Date	2019-03-04
First Named Inventor	R. Drew Major
Art Unit	2444
Examiner Name	Ninos Donabed
Attorney Docket Number	066.0141C3

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16291343
Filing Date	2019-03-04
First Named Inventor	R. Drew Major
Art Unit	2444
Examiner Name	Ninos Donabed
Attorney Docket Number	066.0141C3

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Signature	/BRETT A. CARLSON/	Date (YYYY-MM-DD)	2020-03-11
Name/Print	Brett A. Carlson	Registration Number	39,928

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3GPP compliant **adaptive** wireless video **streaming** using H.264/AVC

[PDF] ieee.org

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T.Schierl, T.Wiegand ... - ... Conference on image ..., 2005 - [ieeexplore.ieee.org](#)

In 3GPP a standard for multimedia **streaming** over mobile networks called PSS (packet-switched **streaming** service) has been specified. In order to deal with changing transmission characteristics like varying link bit-rate or handover, **adaptive streaming** features like client ...

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Adaptive streaming and rendering of large terrains using strip masks

[PDF] acm.org

J.Poudoux, J.E.Marvie ... of the 3rd international conference on ..., 2005 - [dl.acm.org](#)

Terrain rendering is an important factor in the rendering of virtual scenes. If they are large and detailed, digital terrains can represent a huge amount of data and therefore of graphical primitives to render in real-time. In this paper we present an efficient technique for out-of ...

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Adaptive streaming of high-quality video over wireless LANs

[PDF] psu.edu

P.VanBeek, S.Dashpandia, H.Pan ... and Image Processing ..., 2004 - [spiedigitallibrary.org](#)

We address the problem of robust **streaming** of high-quality video over wireless local area networks in a home environment. By robust **streaming**, we mean maintaining the highest possible video quality and preventing interruptions to the video under varying bandwidth ...

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Adaptive rate control for **streaming** stored fine-grained scalable video

[PDF] acm.org

P.De Cuetos, K.W.Ross ... Proceedings of the 12th international workshop ..., 2002 - [dl.acm.org](#)

In this paper we investigate **adaptive streaming** of stored fine-grained scalable video over a TCP-friendly connection. The goal is to develop low-complexity yet high-performing schemes that adequately adapt to the short-and long-term variations in available bandwidth ...

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Securing media for **adaptive streaming**

[PDF] acm.org

C.Venkatramani, P.Westerink, Q.Verscheure ... - Proceedings of the ..., 2003 - [dl.acm.org](#)

This paper describes the ARMS system which enables secure and **adaptive** rich media **streaming** to a large-scale, heterogeneous client population. The secure **streaming** algorithms ensure end-to-end security while the content is adapted and streamed via ...

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Adaptive streaming of stored video in a TCP-friendly context: Multiple versions or multiple layers?

P.de Cuetos, D.Saparilla, K.W.Ross ... in Proc. Packet Video Workshop, 2001 - Citeseer

Video transmission over the current best-effort Internet should be made fair to competing TCP traffic. Because the available bandwidth to a TCP-friendly stream changes significantly over medium and long time scales, it is desirable to adapt the **streaming** rate of the video to ...

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Implementation of **adaptive streaming** of stored MPEG-4 FGS video over TCP

[PDF] ieee.org

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P.De Cuetos, P.Quillotel, K.W.Ross ... on Multimedia and ..., 2002 - [ieeexplore.ieee.org](#)

This paper presents an implementation of an end-to-end application for **streaming** stored MPEG-4 fine-grained scalable (FGS) videos over the best-effort Internet. Our current implementation runs over TCP but can also be run over TCP-friendly RTP/UDP with an error ...

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Channel sharing by rate-**adaptive streaming** applications

[PDF] psu.edu

N.Argiriou, L.Georgiadis ... Performance Evaluation, 2004 - Elsevier

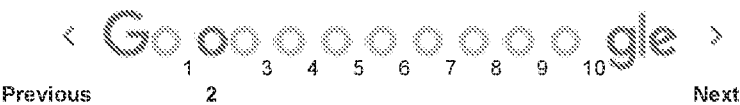
There are various techniques for adapting the transmission rate of an application while maintaining the perceived quality at the receiver at acceptable levels. Shared-channel systems can use this rate adaptation capability to increase the number of concurrent ...
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[PDF] **Streaming multimedia data with adaptive QoS characteristics** [PDF] cti.gr

C Bouras, A Gkamas - Protocols for Multimedia Systems, 2000 - ruS.cti.gr
In this paper, we describe the design and the implementation of an **adaptive streaming** architecture, which is based on real time protocols. The **adaptive streaming** application, which we have developed, can be used for **streaming** multimedia data over heterogeneous ...
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System and method for providing an adaptive streaming flow control mechanism between the TCP and IP layers of the TCP/IP suite of protocols

JP Marce, P Thubert, D Esteve... - US Patent 6,880,017, 2005 - Google Patents
In a data communication network operated under the TCP/IP suite of protocols the invention adds an **adaptive streaming** (AS) layer, inserted between the IP and the TCP protocol layers, in which the received data packets of each open TCP connection are temporarily queued ...
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C Krasic, J Walpole, W Feng - ... of the 13th international workshop on ..., 2003 - dl.acm.org

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A survey of application layer techniques for adaptive streaming of multimedia

[PDF] psu.edu

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B Vandalore, W Feng, R Jain, S Fahmy - Real-Time Imaging, 2001 - Elsevier

... 1077-2014/01/060221+15 \$35.00/0 © 2001 Academic Press Real-Time Imaging 7, 221-235 (2001) doi:10.1006/rtim.2001.0224, available online at <http://www.idealibrary.com> on Page 2 ...

The next section discusses the application level adaptive streaming techniques ...

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Multimedia proxy caching mechanism for quality adaptive streaming applications in the internet

[PDF] ieee.org

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R Rajala, H Yu, M Handley - ... IEEE INFOCOM 2000 ..., 2000 - ieeeexplore.ieee.org

... 2]. Since a dominant portion of today's Internet traffic consists of TCP-based flows, such as HTTP, TCP-friendly ... To maximize the delivered quality to clients while obeying congestion controlled rate limits, streaming applications should be quality adaptive over the Internet ...

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Global messaging with distributed adaptive streaming control

[PDF] googleapis.com

YJ Lee, CA Chao, R Ngai, MC Chiang - ... - US Patent App. 09 ..., 2002 - Google Patents

... Extensible Markup Language (XML)®, 1.0 Specification, WWW Consortium, February 1998, available via <http://www.w3> ... to create an audio/video or rich media data stream to a streaming media server. There is an implicit adaptive rate control scheme to prevent burst of data being ...

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[PDF] Adaptive streaming based on IEEE 802.11 signal quality

[PDF] semanticscholar.org

AE Da Conceição, E Kon - Signal, 2005 - pdfs.semanticscholar.org

... A survey of application layer techniques for adaptive streaming of multimedia. Real-Time Imaging, 7(3):221-235. WildPackets (2002). Converting signal strength percentage to dBm values. Available in <http://www.wildpackets.com/elements/whitepapers> ...

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MPEG-L/MRP: implementing adaptive streaming of MPEG videos for interactive internet applications

[PDF] acm.org

S Boll, W Klas, M Menh, C Heinlein - Proceedings of the ninth ACM ..., 2001 - dl.acm.org

... [6] SUN Microsystems. Java Media Framework 2.0, 1999. <http://java.sun.com/products/java-media/jmf/2.0>. 171 J. W&ale, R. Koster, S. Cen, C. Cowan, D. Maier, ' ' D. M&a&e, C. Pu, and D. Steere. A Player for Adaptive MPEG Video Streaming over the Internet. In PTOC ...

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C Venkatramani, P Westerink, Q Verschure - ... - Proceedings of the ..., 2003 - dl.acm.org

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Layer-encoded video in scalable adaptive streaming

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M Zink, J Schmitt, R Steinmetz - IEEE Transactions on ..., 2005 - ieeeexplore.ieee.org

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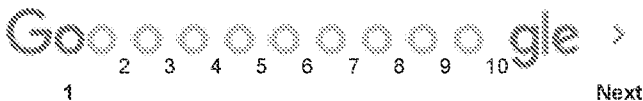
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<i>Search Notes</i> 	Application/Control No. 16/291,343	Applicant(s)/Patent Under Reexamination Major et al.
	Examiner NINOS DONABED	Art Unit 2444

CPC - Searched*		
Symbol	Date	Examiner
((H04N19/124 OR H04N19/132 OR H04N19/59 OR H04N19/61 OR H04N19/12 OR H04N19/172 OR H04N19/187 OR H04N19/192 OR H04L41/145 OR H04L43/04 OR H04L43/50 OR H04N11/042 OR H04N19/00 OR H04N19/117 OR H04N19/30 OR G06F11/3409 OR G06F11/348 OR G06F16/739 OR G06F16/7834 OR G06F16/7844). CPC.)	08/19/2019	nd
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Conducted 101 claim analysis	08/19/2019	nd
Conducted 112 1st and 2nd paragraph analysis	08/19/2019	nd
Conducted 112 6th paragraph claim analysis	08/19/2019	nd
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FEE ADDRESS INDICATION FORM

Application Number	16291343	Art Unit	2444
Filing Date	04-Mar-2019	Examiner Name	NINOS DONABED
First Name Inventor	Robert Major	Attorney Doc. Number	066.0141C3

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Electronic Patent Application Fee Transmittal				
Application Number:		16291343		
Filing Date:		04-Mar-2019		
Title of Invention:		APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT		
First Named Inventor/Applicant Name:		Robert Drew Major		
Filer:		Brett Carlson/Julie Graf		
Attorney Docket Number:		066.0141C3		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
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PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
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Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
16291343	04-Mar-2019	Robert Major	066.0141C3	4634

TITLE OF INVENTION :

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

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Regular Undiscounted	Utility under 35 USC 111(a)	2444	231000	NINOS DONABED
Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
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I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/BRETT A. CARLSON/	Date	07-17-2020
Name	Brett Carlson	Registration Number	39928

Electronic Acknowledgement Receipt

EFS ID:	40030751
Application Number:	16291343
International Application Number:	
Confirmation Number:	4634
Title of Invention:	APPARATUS, SYSTEM, AND METHOD FOR ADAPTIVE-RATE SHIFTING OF STREAMING CONTENT
First Named Inventor/Applicant Name:	Robert Drew Major
Customer Number:	70560
Filer:	Brett Carlson/Julie Graf
Filer Authorized By:	Brett Carlson
Attorney Docket Number:	066.0141C3
Receipt Date:	17-JUL-2020
Filing Date:	04-MAR-2019
Time Stamp:	15:03:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1000
RAM confirmation Number	E20207GF03135764
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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)	Web85b.pdf	46443	no	2
			7e5cc37b5c0c8c18c4c71917a0002b74c991fd66		
Warnings:					
Information:					
2	Change of Address	web85correspondenceaddress.pdf	36863	no	1
			92e915df371311250ae35e5f70cf59778e8eb5e		
Warnings:					
Information:					
3	Maintenance Fee Address Change	web85feeaddress.pdf	32506	no	1
			8414f2fb8aa88c65796847c3d91b10c26be2f82c7		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	32006	no	2
			5a09e52f089ffc001c5f8b20143273f10e7b7787		
Warnings:					
Information:					
Total Files Size (in bytes):			147818		

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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

CHANGE OF CORRESPONDENCE ADDRESS

Application

Application Number	16291343	Art Unit	2444
Filing Date	04-Mar-2019	Examiner Name	NINOS DONABED
First Name Inventor	Robert Major	Attorney Doc. Number	066.0141C3

Please change the correspondence address for the above-identified patent application to:

☒ The address associated with Customer Number:	54583 DISH Technologies L.L.C. 9601 S. Meridian Blvd ENGLEWOOD CO 80112 UNITED STATES 303-706-4506 ipdept@dish.com
--	--

OR

☐ Firm or Individual Name:					
Address					
City		State		Postal Code	
Country					
Telephone			Email		

Signature :

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application.

Signature	/BRETT A. CARLSON/	Date	07-17-2020
Name	Brett Carlson	Registration Number	39928



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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/291,343	08/25/2020	10757156	066.0141C3	4634

54583 7590 08/05/2020

DISH Technologies L.L.C.
9601 S. Meridian Blvd
ENGLEWOOD, CO 80112

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):

DISH Technologies L.L.C., Englewood, CO
Robert Drew Major, Orem, UT;
Mark B. Hurst, Cedar Hills, UT;

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AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court _____ for the District of Delaware _____ on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.);

DOCKET NO.	DATE FILED 4/13/2021	U.S. DISTRICT COURT for the District of Delaware
PLAINTIFF DISH Technologies L.L.C. and Sling TV L.L.C.		DEFENDANT lululemon athletica inc. and Curiouser Products Inc. (d/b/a MIRROR)
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 US 9,407,564 B2	8/2/2016	DISH Technologies L.L.C.
2 US 10,469,554 B2	11/5/2019	DISH Technologies L.L.C.
3 US 10,469,555 B2	11/5/2019	DISH Technologies L.L.C.
4 US 10,757,156 B2	8/25/2020	DISH Technologies L.L.C.
5 US 10,951,680 B2	3/16/2021	DISH Technologies L.L.C.

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1			
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3			
4			
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
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Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court _____ for the District of Delaware _____ on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.);

DOCKET NO.	DATE FILED 4/13/2021	U.S. DISTRICT COURT for the District of Delaware
PLAINTIFF DISH Technologies L.L.C. and Sling TV L.L.C.		DEFENDANT ICON Health & Fitness, Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 US 9,407,564 B2	8/2/2016	DISH Technologies L.L.C.
2 US 10,469,554 B2	11/5/2019	DISH Technologies L.L.C.
3 US 10,469,555 B2	11/5/2019	DISH Technologies L.L.C.
4 US 10,757,156 B2	8/25/2020	DISH Technologies L.L.C.
5 US 10,951,680 B2	3/16/2021	DISH Technologies L.L.C.

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
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 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.);

DOCKET NO. 2:21-cv-00132	DATE FILED 4/13/2021	U.S. DISTRICT COURT Eastern District of Texas
PLAINTIFF DISH TECHNOLOGIES L.L.C. and SLING TV L.L.C.		DEFENDANT PELOTON INTERACTIVE, INC.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 9,407,564	8/2/2016	DISH Technologies L.L.C.
2 10,469,554	11/5/2019	DISH Technologies L.L.C.
3 10,469,555	11/5/2019	DISH Technologies L.L.C.
4 10,757,156	8/25/2020	DISH Technologies L.L.C.
5 10,951,680	3/16/2021	DISH Technologies L.L.C.

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
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 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy